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RESEARCH ARTICLE

SPACE ECONOMY: BOON FOR SOCIO-ECONOMIC-NATURE DEVELOPMENT FOR FUTURE MANKIND

*[1]Dastagiri, M.B. and [2]Naga Sindhuja PV

[1]Principal Scientist, ICAR-National Academy of Agricultural Research Management, Rajendranagar, Hyderabad-500030. India; [2]Young Professional, ICAR-NAARM, Rajendranagar, Hyderabad-500030

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ABSTRACT

According to scientific theory, demolition of earth is an inevitability. The human mission to Mars is our destiny and the future is human colonization of the cosmos. Space science promotes social, economic and ecological sustainable development. This is Exploratory research. Perspectives, Meta-analysis, Vision and Economic analysis of research has been done. Data collected from Bryce Space and Technology, OECD, NASA, ESA, JAXA, IREA, and UNOOSA. The current study found that contribution of total global space economy was $366 Billion in 2019. United States, China, Russia, France and Japan allocated the highest budget on space. Revenue contributed to space economy from the satellite industry was more than Government Space Budgets and Commercial Human Spaceflight. Space investment provided benefits highly for environmental management, transport and urban planning, and R & D. Broadcasting activities help in social, educational and economic development. UNOOSA works to advance planetary defence mechanisms to increase the resilience of Earth to threats such as asteroid impacts. Solar powered satellites provide solution for global warming and easy energy generation using solar energy. Asia and Europe contributed the highest renewable energy in the world. Globally, China, Japan, United States, Germany and India have been generating higher solar energy. Applications of geospatial technology in the precision agriculture can make the crop production safer and reduce their detrimental impacts on nature and make agriculture sustainable. Space tourism activities are being advanced predominantly in North America and Europe, with zero-gravity/ parabolic flights, orbital space travel and sub-orbital flights provided to private customers. United States, Europe, India, Russia, China, Korea and Japan have been launchingmany satellites to collect information on weather parameters. NOAA operated Geostationary Operational Environmental Satellites for short range warnings, forecasts and observations and polar-orbiting satellites for longer-term forecasting, warnings, forecasts and observations and polar-orbiting satellites for longer-term forecasting. The study suggests that as space economy contribution more than spending for the development of socio-economic-nature planet development, the global countries, UNOOSA, space agencies, private industries, Philanthropic institutes cooperate, collaborate in all areas and invest for the space development.

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INTRODUCTION

According to scientific theory demolition of earth is an inevitability. When our sun drains its nuclear fuel, it will multiply in size and shroud the inner planets including Earth and burn them into oblivion (Williams, 2010). The earth is moving back toward the hostile equilibrium of outer space for the planet and humanity (Schramski *et al*, 2015). Presence of water and surface conditions on Mars craft is the most cordial of human life. Trade between Mars and Earth may stipulate an economic rationale for endured settlement on the planet. It is possible owing to breakthroughs ensued in rocket and space science (Dastagiri, 2017). The human mission to Mars is our destiny and the future is human colonization of the cosmos (Levine, 2010). World space forum mainly concentrates on space economy, space accessibility, space society, and space diplomacy (UNOOSA, 2019). Space science technology and its solicitations stipulate many solutions and assist to reach the Sustainable Development Goals of United Nations. Space science promote social, economic and ecological sustainable development (Ferretti, 2020). Government space activities include military applications for imagery and communications and civil activities including weather forecasting, science, and human exploration (Bryce Space and Technology, 2017). According to European Space Agency, space fosters an

***Corresponding author:* Dastagiri, M.B.,**
Principal Scientist, ICAR-National Academy of Agricultural Research Management, Rajendranagar, Hyderabad-500030. India

industry of innovation and high added-value services, enhancing employment and economic growth. Space tools endorse resilience and sustainable development from water management to precision agriculture and telemedicine. It is very essential to fight against diseases, help counteract terrorism, piracy, crime and also support populations at risk by delivering information in advance about disasters (UNOOSA Annual Report, 2019). Space economy set up a wide range of activities to understand the use of resources that build and offer value to the global population in the path of understanding, exploring, and utilizing space. The main purpose of space economy is to strengthen its role as the chief driver for a dynamic economy and address the economic benefits of the space sector (UNOOSA, 2020). Global space economy has exceeded 400 Billion USD in 2018 for the first time (UNOOSA, 2020).United States, China, Russia, France and Japan allocated the highest space budget in 2018 (Simon Seminari, 2019).NASA is working to inaugurate an eternal human presence within the next decade in the outer space to find novel scientific discoveries and lazed the base for private companies to construct a lunar economy (NASA, 2020). Total orbital launches and total spacecraft launches from 1957 to 2019 were 102 & 492, respectively. Launches by China was more i.e., 34 satellites followed by USA (27), while launches by Russia, Europe and India were 22, 9 and 6, respectively (Bryce Space and Technology, 2019). Extinction of humans may be promising like other animals. So, human beings have to search other planet to stay. For that knowledge on space exploration is very important to the discovery of planets and galaxies. How much global governments spending on space economy and receiving returns and the sectors associated with the space economy are analyzed. The present paper focuses mainly on broadcasting, communication, Earth observation, defense, navigation, scientific agriculture, space tourism, colonization, agriculture, climate and oceans.

Objectives

1. To analyze the global different countries governments budget spending and returns on space exploration and benefited sectors from space investment.
2. To estimate the contribution of global space economy for socio-economic-nature of planet development
3. To analyze components of space economy and Global Revenue of Satellite Industry
4. To suggest strategies and policies for the socio-economic-nature development for the welfare of future mankind.

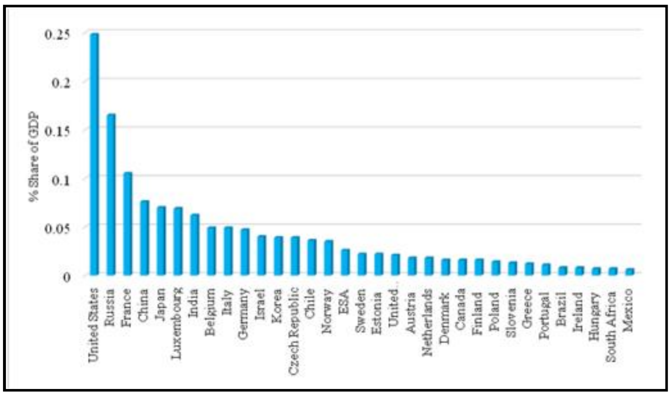
METHODOLOGY

This is Exploratory research. Perspectives, Meta-analysis, Vision and Economic analysis research has been done. How much on space economy is spending and returns benefited by different governments and the sectors associated with the space economy are analyzed. The present paper focuses mainly on broadcasting, communication, Earth observation, defense, navigation, scientific agriculture, space tourism, colonization, agriculture, climate and oceans. Data collected from Bryce Space and Technology, OECD, NOAA, NASA, ESA, JAXA, and UNO Outer space Agency on Space economy components and its contribution to global GDP as well as nations, private and public space organizations. Space Economy definitions and Concepts specified. Percentages calculated to find the contribution of each sector to space economy revenue and examined the benefitted sectors from space investment. Creative techniques employed, including techniques for idea generation and divergent thinking, methods of re-framing problems, changes in the affective environment and so on.

RESULTS AND DISCUSSIONS

Governments Budget Spending on Space Exploration and Benefited Sectors from Space Investment

Share of GDP in Government Space Budget of different countries (%): Percentage Share of GDP in Government Space Budget of different countries in 2017 has presented in the Figure 1. United States (0.248%), Russia (0.165%), France (0.076%), China (0.070%) and Japan (0.069%) shared the highest percentage of GDP on space budget when compared to other nations in the world.The study found that developed economies are spending more budget on space exploration.



Source: OECD Database

Figure 1. Percentage Share of GDP in Government Space Budget Estimates in 2017

Benefited Sectors from Space Investment: Sectors benefitted from space investment have depicted in the Figure 2. Overall global economy was improved by 11.6% from space investment. Space investment provided benefits highly for environmental management (11.3%), transport and urban planning (9.7%) and Research and development and science (9.4%). Space investment also provide benefits for climate monitoring and meteorology (8.1%), telecommunications (6.9%), defence and security (5.3%), energy (5.3%), agriculture (4.7%), high tech industries (4.1%), manufacturing, mining and construction (4.1%), disaster management (4.1%), education (3.8%), health (3.8%), tourism and leisure (2.8%), other services (1.9%), data analytics and location based studies (1.9%), and finance and insurance (1.6%).

Space Economy for Planet Development: Main components of space economy include space broadcasting, communication, earth observation, defense, navigation, energy sources, scientific agriculture, upstream (space tourism and colonization) and downstream (climate and oceans).

Space Economy Definitions and Concepts by Reports and Organizations: Economics and Statistics Administration, U.S. Department of Commerce, Federal Aviation Administration, White House, Congressional Research Service**,** OECD, Bureau of Industry and Security, Space Foundation and George gave definitions on space economy from different views, which was given in the Table 1.

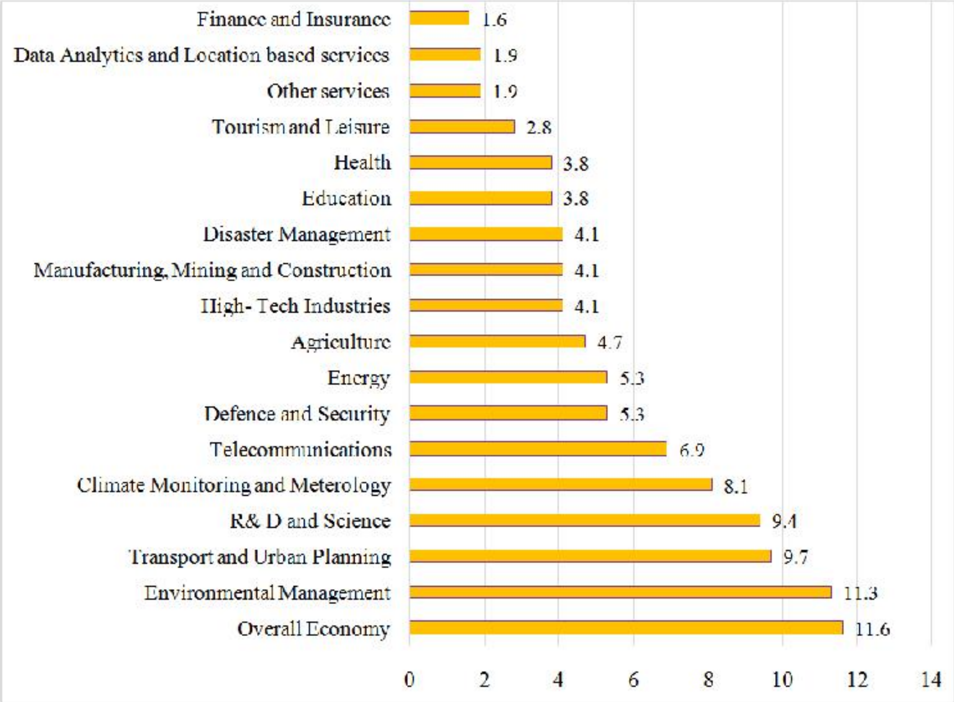


Figure 2. Globally, Benefited sectors from Space Investment (%)

Table 1. Definitions and Concepts on Space Economy and Commercial Space Activities

S. No.	Report or Organization	Space Economy Definitions and Concepts
1	Federal Aviation Administration (2010, 4)	“Commercial space transportation is carried out using orbital and suborbital vehicles operated and owned by private companies or organizations for profit, acquired through a competitive bidding process”.
2	White House (2010, 10)	“commercial space,” refers to space goods, services, or activities provided by private sector enterprises operate in accordance with typical market-based incentives for controlling cost and optimizing return on investment, and have the legal capacity to offer these goods or services to existing or potential non-governmental customers.
3	OECD (2012, 20)	“The Space Economy is the full range of activities and the utilization of resources, design and provide value and benefits to human beings in the course of exploring, understanding, managing and utilizing space. Hence, it includes all public and private actors involved in developing, providing and using space-related products and services, ranging from R & D, the manufacture and use of space infrastructure to space-enabled applications and the scientific knowledge generated by such activities”.

Source: The Journal of the U.S. Bureau of Economy Analysis

As per Economics and Statistics Administration, the revenue generated from space related activities would spend for improving private industries in USA, export markets and commercial launch services. US Department of Commerce uttered the commercial launch from the side of military or civil commercial payload. Federal Aviation Administration notified that private companies had involved mainly for profits in commercial space transportation. White House betrayed that private companies had capacity to face risk, operate with typical market-based incentives and invest in commercial space services. Congressional Research Service gave the definition of the space industry that economic activities relayed to fabricate and delivery of components, which drive into Earth's orbit or beyond. Both public and private sectors involved in space related activities mainly for developing, using and providing space-related products and services which was given by OECD. Bureau of Industry and Security told that space-related goods and services used to support space applications from Earth and launched into space. Federal Aviation Administration revealed the characteristics of commercial suborbital or orbital launch. Commercial payload was mainly operated and launched by private company, sometimes funded by government. Space foundation stated that it is a commercial mission which involved very less or no public investment for scampering the business. George viewed his opinion that profit pursuing companies performed commercial space transportation in this competitive market (Source: Bureau of Economic Analysis).

The Contribution of Space Economy: The contribution of global space economy in 2019 has presented in the Table 2. The revenue generated from satellite industry was contributed higher in space economy during 2019, which shared to be 74.04% ($271 Billion). Remaining 25.95% has been contributed by government space budgets and commercial human spaceflight. In satellite industry, ground equipment (35.60%) shared the highest percentage followed by satellite services (33.61%), satellite manufacturing (3.42%) and launch industry (1.33%).

The Global Revenue of Satellite Industry in 2019 has presented in the Table 3. Ground equipment includes main components such as GNSS equipment, satellite TV dishes and network equipment. Global revenue generated from ground equipment was $130.3 Billion that shared 48.08% to total Satellite Industry global revenue in 2019. Among the ground equipment, GNSS equipment generated more global revenue i.e., $97.4 Billion, which shared 35.94% to the total Satellite Industry global revenue in 2019. Revenue came from satellite TV dishes and network equipment was $17.9 Billion & $ 15.00 Billion, respectively.

Table 2. Contribution of Global Space Economy in 2019

S. No.	Particulars	Revenue (in Billion USD)
1	Government Space Budgets and Commercial Human Spaceflight	95 (25.95)
2	Satellite Industry	271 (74.04)
a)	Ground Equipment	130.3 (35.60)
b)	Satellite Services	123 (33.61)
c)	Satellite Manufacturing	12.5 (3.42)
d)	Launch Industry	4.9 (1.33)
Global Space Economy		366 (100)

Source: State of the Satellite Industry Report, June 2020, Bryce Space and Technology.
Note: Figure in Parenthesis indicate the percentage to the global space economy

Table 3. The Global Revenue of Satellite Industry during 2019

S. No.	Satellite Industry	Global Revenue (Billion US$)	Percentage to Total Satellite Industry Global Revenue
1	**Ground Equipment**		
	GNSS Equipment (devices/chipsets)	97.4	35.94
	Satellite TV dishes	17.9	6.61
	Network equipment (VSAs, Gateways)	15	5.54
	Total	**130.3**	**48.08**
2	**Satellite services**		
	Television	92	33.95
	Radio	6.2	2.29
	Broadband	2.8	1.03
	Fixed	17.7	6.53
	Mobile	2	0.74
	Remote Sensing	2.3	0.85
	Total	**123**	**45.39**
3	**Satellite manufacturing**		
	Commercial communications	5.63	2.08
	Remote sensing	3.38	1.25
	R & D	2.13	0.79
	Civil/Military Communications	0.38	0.14
	Satellite Servicing	0.13	0.05
	Navigation	0.38	0.14
	Military Surveiliance	0.25	0.09
	Scientific	0.13	0.05
	Others	0.13	0.05
	Total	**12.5**	**4.61**
4	**Launch industry**		
	United States launches	1.7	0.63
	Non-US launches	3.2	1.18
	Total	**4.9**	**1.81**
Total Satellite Industry Global Revenue in 2019		**271**	**100.00**

Source: Bryce Space and Technology & Satellite Industry Association

Components of Space Economy

Broadcasting TV and Radio: Broadcasting is a way of message convey to all receivers instantaneously. Its services are those execute the transmission of sounds and images (TV) or just sounds (radio) to the general public (De Oliveria *et al*, 2020).Broadcasting activities endorse the free dissemination and mutual exchange of facts and knowledge in scientific and cultural fields, which helps in social, educational and economic development, mainly in the developing countries. It improves the qualities of human beings life with respect to the integrity of political and cultural States (UNOOSA, 2020). Social media has flattered the key stage for ethnic minorities to articulate these scuffles. There has been mounting concerns on the role of broadcasting especially radios as a more active channel for ethnic involvement (Leung, 2020). Television and radio dive people both individually and collectively by mingling a variety of practices with communication technology (Denborough & Uwihoye, 2020). ARABSAT, EUTELSAT, ASTRA, HOT BIRD, INTERSPUTNIK, TELECOM, INTELSAT, and Inmarsat are the satellites, which are used for TV broadcasting and telecommunications (UNOOSA Report). Broadcasting and data services by GSO satellites assured basis for commercial, governmental and societal applications (UNOOSA, 2020). Regional co-operation mechanism assists African countries, mend their capacity to cope with climate change, and fortify cooperation in monitoring of satellite meteorologically, construct high-altitude observation radar stations, meteorological stations and personnel training and exchange for African countries (UNOOSA, 2020). INSAT 4A Satellite provide broadcasting services in remotely located regions in Bhutan (Cheki Dorji, 2018). Radio is an integral part of modernization, under very strict state control in Tukey. Television broadcasting has negative perception in Turkey from the beginning (Sumer & Tas, 2020).

Communication: Communication convey satellites are required for certifying consistent and continuous communication between the Earth and lunar assets (Gaur & Prasad, 2020). Satellite communication networks offered niche services and performed as relays for connectivity in remote and harsh environments and also for long distance broadcasting services. Generating network in planetary has its personal tasks because of fast orbital speeds and limited on-board power supply (Hassan *et al*, 2020). NASA CS2 (Cube

Sat Card Standard) planning offers many missions for high rate communication with a single platform and also a future platform for developing cognitive radio systems (Franconi *et al*, 2020).Free-space optical communication (FSO) system run on the basis of microring resonator (MRR) highlights 10 times bandwidth improvement over the radius, maintain and receive higher power than the minimum threshold at the users that helps to extract the original data without detection (Sivakumar *et al*, 2020). CFS-STM (Coded Forward Scheme- Streaming Transmission Model) can ominously develop the transmission efficiency of multi-service priority streaming delivery in Lunar Space Communication Networks (Gu *et al*, 2020). UNOOSA works with both SMPAG and IAWN in areas for communication and capacity-building, to increase cognizance among Member States on NEO risks.

Earth Observation: Earth observation from satellites assists to improve traceability of products, support predictive models for food supply, and monitor illegal fishing around the globe (Morgan Stanley, 2020). Earth Observation systems are used commonly for gauging earthquake and crustal deformation, which may assist to oblige the potential sources of seismic hazard (Elliott, 2020). European Copernicus Program was designed to promote earth observation data in various application of realms (Sudmanns *et al*, 2020). GNSS (Global Navigation Satellite System) and InSAR (Interferometric Synthetic Aperture Radar) contribute the data to estimate the hazards in advance (Elliott, 2020). Improvements in Earth observation from the aircraft, ground and space have enriched our capacity to identify and monitor active landslides. Satellite radar observations can be employed to find deformation signs to disastrous landslides, and warnings can be attained within real-time (Dai *et al*, 2020). Earth observation data obtained by satellites from geo-information products plays a prominent role in the detection of environmental parameters (Sogno *et al*, 2020). Advanced satellite sensor technologies and hyperspectral image-processing approaches could provide high resolution and real time data on a wide range of vulnerable ecosystem around the globe (Moran *et al*, 2020).

Defence: Planetary defense is a subtle topic that has inherently genuine intentions to safeguard the Earth, humankind or biosphere from an asteroid capable of triggering a destructive event (Schmidt, 2019). UNOOSA works to advance planetary defence mechanisms to increase the resilience of Earth to threats such as asteroid impacts. SMPAG (Space Mission Planning Advisory Group) works with space agencies worldwide on planetary defence. UNOOSA also collaborates with the IAWN (International Asteroid Warning Network) to strengthen an international coordination and cooperation in case of NEO (Near Earth Object) impact hazards. UN-SPIDER cares emergency retort efforts by enabling access to space-based information products offered by regional and global emergency mechanisms when a disaster strikes. EU space program provide an opportunity to employ safe and secure communication of satellites for community members (Borek *et al*, 2020). National Defence Strategy gave special attention to the development of technologies namely big data analytics, advanced computing, artificial intelligence, robotics, autonomy, directed energy, biotechnology and hypersonics (National Defence Strategy, 2018). CIRCE (Coordinated Ionospheric Reconstruction Cubesat Experiment) is a combined space mission between the UK Defence Science and Technology Laboratory and the US Naval Research Laboratory (NRL), which develops small satellite ionospheric physics capability. It helps in portraying dynamic ionosphere that is useful for the applications of defence and civil such as GPS, sensing technology, and communications (Agathanggelou *et al*, 2020).

Navigation: Now-a- days, it is easy to transport goods and services to any other country on water because of improvement in satellite technology. River navigation is a trade component and transport on water that can be accomplished by using modern GNSS satellite type of navigation. Global positioning systems are highly advantageous in the navigating component of the seas and oceans in the world. GNSS-type global positioning systems are using to monitor and manage commercial vessels sailing safer on the planetary oceans and the seas of Earth (Badescu *et al*, 2020). GNSS type global positioning systems include all the positioning systems namely GLONASS, BEIDOU, NAVSTAR-GPS, and GALILELO. BDS-3 GEO satellite (BeiDou Navigation Satellite System) was the successfully launched, provide many fundamental services around the globe (Li *et al*, 2020).

Many decisive operations such as sampling and landing operations was successfully performed by Hayabusa2, which is an asteroid sample return mission approved by the JAXA (Japan Aerospace Exploration Agency) (Ogawa *et al*, 2020). DTN (Disruption Tolerant Networking) allows for transmission and recovery of automated data thus helps to reduce manual operations. In deep space, SmallSats may utilize a spacecraft for communications with earth or act as a relay for landed and in-orbit assets (Davarian *et al*, 2020).Arcsecond Space Telescope Enabling Research in Astrophysics (ASTERIA) was a 6-unit CubeSat technology demonstration platform for optical navigation operations in low earth orbit (LEO) (Kennedy *et al*, 2020).

Energy: A satellite has to produce its own power, generating electricity from sunlight falling on photovoltaic cells or solar panels (European Space Agency, 2003). The main aim behind the proposed solar powered satellites is to achieve completely avoiding environmental pollution. The solar powered satellites provide solution for global warming and easy energy generation using solar energy (Boddu *et al*, 2019). Globally, SBSP (Space Based Solar Power) plays an immense role to provide clean energy to people in remote communities without depending on the outdated grid to a large local power plant. The utilization of the SPS to deliver power to small rovers or human outpost on Mars (Cougnet *et al*, 2006). Solar panel fortified, energy transferring satellites, which accumulate high intensity, incessant solar radiation by means of giant mirrors to replicate enormous amounts of solar rays onto smaller solar collectors. This energy is then wirelessly beamed to Earth in a harmless and controlled way as either a laser beams or microwave (Daniel Wood, 2014). Contribution of renewable energy by region have presented in the Table 4. Asian continent installed higher renewable energy in 2019 i.e., 44.19% of global total followed by European continent (22.65%). The generation of electricity from solar energy in 2018 was found to be highest in Asia (40.14%) followed by Europe (19.71%) and North America (18.62%). Country wise contribution of solar energy in the world has presented in the Table 5. China, Japan, United States, Germany and India were the major countries involved in the contribution of solar energy around the world.

Table 4. Contribution of Renewable Energy by Region

Name of the Regions	Installed Capacity in 2019 (MW)	Electricity Generation from Solar Energy 2018 (GWh)
Asia	1119265 (44.19)	2643589 (40.14)
Europe	573612 (22.65)	1297883 (19.71)
North America	391241 (15.45)	1226317 (18.62)
South America	220986 (8.72)	794164 (12.06)
Eurasia	103337 (4.08)	305588 (4.64)
Africa	48446 (1.91)	160236 (2.43)
Oceania	37149 (1.47)	84082 (1.28)
Middle East	23137 (0.91)	26605 (0.40)
Central America & the Caribbean	15691 (0.62)	47658 (0.72)
World	2532846.79 (100.00)	6585921.77 (100.00)

Source: International Renewable Energy Agency.
Note: Figure in Parenthesis indicate the percentage to the world total.

Table 5. Contribution of Solar Energy of Top 10 Countries in the World

Countries	Installed Capacity of Solar Energy (MW)	Countries	Electricity Generation from Solar Energy (GWh)
China	175286.86	China	178070.75
Japan	55500.00	United States	85184.00
United States	53183.50	Japan	62667.67
Germany	45181.00	Germany	45784.00
India	27355.32	India	31066.80
Italy	20113.66	Italy	22666.31
United Kingdom	13118.34	United Kingdom	12857.35
France	9617.02	Spain	12744.00
Australia	8627.00	France	10568.74
Republic of Korea	7129.86	Australia	9930.00

Source: International Renewable Energy Agency

Scientific Agriculture: Digital transformation technologies in agriculture is relevant and becoming a part of a competitive business. Modern technologies such as artificial intelligence, remote sensing and image processing, and artificial intelligence united with geographic information services are being used actively in an agriculture sector (Kirkaya, 2020). Precision farming technologies, cloud services of agricultural enterprise management, monitoring and accounting systems are the modern intelligent innovations applied in the field of agriculture in raising crop production (Rimma et al, 2020). Precision agriculture plays an important role in the modern revolution of agriculture (Caballero et al, 2020). High resolution multi-band images captured from satellite systems, unmanned aerial vehicles, and meteorological and soil characteristic data from sensors are assigned to decision support platforms. Artificial intelligence support can be mainly employed to identify the crop stress factors that may help to provide instant alternatives of solution (Kirkaya, 2020). UAVs (Unmanned Aerial Vehicle) captured the images, which helps to identify the crop quality, weeds, healthy and dried leaves, ripen fruits, fungus infected areas (Nakshmi et al, 2020). The ESI (Evaporative Stress Index), indicator of agricultural drought, is accessible through SERVIR Global, a joint venture between the NASA and the United States Agency for International Development (USAID) (Yoon et al, 2020). USA is the leading country in the adoption of precision agriculture followed by China (Maloku et al, 2020). Satellite and sensor technology assist to identify various stages of N fertilization by providing data under optimal conditions. Two twin satellites Copernicus Sentinel-2A/B mainly helps to improve Nitrogen fertilization by yielding a higher spatial and spectral resolution (Spiegel et al, 2020). In precision agriculture, applications of geospatial technology can make the crop production safer and reduce their detrimental impacts on nature and make agriculture sustainable (Praveen and Sharma, 2020). The rise of precision technologies for agriculture mainly plant genome editing and digital farming made the agri-food sector environmentally sustainable (Clapp & Ruder, 2020).

Upstream (Space Tourism and Colonization)

Space Tourism: Resource and technology standards are still underdeveloped (Davidian, 2020). So many years of improvement, testing and investing millions of dollars, the adventure space tourism operators are getting closer to open commercial operations (OECD, 2019). Space tourism and orbit servicing are in the cutting edges of development. The interest of travelling into space for recreational purposes is called Space Tourism. This is also known as personal spaceflight, citizen space exploration, or commercial human spaceflight that covers spaceflights which are orbital, sub-orbital, and even beyond Earth orbit. In the coming few decades, space tourism may head to large numbers of people traveling to space (National Space Society). Both state and federal governments look for on private space travel to achieve their basic infrastructural maintenance pertaining to economic development, expansion, and competitiveness (Beery, 2012). Space tourism activities might be grown to a range of $100 billion per annum by 2030 and creating more employment opportunities according to Japanese Rocket Society scenario (Collins, 2000). The first commercial sub-orbital spaceflight began since 2004. Atmospheric zero-gravity flights, High-altitude jet fighter flights, short-duration sub-orbital flights, and longer duration orbital voyages into space (Crouch et al, 2009).

Activities of space tourism activities are being advanced predominantly in North America and Europe, with zero-gravity/ parabolic flights, orbital space travel and sub-orbital flights provided to private customers (Space economy at a Glance, 2014). Suborbital space tourism planning requires 2-3 days of training to reach the 100 kms altitude border of space and returning to Earth either vertically or horizontally (OECD, 2019). Orbital space tourism amenities intention is to typically provide a 7-11 day reside in space and charges tens of millions of USDs. The US start-up Axiom Aerospace will be contributing additional tourist with charges about 55 million USDlodges on the International Space Station starting from 2020 (Axion Space, 2019). There are some activities to influence the space tourism, namely type of launch and design of the spacecraft, type of space travel either orbital or sub-orbital, training required, reputation of the company, health, duration and insurance (Reddy et al, 2012). ICPEN members identified inadequate and misleading information disclosures relayed to pricing information of space tourism as a major constrain for online customers in 2015 (Digital Economy OECD, 2016). There are several cultural, environmental, and geo-political implications to being a space launch state with many consequences for sustainability, tourism, and tourism branding (Scott, 2020).

Table 6. Current Geostationary Weather Satellites

Actors/ Organizations	Country	Satellites' Name	Orbital Position of Satellites'
NOAA	United states	GOES-15 GOES-13, OES-14[2]	East Pacific West Atlantic
Eumetsat	Europe	Meteosat-9, 10 and 11 Meteostat-7	East Atlantic Indian Ocean
ISRO	India	INSAT-3C, Kalpana-1, INSAT-3D, INSAT-3A	Indian Ocean
RosHydroMet	Russian Federation	Electro-LN1[1]	Indian Ocean
China Meteorological Administration	China	Feng-Yun-2D, FY-2E FY-2F[2]	Indian Ocean West Major Pacific
Korea Meteorological Administration	Korea	COMS-1	West Major Pacific
Japan Meteorological Agency	Japan	Himawari-6 and 7	West Major Pacific

Source: OECD: Space Economy at a Glance 2014.

Commercial space tourism and suborbital flights are not concealed by any existing insurance regime. This is the main problem for space tourism travelers (Space economy at a Glance, 2014). Prevailing international legal rules casing space and air activities are not fit to large-scale commercial entry to space (Freeland, 2010). Ticket cost, demand, motivation, health, and risk are the main aspects influencing the arrival of sub-orbital space tourism (Musselman& Hampton, 2020). There are some restrictions on space travelling risks in US. US have domestic law instrument for US execution in space sphere, moreover grants property rights to concerns to mien events on personal risks in space with issue of traveler (Bulgakova, 2020).

Colonization: Space exploration will be unsafe trips of discovery. The biggest challenge for human collaboration on Mars will be permanent dependence on a life support system, dependence on delivery from Earth, and no possibility for evacuation or escape (Szocik et al, 2020). Increasing private investment in the space exploration is dependent on the existence of clear worldwide space laws that allow and ignite pro-profit decision making (Iliopoulos & Esteban, 2020). Space colonization is the goal of public as well as private space-related ambitions and ventures (Kovic, 2020). Space colonization, the establishment of permanent human habitats beyond Earth, has an enormous potential moral value, because successful space colonization is the necessary condition for trillions of future people to come into existence. Reusable rockets were projected to enable and revolutionize solar system human colonization (Bushnell & Moses, 2020). They may be a radiation and lower energy, which is dangerous for the existence of human beings (Szocik et al, 2020). Loss of bone density, eye effects and radiation effects were associated with the space missions (Aravindhan et al, 2020). Increasing awareness for environmental preservation has kindled debates around the financial and socio-environmental sustainability of space exploration (Iliopoulos & Esteban, 2020). The most facing problem in future if we shift to other space is mainly food. If food and nutrition system fail to happen then the situation will go wrong horribly (Douglas et al, 2020). Future efforts needed to mitigate the risks associated with the space colonization (Kovic, 2020).

Down Stream

Climate: Space-based technologies and space-derived information play a key role in science, climate knowledge, monitoring and early warning (UNOOSA, 2020). Satellites aid to gauge Earth's temperature, sea levels, greenhouse gas emissions, dwindling ice atmospheric gases, and forest cover etc., for understanding climate change and forecasting future of the planet. Meteorological satellites help to forecast cyclones and weather by capturing images (UNOOSA, 2020). Weather satellites are operated by agencies in China, France, India, Japan, Korea, the Russian Federation, the United States and Europe international collaboration with WMO (World Meteorological Organization). LIBRA is the satellite will be launched by CSRB (Chinese Space-based Radiometric Benchmark) around 2025. LIBRA will provide measurements with SI traceability for the incoming radiation from the Sun and the outgoing radiation from the Earth with high spectral resolution (Zhang et al, 2020). NASA designed TRMM (The Tropical Rainfall Measuring Mission) satellite to increase our understanding of the precipitation distribution and variability within the tropics as part of the water cycle in the current climate system (NASA, 2020). Current geostationary weather monitoring satellites have presented in the Table 6. United States, Europe, India, Russian Federation, China, Korea and Japan are the countries mainly launched satellites, involved in collecting information on weather parameters.

Oceans: According to NOAA, the role of ocean is immense in regulating the planet weather and climate. Satellite altimetry is one of the most essential technique required to monitor, understand and forecast the status of the ocean (Ravichandran, 2008).Information gathered by satellites can inform us about sea surface temperature, coral reefs, ocean bathymetry, ocean color, and sea and lake ice. Transmitters on satellites provide reliable information from emergency warning to save lives when people are in distress on airplanes, boats, or in remote areas (NOAA, 2020). NOAA operated GOES (Geostationary Operational Environmental Satellites) for short range warnings, forecasts and observations and polar-orbiting satellites for longer-term forecasting. Satellite data used to estimate the moisture transport incorporated over the depth of the atmosphere (Liu et al, 2005). NOAA, NASA, and ESA scrutinize temperature, clouds, sea levels, ocean conditions, and heat content to obtain information on how quickly Earth's temperature is changing (Aditya Chaturvedi, 2020). AQUA/ AIRS, ISCCP, and TRMM 3B42, IMD, GPCD & CMAP satellites aided to provide an information on surface air temperature and humidity, short wave radiation, and rainfall (Ravichandran, 2008). The SMOS (Soil Moisture and Ocean Salinity) satellite sensors have been observing the oceans and soil (Kira Coley, 2015). Nimbus-7 satellite was being launched which carried sensor named the Coastal Zone Colour Scanner (CZCS), mainly intended for supervising the water bodies and Earth's oceans (Government of Canada, 2015). Autonomous profiling floats equipped with biogeochemical sensors monitor temperature, conductivity, bio-optical parameters, dissolved oxygen as well as nitrate (Barnard & Mitchell, 2013). NOAA/NASA Suomi NPP satellite, VIIRS

(Visible Infrared Imaging Radiometer Suite) was the most frequently used device to show variations of sea surface temperature over time for several regions around the world.

Conclusions: According to scientific theory, demolition of earth is an inevitability. The human mission to Mars is our destiny and the future is human colonization of the cosmos. World space forum mainly concentrates on space economy, space accessibility, space society, and space diplomacy. Space science promote social, economic and ecological sustainable development. Global space economy has exceeded 400 Billion USD in 2018 for the first time. How much space economy is spending and returns obtained by different governments and the sectors benefited with the space economy are discussed in the current paper are mainly broadcasting, communication, Earth observation, defense, navigation, scientific agriculture, space tourism, colonization, agriculture, climate and oceans. This is explorative research. Perspectives, meta-analysis, vision and economic analysis research has been done. Data was gathered from Bryce Space and Technology, OECD, NOAA, NASA, ESA, JAXA, International Renewable Energy Agency and UNOOSA. United States, China, Russia, France and Japan allocated the highest budget on space in 2018. Contribution of total global space economy was $366 Billion in 2019. Out of which, $271 Billion revenue has been generated from the satellite industry and the remaining $95 Billion from Government Space Budgets and Commercial Human Spaceflight. Ground equipment and satellite services contributed higher space economy to satellite industry. Space investment provided benefits highly for environmental management transport and urban planning, R & D, and science. Broadcasting activities help in social, educational and economic development, mainly in the developing countries. Satellite radar observations can be employed to find deformation signs to disastrous landslides, and warnings can be attained within real-time.

UNOOSA works to advance planetary defence mechanisms to increase the resilience of Earth to threats such as asteroid impacts. River navigation is a trade component and transport on water that can be accomplished by using modern GNSS satellite type of navigation. The solar powered satellites provide solution for global warming and easy energy generation using solar energy. Asia and Europe contributed the highest renewable energy in the world. China, Japan, United States, Germany and India have been generating more solar energy in the world. Modern technologies such as artificial intelligence, remote sensing and image processing, and artificial intelligence united with geographic information services are being used actively in an agriculture sector. In precision agriculture, applications of geospatial technology can make the crop production safer and reduce their detrimental impacts on nature and make agriculture sustainable. Space tourism activities might be grown to a range of $100 billion per annum by 2030 and creating more employment opportunities according to Japanese Rocket Society scenario. Activities of space tourism activities are being advanced predominantly in North America and Europe, with zero-gravity/ parabolic flights, orbital space travel and sub-orbital flights provided to private customers. There are several cultural, environmental, and geo-political implications to being a space launch state with many consequences for sustainability, tourism, and tourism branding. Ticket cost, demand, motivation, health, and risk are the main aspects influencing the arrival of sub-orbital space tourism. Successful space colonization is the necessary condition for trillions of future people to come into existence. United States, Europe, India, Russian Federation, China, Korea and Japan are the countries mainly launched satellites, involved in collecting information on weather parameters. Transmitters on satellites provide reliable information from emergency warning to save lives when people are in distress on airplanes, boats, or in remote areas. NOAA operated Geostationary Operational Environmental Satellites for short range warnings, forecasts and observations and polar-orbiting satellites for longer-term forecasting. The study suggests that as space economy contribution more than spending for the development of socio-economic-nature planet development. So the global countries, UNOOSA, space agencies, private industries, philanthropic institutes collaborate, cooperate and invest for the space development.

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