ISSN: P-2455-0515
E- 2394-8450

Educreator Research Journal

A Peer Reviewed Referred Journal

Volume–IX, Special Issues–I
March – April 2022

Original Research Article

EFFECT OF SPACE POLLUTION ON ENVIRONMENT AND HUMAN HEALTH

Dr. Sudhakar Jagannath Borase

**Assistant Professor, Department of Geography, RNC Arts, JDB Commerce & NSC Science College, Nashik , Maharashtra.*

Abstract

The problem of waste is now being felt in space as well as on earth. There is so much rubbish growing around the earth in space that a mission has to be launched for it. Scientists estimate that there is 7600 tons of space waste around the earth. If a small piece of debris hits a satellite in space, it could split into thousands of pieces. Not only is that, but the speed of the satellite in danger of increasing to 25000 kilometers per hour. Fragments of satellites orbiting in space at this speed can be dangerous to other satellites. It is better not to think about what will happen if these pieces hit a human spacecraft. In the current age of science and technology, the rate of launching satellites into space has increased rapidly. Private companies have also started sending satellites. Rockets and their components needed to launch a satellite into space do not usually return to Earth. They revolve around the earth. So naturally, the more rockets go into space, the more waste there will be. It usually lasts 10 to 15 years after launching a satellite into space. After that it fails. But it keeps moving in space. Moreover, some satellites fail after going into space. So they are also moving. So the more satellites go into space, the greater the risk. For this, the whole world needs to think of the future and take concrete steps

Keywords*:* *Space Pollution, Fragmentation Debris, Satellite.*

Introduction:

Debris in space is any man-made object in orbit that no longer serves a useful purpose, including the failed satellites, discarded equipment and rocket phases, and fragments of satellites and rocket phases. This is a matter of concern because - due to the very high speed in orbit - even relatively small pieces can damage or destroy satellites in a collision. High-altitude mounds can remain in orbit for decades or more, so they accumulate during high production and increase the risk of collisions with satellites. Since there is currently no effective way to remove large amounts of debris from the orbit, it is important to control scrap production in order to maintain long-term use of space. Today, as of January 1, 2021, there are approximately 6,542 satellites orbiting the Earth. Of these, 3,372 satellites are active and 3,170 are inactive.

There are about 34,000 pieces of space junk larger than 10 centimetres, and millions of smaller pieces that can still be devastating if they collide with another object.

Methodology:

The methodology of present work includes secondary data. The secondary data collected through varies books and internet.

Objectives:

- To identify the situation of Space pollution.
- To assess the awareness regarding Space pollution.

Causes of space pollution:

Space is generally polluted for all the following reasons or its various sources are as follows.

- Defunct satellites. Satellites have a limited useful life and, when their batteries are spent or they break down, they are left drifting about in space. ...
- Missing equipment. Astronauts sometimes drop tools or other objects during space walks.
- Rocket stages. ...
- Weapons.

Table No. 1: No. of Satellites by various Countries and Organizations 2021

Sr. No.	Country/Organization Name	Satellites in Orbit	Sr. No.	Country/Organization Name	Satellites in Orbit
1	Algeria	06	47	Malaysia	07
2	Arab Satellite Communications org.	14	48	Mauritius	01
3	Argentina	39	49	Mexico	15
4	Asia Satellite Communications org.	08	50	Morocco	02
5	Australia	31	51	Netherlands	11
6	Azerbaijan	31	52	New Ico	01
7	Bangladesh	01	53	New Zealand	05
8	Belarus	02	54	Nigeria	06
9	Boliva	01	55	North Atlantic Treaty Organization	08
10	Brazil	19	56	North Korea	02
11	Bulgaria	03	57	Norway	11
12	Canada	73	58	O3B Networks	20
13	Chile	03	59	Orbcomm	41
14	China/Brazil	03	60	Pakistan	06
15	Commonwealth of Independent states (Former USSR)	1534	61	Peoples Republic of China	519
16	Czech Republic (Former Vzechoslovakia)	03	62	Peru	02
17	Czechia	03	63	Philippines (Republic of the Philippines)	04
18	Denmark	09	64	Poland	10
19	Ecuador	02	65	Portugal	02
20	Egypt	07	66	Qatar	01
21	Estonia	02	67	Regional African Satellite Com. Org.	02
22	European Org. for the Exploration of Metrological Satellite	09	68	Republic of Rwanda	02
23	European Space Agency	93	69	Republic of Slovenia	02
24	European Telecomm. Satellite Org.	55	70	Republic of Tunisia	01
25	France	86	71	Saudi Arabia	15
26	France/Germany	02	72	Sea launch	01
27	France/Italy	02	73	Singapore	10
28	Germany	75	74	Singapore/Taiwan	02
29	Global star	84	75	Slovakia	01
30	Greece	03	76	Societe Europeenne des satellites	57
31	Hungary	01	77	South Africa	08
32	India	103	78	South Korea	25
33	Indonesia	17	79	Spain	40
34	International Mob. Satellite Organization (Inmarsat)	19	80	Sweden	11
35	International Space Station	05	81	Taiwan (republic of China)	19
36	International Telecommunication Satellite Organization	86	82	Thailand	13
37	Iran	03	83	Turkey	15
38	Iraq	01	84	Turkmenistan/Monaco	01

39	Israel	23	85	United Arab Emirates	16
40	Italy	36	86	United Kingdom	438
41	Japan	209	87	United States	4321
42	Kazakhstan	08	88	United States/Brazil	01
43	Laos	01	89	Uruguay	01
44	Latvia	01	90	Venezuela	03
45	Lithuania	08	91	Vietnam	03
46	Luxembourg	12			

Source: https://www.statista.com

The table above lists the number of satellites launched by different countries and organizations in space so far. Most satellites launched by Commonwealth of Independent States (Former USSR) (1534). It is followed by United States (4321). Almost all countries in the world, with a few exceptions, are responsible for space pollution. This is evident from the statistics.

The contamination of space from non-working and decommissioned satellites, abandoned rocket stages and other debris. An estimated 20,000 objects considered "space junk" have been tracked; however, more than a million smaller pieces are estimated. Starting with Russia's Sputnik 1 in 1957, the ever-increasing rocket launches and number of satellites in orbit all contribute to space pollution. In 2020, there were approximately 2,500 satellites with plans by companies such as Amazon and Space to launch thousands more

In the most general sense, the term space pollution includes both the natural micrometeoroid and man-made orbital debris components of the space environment; however, as "pollution" is generally considered to indicate a despoiling of the natural environment, space pollution here refers to only man-made orbital debris. Orbital debris poses a threat to both manned and unmanned spacecraft as well as the earth's inhabitants.

Environmental and health impact:

Effects of debris on other spacecraft range from surface abrasion due to repeated small-particle impact to a catastrophic fragmentation due to a collision with a large object. The relative velocities of orbital objects (10 km/s on average, but ranging from meters per second up to 15.5 km/s allow even very small objects such as a paint flake to damage spacecraft components and surfaces . For example, a 3mm aluminum particle traveling at 10 km / s is equivalent in energy to a bowling ball traveling at 38 Km/h. In this case, all the energy Contamination of space due to inactive and decommissioned satellites, launched rocket stages and other debris. Approximately 20,000 objects are considered "space junk"; however, more than a million smaller pieces are estimated. Beginning with Russia's Sputnik 1 in 1957, the ever-increasing number of rocket launches and the number of satellites in orbit all contribute to space pollution. By 2020, companies like Amazon and Space have approximately 2,500 satellites with plans to launch thousands more

In the most general sense, the term space pollution includes both natural micrometeoroids and man-made orbital debris in the space environment; however, "pollution" is generally considered to indicate the degradation of the natural environment, here the reference to space pollution is only man-made orbital debris. Orbital debris poses a threat to unmanned and unmanned spacecraft as well as to Earth's inhabitants.

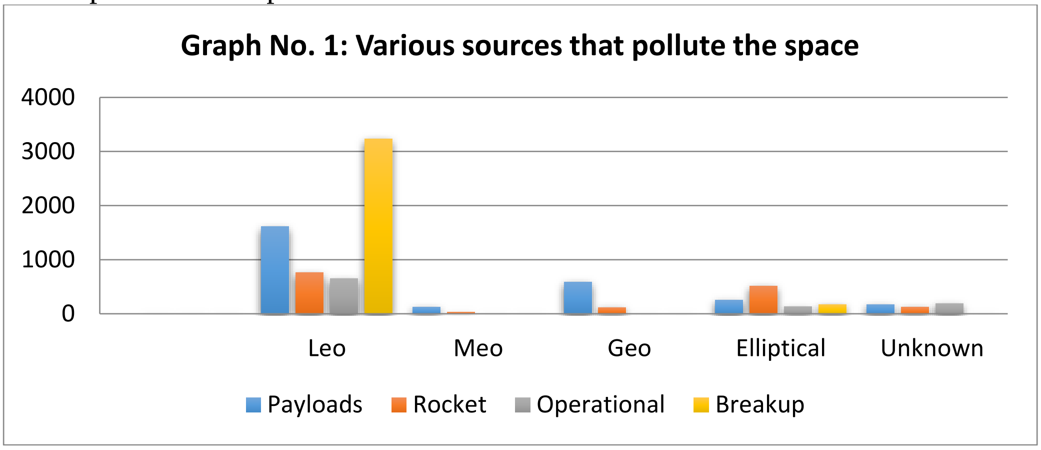
The impact of piles on other spacecraft is often due to the effects of small-particles, from surface friction to catastrophic fractures due to collisions with large objects. The relative speed of orbiting objects averages 10 kilometres per second, but meters per second to 15.5 km/s. For example, a 3 mm aluminium particle traveling at a speed of 10 km/s is equivalent to the energy of a bowling ball traveling at a speed of 37.5 km/h.

Table No. 2: Various sources that pollute the space

	Payloads	Rocket bodies	Operational debris	Breakup debris	Anomalous debris	Totals
Leo	1612	758	651	3232	119	6372

Meo	126	28	2	0	0	156
Geo	587	116	1	2	0	706
Elliptical	249	515	135	167	0	1066
Unknown	171	120	185	0	0	476
Totals	2745	1537	974	3401	119	8776

Source: Anz-meador, p.d., "history of on-orbit satellite fragmentations", 12th ed., NASA Johnson space centre report



Above the table and graph can be seen that if we look at the statistics, then Breakup debris (3401), Payloads (2745), Rocket bodies (1537), Operational debris (974), and Anomalous debris (119) are generated in this way. So much waste has been created.

Fragmentation breakdown:

The particles will be distributed over an area of equal size, causing cracking or penetration, depending on the thickness and physical properties of the surface being affected. There has been an accidental collision between objects catalogued to date, but surfaces returned from space and examined in a laboratory confirm regular bombings by small particles. Due to this type of damage while in orbit, the components of the space shuttle vehicle with windows are regularly replaced. Garbage also poses a threat to the earth's surface. High-melting-point materials such as titanium, steel, ceramics, or large or densely constructed objects can withstand re-entry into the atmosphere to strike the Earth's surface. Although no casualties or serious injuries have been reported from the piles, re-entry items are routinely inspected, and occasional found debris is generally divided into three sizes, depending on the damage caused: 1 cm, less than 1 to 10 cm, And larger than 10 cm. Objects less than 1 cm in size can be protected, but they still have the potential to damage most satellites. Piles in the range of 1 to 10 cm are not protected; they are not easily seen and can destroy satellites. Finally, collisions with objects larger than 10 cm can cause the satellite to break. Of these sizes, only 10 cm and larger objects are regularly tracked and catalogued by surveillance networks in the United States and the former Soviet Union. Other populations are estimated statistically by analysis of the returned surface by special measurement operations with sensitive radar (size greater than 3 mm). Approximately 30 million piles of approximately 1 mm and 1 cm for a population, more than 100,000 debris between 1 and 10 cm, and 8,800 objects larger than 10 cm provided the number, nature and location of objects larger than 10 cm. In the fragmentation debris table and the image of the mounds in space around the earth. Low Earth Orbit (LEO) is defined as the orbital altitude of 2,000 km below the Earth's surface and is the subject of the image of clusters in space around the Earth. Middle Earth Orbit (MEO) is the territory of the Global Positioning System (GPS) and the Russian Navigation Satellite System and is located at an altitude of approximately 20,000-km, while the Geosynchronous Earth Orbit (GEO) "belt" is dominated by communications and Earth. - Observation payload about 35,800 km. Most of the objects in these orbits are in a circular or near-spherical orbit around the earth. In contrast, the elliptical orbital range includes MEO and GEO, as well as rocket bodies released into their transfer orbits in scientific, communications and Earth-observation payloads. Of all the objects listed in the fragmentation debris table, the majorities are "debris" - only 5 percent of the objects in orbit represent operational payloads or spacecraft. Also, of the approximately 28,000 objects tracked since the launch of Sputnik 1 in October 1957, items not included in the fragmented debris table have either re-entered Earth's atmosphere or escaped Earth's influence (to land on Mars, for example). The distribution of piles smaller than 10 cm is assumed to be in the orbit of the original object and is assumed to be similar to the distribution presented in the image of the piles in space around the Earth.

Solution plan:

Measures take two courses: protection and mitigation. The defense seeks to protect the spacecraft and uses intelligent design methods to minimize the impact of piles. Mitigation efforts to prevent debris from forming. Active mitigation techniques include the avoidance of collisions between traceable and manipulative objects and the deliberate re-entry of objects into the oceans. Passive techniques include the removal of residual fuel or pressure vessels from rockets and spacecraft, retention of operational debris, and the disposal of spacecraft at the end of the mission. Space salvage or recovery, while an option, is currently very expensive to hire on a regular basis.

The United States and the International Atomic Energy Agency (IAEA) have identified the threat and are working to limit its environmental and health risks. The Inter-Agency Space Debris Coordination Committee (IADC), originally sponsored by the National Aeronautics and Space Administration (NASA), includes all major space-traveling nations. The IADC Charter covers the coordination and dissemination of solution research, and policies based on research findings are being adopted by the space community around the world.

Although the overall population is growing, the rate of growth has slowed down in the 1990s due to policies to improve growth. However, continuous work is needed to reduce the risk of orbital debris for future generations and to continue to use space safely, economically.

Conclusion:

A collision with a mound larger than 1 cm will disable the working spacecraft and may cause a disintegrated spacecraft or rocket body to explode. The impact of the millimetre-sized pile could cause local damage or disable the subsystem of the operational spacecraft. Therefore, it is necessary to make arrangements in such a way that all the waste products will be burnt to ashes. So that the risk is reduced

References:

Committee on Space Debris, Aeronautics and Space Engineering Board, Commission on Engineering and Technical Systems, National Research Council. (1995).

"Orbital Debris: A Technical Assessment." Washington, D.C.: National Academy Press. Johnson, Nicholas L. (1998). "Monitoring and Controlling Debris in Space." Scientific American 279(2):62–67.

http://www.iadc-online.org.

http://pompeii.nap.edu/books/0309051258/html/index.html

https://www.statista.com

Daily Lokmat News paper

Cite This Article:

****Dr. Sudhakar Jagannath Borase,*** *(2022).* ***Effect of Space Pollution on Environment and Human Health,*** *Educreator Research Journal IX (Special Issues - I), March –April, 7-11.*