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## **GEOGRAPHY AS A DESIGN DRIVER**

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### **Abstract**

The influence of geography on design is a significant factor that shapes various aspects of our lives. This paper explores the impact of geography on design, including its influence on the environment, evolution, culture, socio-economic development, and architecture. Geography, as the study of places and their relationships with people and the environment, explains the diversity and uniqueness found worldwide. It affects the evolution of species and cultures through varying environmental conditions created by geographical separations. Furthermore, geography plays a role in shaping human traits such as race and ethnicity. Socio-economic development is influenced by geography, with factors like landlocked locations affecting trade, coastal areas benefiting from higher incomes, and topography impacting state formation. In architecture, geography influences materials, design decisions, and climate adaptation. Moreover, the future colonization of other planets, such as Mars, will require innovative designs driven by the unique geographic conditions of these celestial bodies. Overall, geography is a crucial

determinant of design, influencing form, function, and cultural expression.

**Key Words:** *Geography, Design driver, Nature, Human Creativity, Future.*

## **Introduction**

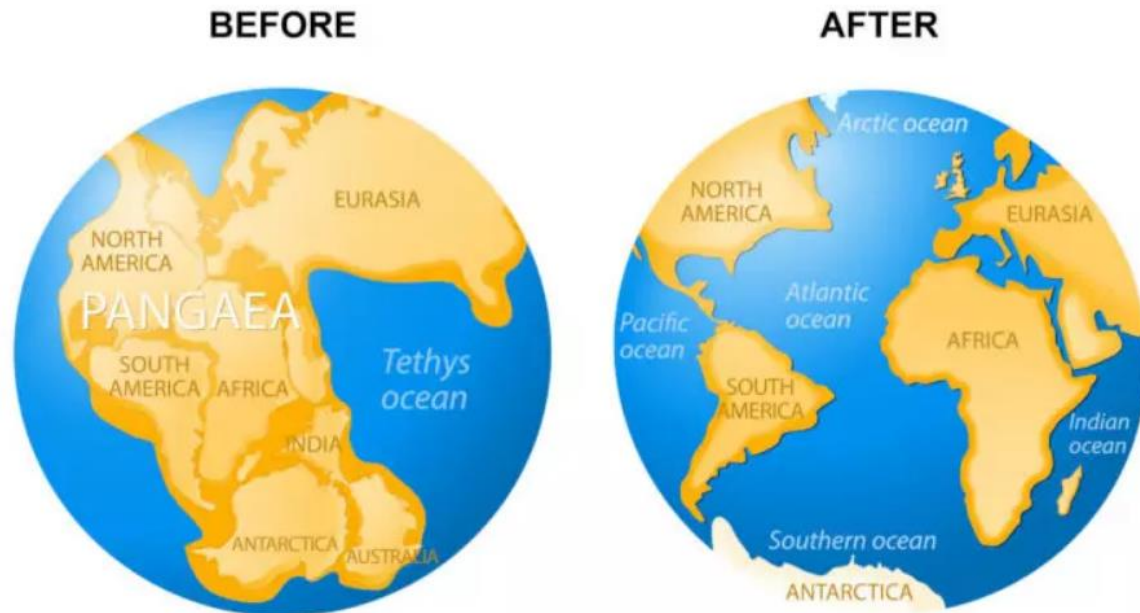
Design is a broad concept, and its meaning can vary from situation to situation, person to person. Every designer will have their perception of what drives it. Many things can drive designs, and one of those important things is geography. This paper aims to look at what geography is and how influential it is in shaping things around us, whether natural or man-made.

According to National Geographic, Geography is the study of places and the relationships between people and their environments. To most people, Geography means where places are and what they are like, but if we take a closer look, Geography explains why certain things are as they are, and where they are. (What is Geography? n.d.). It explains why there is so much diversity all around the world in everything from the appearance of people to the food they eat. Geography influences everything from our food, health, safety, and climate to our social and economic systems. Imagine a world there are no geographical differences, no deserts in Sahara, or ice caps on the poles, it would result in everywhere everything looking and feeling the same, and everyone would be experiencing similar environmental conditions and having access to similar resources. Most importantly, this would completely alter the course of the origin and evolution of species and cultures.

**Geography is a field of study that deals with the description, distribution, and interaction of the diverse physical, biological, and cultural features of a planet's surface. Geography can also improve our understanding of places and the relationship between people and their environment, it includes physical features, their atmosphere, human activity, distribution of population, resources, and economic activities. Our understanding of social and physical**

**processes within the context of place defines geography. Even though the term means to graph physical places, geography is also about spatial aspects of human existence and its shared relations, how humans occupy and alter the physical landscape, and the relationship between the environment and human society.**





*Figure 2 Earth before and after separation of Plate Tectonics. Source: <https://worldinmaps.com/tectonic-plates>*

## **Influence on Geography in Nurturing Life**

**We all have learned about the theory of evolution. At a very basic level, organism undergoes evolution to adapt to their change's environmental conditions; it's a survival mechanism, now what drives these environmental conditions are primarily their geographical location. Climate, resources, flora, and fauna all change due to varying geography. Geological studies show that the earth's geography was in a very different state than what we see now. There was only one single land mass continent called Pangea and one single huge ocean called Panthalassa; the continents and oceans we have now are the results of the movement of plate tectonics and the subsequent breakdown and separation of land mass that sits above it. These geographic separations caused the formation of very diverse geographic conditions all over the globe. Hot, cold, dry,**

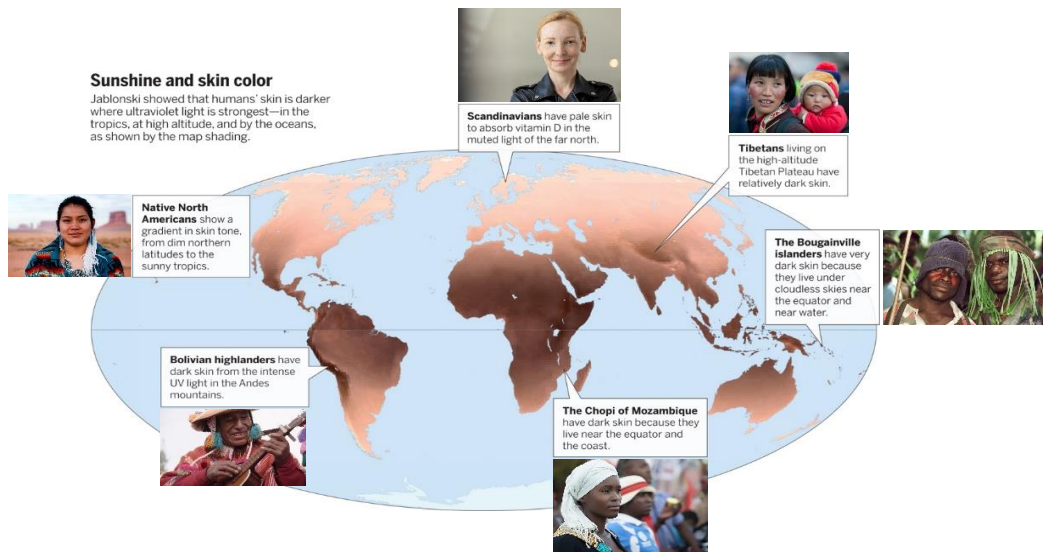
humid, etc. This also caused species to evolve differently to adapt to their changing conditions. These eventually led to minor and major biological differences in life forms. Human differences in cultures, way of life, faith, food, shelter, clothing, etc., all of these things began to take unique shapes and forms in different parts of the world.



There is a strong relationship between man and the natural environment, After the publication of Charles Darwin's Origin of Species (1859), the concept of defining geography concerning the relationship between man and the environment began to take shape. Darwin's geological findings and theories all pointed toward the idea that things in nature evolve with time and their changing conditions or said as evolution. Some places contain more species than others. For example, Sahara has fewer species than a temperate rainforest like Amazon. Life thrives in one, and in the other, only very selected lifeforms that have undergone evolution can survive. The Amazon is the most biodiverse terrestrial place on the planet. This amazing rainforest is home to more species of birds, plants, and mammals than anywhere else. Around 30% of the world's species, and 10% of the world's biodiversity, can be found there. Factors that influence the species richness include are size and position of continents and islands, the height, position, and location of mountains, and



temperature and exposure to energy from the sun. (Lobo, n.d.). These three factors in different combinations can cause very different environmental conditions cold, hot, dry, tropic, etc., On the poles, it is very cold due absence of direct sunlight. The high position of the sun causes extreme heat in deserts. Many of the patterns we observe around us are the result of the historical movement of tectonic plates, and uplift and degradation of mountains and the accompanying effect on climate and the persistence and distribution of flora and fauna. The geographic distribution of organisms in the various locations follows patterns that can be explained by evolution concerning the movement of tectonic plates slowly over time.



Race and Ethnicity are other important Human traits influenced by physical geography. Further, the distance between the two places and differences in people's physical traits like skin, color, height, and hair will be more and more. a person's racial character can be traced down to where in the world their ancestors originated from. People whose ancestors have been living in the same geographic location

for a long time seem to show similar visible traits. Further, the distance between the two places and differences in people's physical traits like skin, color, height, and hair will be more and more. a person's racial character can be traced down to where in the world their ancestors originated from. People whose ancestors have been living in the same geographic location for a long time seem to show similar visible traits. Fig 4 shows that human skin is darker where ultraviolet light is strongest. In the tropics, at high altitudes, and by the oceans. (Gibbons, 2014). The environment they evolved in favours certain characteristics, causing the development of populations that are, on average taller, darker, or more rugged than other populations from other geographic areas around the world.

### **Geography and Socio-Economic Development.**

Geography is often a key affecting the design and character of various things around us, it can influence choices like form, colour, or material. A house in a rainy suburb of Kerala may look nothing like a shelter in a desert-like Thar, likewise clothes, foods, products, and vehicles all change in form and function based on geographical differences. However, the current reality is that with globalization at its peak, most products are being designed for a global audience. The concept of 'one-design-fits-all' is becoming more popular, evident in several fields like Architecture, Automobiles, Products, Films, etc.

The physical features of a place can influence the human culture and social development of that place. This means that the landforms, ecology, and climate of a specific region are the most important factors influencing how culture develops in that place. There is a field of science called Environmental Determinism which studies



physical geographic features such as climate and terrain and their influence on human culture. Friedrich Ratzel, A well-known German geographer in his book first pointed out the influence of the physical environment on history, culture, way of life, and the geographical distribution of humans around the world. (KROSOFSKY, 2020) He considered a nation similar to a living thing and argued that a country's search for territorial expansion is similar to a growing organism's need for space and resources; this particular concept was used Nazi regime to justify their program of territorial expansion, which led to the World Wars. Almost all the landlocked countries have poor economies or are underdeveloped, except for the few in Western and Central Europe, which are well connected to the regional European market. It is because landlocked countries are completely dependent on their neighbouring countries to access overseas markets. Kazakhstan has the longest distance from the sea, followed by Afghanistan, Chad, Niger, Zambia, and Zimbabwe, with distances from the closest coastline of more than 2,000 km. Transit time for goods in these countries is very long because of their landlocked location, difficult terrain conditions, road and rail conditions, and inefficiency of transport networks. On the opposite, Britain's geography allowed it to become a superpower. In the past, it made foreign invasion difficult, which protected its resources so that it could develop relatively uninterrupted. It eventually focused on trade and naval power. The unique geographical position of Britain also helped in tremendous trade opportunities all over the world, Britain held a highly strategically important position on the global map. It links America with Europe. It sits in the middle of the world. It controlled the English Channel, one of the busiest shipping

**routes in the world, and all of these eventually helped Britain to become a world power.**

**Historians have also noted that the density of population seems to concentrate on coastal areas and that regions with large coastlines benefit from higher average incomes per capita when compared to those in landlocked countries. It has been proven that coastal living has huge advantages as coastal civilizations relied on the coastline and waterways for trade, irrigation, and, very importantly, as a food source. On the contrary, landlocked countries and countries without navigable waterways are often less developed and have less growth potential because of the slow movement of knowledge, innovations, and goods. In addition, landlocked regions tend to have both lower population densities and low labour productivity levels. However, other factors, including land fertility, connected rivers, and ecological conditions suited for rice or wheat cultivation, can lead to dense populations and further development of civilization. (John Luke Gallup, 2009)**

**A study by Economists Nathan Nunn and Diego Puga explained that the terrain had positive effects on some African communities by protecting them from the slave trade. Some communities that were located in areas with rugged terrain were able to conceal themselves from slave traders and protect their place from being invaded. The study found that in these areas, rugged topography produced long-term economic benefits and aided post-colonial state formation. Economic historians have found that societies in the Northern Hemisphere experience higher standards of living and that as latitude increases north or south from the equator, levels of real GDP per capita also increase.**

## Design driven by Geography

Architecture is the art and science of designing and creating buildings, the influence of geography on architecture is different in places around the world. In North Africa, they use rammed earth that is made of chalk, lime, and gravel and in West Africa, they use mud for adobes. Because of the geography, the materials available locally are different. Japan is located in the highly seismically active area of The Ring of Fire in the basic Pacific Ocean, where a lot of tsunamis and earthquakes occur, causing frequent destructions. Japan has come up with an interesting design solution called a levitation system to protect from earthquakes; this technique which sulates the building from the effects of seismic waves by lifting off its foundation for the duration of the earthquake.



Today what we call now as vernacular architecture is an architectural style that is built to meet the present needs, keeping in mind the local climate, culture, and materials. But its presence appeared a long time back when the need for "a shelter" came up, which pushed humans to use indigenous techniques and materials to come up with an optimum solution for themselves. This gave birth to a "tent" that now has unique designs in different geographic locations. It is also evolving because the local conditions proportionally evolve and are dispersed because it is purely regional. Its diverse nature makes it difficult to be termed into a singular style with a single name. (Jindal, n.d.). There are more ways in which geography can dictate architectural designs. Building something on a flat piece of land and a sloping terrain is different. There are design different approaches you can take in this case; the best would be designing the spaces with carefully planned levels that follow the contours of the site in a way that the disturbance and displacement to the land are as minimal as possible. The result would be a design that is unique to that particular site's conditions.

Different geographic conditions can drive people to make the same product in different shapes and forms. In Fig 7, These are both small boats with similar use cases. The shorter one is from Varanasi, and the longer is from Kerala backwaters. It is very evident that the boats are docked differently, in Varanasi boats are docked perpendicular to the shore; this is because Varanasi experiences a tidal variation of up to 4m in a single day; the boats will roll over during low tide if docked parallelly since they are docked perpendicular ingress and egress from the boats will be easier if they have this flat portion on both ends. Secondly, If we look at

boats in Kerala, they don't have to worry much about the tidal variation since it is less than 1 meter, so boats can be longer and can be docked sideways, also easier to enter and exit. In both cases, we can see how geography has played an important role in deciding the form and shape of boats with similar functions.

We, humans, are not naturally designed to live in extreme conditions so, we have come up with solutions or products that can assist in extreme conditions like very cold, hot, or outer space. When we started going out to space, we realized that a simple thing like a pen wouldn't work in space, it needs gravity, so we needed to design a new pen that doesn't require gravity. That's how fisher space pens were invented. it works in zero gravity because of pressurized nitrogen pushing the ink. Similarly, we have specially designed gadgets like laptops that are designed to be used in extreme climatic conditions like the pole, because our conventional when we started going out to space, we realized that a simple thing like a pen wouldn't work in space, it needs gravity, so we needed to design a new pen that doesn't require gravity. That's how fisher space pens were invented. it works in zero gravity because pressurized nitrogen pushes the ink.

Fig 9 shows a motorcycle, designed for the moon, we can see how the tires are, and how the mechanics are shielded from radiation, and overall, it has a spacecraft theme to it, all purely based on functional requirements. this design is completely driven by the geographic characteristics of the Moon.

Looking beyond, Planets like Mars do not have anything in common with earth's geography, we are forced to come up with innovations and designs if we were to inhabit Mars. All the conceptual buildings or habitat designs (fig 10) for Mars can be seen as round bubble shapes. Because circular shapes hold the air pressure most effectively, also huge vehicles as shown in (fig 10) can be more effective on mars than on earth due to low gravity, mars have only one-third of the earth's gravity so things would only weigh one-third.

A lot of organizations are conducting several outer space design competitions for the public to encourage innovations and techniques to solve challenges put forward by these very different geographic conditions. Just like how we thought of building dams on a river, surely these new geographic conditions will enable us to come up with similar solutions that will enable future generations.

## Conclusion

We, humans, are wonderful creatures, we can create languages, conventions, and customs and are incredibly diverse. The rules governing human progression are not built into our genes; each new generation has to learn to live according to the surroundings they are introduced to. We continue what previous generations have started. We move forward as a species not as an individual. Maybe sometimes in the future, we may not even be earthbound, but we have that extraordinary ability to make the best out of what we are given. We might evolve, but we will always be Humans and we have to take care of our environment for the betterment of all life.

We saw how geographic conditions can drive innovations and development in different ways. It very strong driving factor in



**deciding how things are and where they are. But now we have started to overcome geographic limitations through technology to expand our footprint to places that were thought to be impossible earlier, so it is right to say that geographic limitation is the new driving force behind a lot of innovative designs and technologies. In the design and technological field, now there is a lot of design competition concerning outer space habitation, all of these are to generate new thought processes and innovations to enable us to sustain ourselves in an environment that we are naturally not suited to live in. With the development of technology, humans have been able to improve their quality of life by connecting and having access to information and overcoming the limitations of unfavorable geography.**

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