1. What is seafloor spreading? What are those forces that cause the seafloor to spread? What are the geophysical phenomena associated with seafloor spreading? Discuss

Approach

The questions asks us the basic concept of Sea floor spreading theory which can be a possible introduction. Along with the theory we also need to explain why sea floor spreads and what are its consequent events related to it.

Introduction

Sea floor spreading theory was given by Harry Hess. The theory states that in the middle of ocean, the oceanic plates are moving away from each other in the middle of the oceans. Whereas, at the oceanic continental plate boundary, the oceanic plate gets sub ducted under the continental plate.

Body

The theory of Sea Floor Spreading states that new oceanic crust is being formed continuously at mid-oceanic ridges, while the older rocks move away from the ridge. That is, it explains why the age, thickness, and density of the oceanic crust increases with distance from the mid-oceanic ridge.

Forces that cause Seafloor spreading

- Convectional current theory which was was proposed by Arthur Holmes addresses the forces which cause the sea floor spreading.
- According to Holmes the heat which is generated from the radioactive decay of substances deep inside the Earth (the mantle) creates magma which consists of molten rocks, volatiles, dissolved gases among other material.
- Further this magma, heat and gases seek a path to escape which leads to the formation of convection currents in the mantle.
- According to the theory of Seafloor spreading, convectional cells are the force behind drifting of continents thus these conventional cells are explained by convectional current theory of Holmes
- These ocean plates get subducted under the continental plates (since ocean plates are denser than continental plates), when these two types of plates converge.

Consequently, it was deciphered that

- Due to diverging plate boundary, magma vents out resulting in volcanic eruptions in the middle of ocean and new rocks keeps forming at this plate boundary.
- This new crust is pushed apart again due to magma that leads to formation of volcanic mountain in the mid of Ocean. Thus its name, sea floor spreading theory.
- The Oceanic plate when meets Continental plate at the edges gets sub ducted under it due to higher density. It thereby maintains balance.

- These plates are in constant motion and that seismic boundaries between them delineate zones where oceanic crust is created or destroyed

The Geophysical phenomenon associated to sea floor spreading theory include:

- Earthquakes- It occurs when Divergent plates are pushed apart that shakes the existing plates. It may also occur at the convergent plate boundary when oceanic plate pushes the continental plate.Thus the Circum-Pacific belt is an active zone for earthquakes .
- Volcanic eruption- It occurs when divergent plates give way to magma to come to the surface. This can be violent (acidic violent eruptions).The mid oceanic ridges in artic ocean and pacific ocean are constantly active volcanic sites.
- Tsunami- These are formed when sea bed shakes due to any reason creating disruptions in water causing huge waves.As seafloor spreading leads to earthquakes and volcanic eruptions it provides the necessary thrust for Tsunamis.In 2004 Indian ocean was witness to such a devastating Tsunami which took toll on both human lives and economic activity of whole region.
- Geophysical formations- various phenomenon mentioned above causes geophysical formations on sea bed such as sea mount, guyots, etc. Also features like, young fold mountains or deep trenches are formed at the boundary of oceanic continental plates.

Conclusion

Geographers have combined the knowledge from Plate tectonic theory, Sea floor spreading theory as well as continental drift theory to explain the formation of various physical features and geological processes on earth.Further these theories combined with modern technological advancements have helped humankind to predict various disasters more efficiently and save lives this making lives more secure and economy resilient.

2. If you observe the map of the world, you will realise that the volcanic activity in the oceans is almost parallel to the coastlines. Why? Explain with the help of suitable examples

Approach

The student should first define what is volcanic activity and what are the reasons for its occurrence.In the next part the student should explain why the most of the volcanic activity is parallel to the coastlines with help of suitable examples.

Introduction

A volcano on Earth is a vent or fissure in the planet's crust through which lava, ash, rock and gases erupt. A volcano is also a mountain formed by the accumulation of these eruptive products. Volcanic activity is the phenomenon of eruption of molten rock (magma) onto the surface of the Earth where lava, pyroclastic and volcanic gases erupt through a break in the surface called a vent.

Body

According to the plate tectonic theory, earth's crust is divided into several major and minor rigid slabs called plates. These plates move horizontally over the underlying asthenosphere. These plate sometimes move towards each other, sometimes they move apart and other times one will sink while the other rises over it.

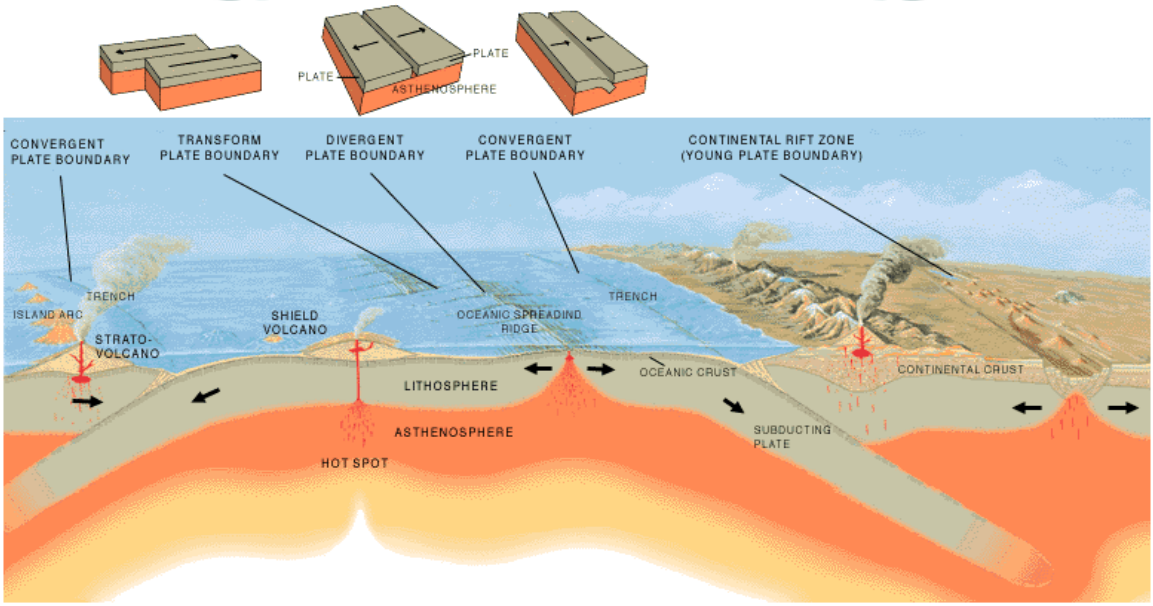

Fig.Volcanic activity along the coastline

There are two types of plate boundaries that exist parallel to the coastlines and responsible for volcanic activity.

A. Divergent Plate Boundaries

- At a divergent boundary, tectonic plates move apart from one another. They never really separate because magma continuously moves up from the mantle into this boundary, building new plate material on both sides of the plate boundary.
- The Atlantic Ocean is home to a divergent plate boundary, a place called the Mid-Atlantic Ridge. Here, the North American and Eurasian tectonic plates are moving in opposite directions. Along the Mid-Atlantic Ridge, hot magma swells upward and becomes part of the North American and Eurasian plates. The upward movement and eventual cooling of this buoyant magma creates high ridges on the ocean floor. These ridges are interconnected, forming a continuous and the longest volcanic mountain range in the world.
- Another divergent plate boundary is the East Pacific Rise, which separates the massive Pacific plate from the Nazca, Cocos, and North American plates.
- The East African Rift is an example of a single tectonic plate being ripped in two. Along the Horn of Africa, the African plate is tearing itself into what is sometimes called the Nubian plate (to the west, including most of the current African plate) and the Somali plate (to the east, including the Horn of Africa and the western Indian Ocean). Along this divergent plate boundary are volcanoes such as Mount Nyiragongo, in the Democratic Republic of Congo, and Mount Kilimanjaro, in Kenya.

B. Convergent Plate Boundaries

- At a convergent plate boundary, tectonic plates move toward one another and collide. Oftentimes, this collision forces the denser plate edge to subduct, or sink beneath the plate edge that is less dense.
- These subduction zones can create deep trenches. As the denser plate edge moves downward, the pressure and temperature surrounding it increases, which causes changes to the plate that melt the mantle above, and the melted rock rises through the plate, sometimes reaching its surface as part of a volcano. Over millions of years, the rising magma can create a series of volcanoes known as a volcanic arc.
- The majority of volcanic arcs can be found in the Ring of Fire, a horseshoe-shaped string of about 425 volcanoes that edges the Pacific Ocean. The Aleutian Islands, stretching from Alaska to Russia in the Bering Sea, for instance, run parallel to the Aleutian Trench, formed as the Pacific plate subducts under the North American plate.
- The mighty Andes Mountains of South America run parallel to the Peru-Chile Trench. These mountains are continually built up as the Nazca plate subducts under the South American plate. The Andes Mountains include the world's highest active volcano, Nevados Ojos del Salado, which rises to 6,879 meters (over 22,500 feet) along the Chile-Argentina border.

Other than these two types of volcanoes there exists a third type known as Hotspot volcanoes which are far away from the tectonic activity pf the plate boundaries and therefore are not parallel to the coastline.The best example of hot spot volcanism is the Hawaiian Islands.

Conclusion

Therefore the volcanic activity observed parallel to the coastline across the world is mainly due to the divergent and convergent plate boundaries which is explained by the plate tectonics theory.Further these volcanoes have also been responsible for earthquakes and tsunamis and thus many nations have monitoring sites at the volcanic activity for future predictions and mitigation.

3. How are different vulnerable groups getting impacted by COVID? What measures should be put in place to assist such groups? Discuss.

Approach

The question is based on the current situation of COVID pandemic.The candidate first need to introduce that how covid has led to a disastrous situation all over the world.In next part address specific issues to various vulnerable groups.At the end suggest what measure can be taken to overcome the problems being faced by the vulnerable groups.

Introduction

The COVID-19 pandemic is first and foremost a public health emergency, but the ripples of its effects extend far beyond the infected individuals. A major global recession the worst the world has seen since the Great Depression has emerged as a result of countries being placed on coronavirus lockdown. A crisis of such proportions only serves to exacerbate pre-existing inequalities, putting vulnerable populations at even greater risk for poverty and suffering. In the context of India, the pandemic particularly endangers individuals belonging to the traditionally socioeconomically disadvantaged groups.

Body

The vulnerable groups which are exposed to their vulnerabilities during COVID-19 pandemic are- Women, Children, Students, Aged, Disabled, Poor migrants, unorganised sectors workers, People living with ailments and Sexual Minorities.
The COVID-19 pandemic affected these vulnerable sections of population differently:

- While children's health appears less impacted by COVID-19 than older adults, children's education are interrupted, protective structures disrupted and their families and communities placed under stress by health and economic burdens.
- COVID-19 pandemic, increased girls' and young women's duties caring for elderly and ill family members, as well as for siblings who are out of school.Further there have been increase in incidences of domestic violence which is hard to address due to lack of reporting.
- Girls, especially those from marginalised communities and with disabilities, may be particularly affected by the secondary impacts of the outbreak. It also put at women at greater risk of exploitation, child labour and gender-based violence.
- The poor population who were already surviving on the margins have lost whatever casual employment they had and further it has led to starvation, hunger and in longterm can lead to malnutrition.
- Further according to CMIE report 97 percent of population has become poorer and the unemployment rate has risen to 12 percent which will affect not only

the individual earner but the whole household and could have longterm social, health and economic repercussions.

- The Disruptions to remittances and rural livelihoods have forced children out of education, while school closures have interrupted existing food ration and immunisation programmes.
- The government provided relief through cash transfers and in- kind benefits but many found them difficult to access. Some benefits were only available to those with bank accounts, ration cards, biometric ID, or a fixed address.
- The impact on older adults is notable. According to World Health Organisation (WHO) data from April 2020, more than 95% of COVID-19 deaths were among people over 60 years of age, and more than half of all deaths occurred in people of 80 years-plus.This has led to depression, fear and anxiety in this group.Insomnia is particularly a widespread phenomenon.

Measures to provide relief to these groups:

- First of all an online database needs to be created to register the names and places of origin and migration of the workers e.g. An online database named as National Migrant Information System (NMIS), by the National Disaster Management Authority (NDMA). It will help streamline the movement of the migrant workers.
- Setting up of relief camp, facilitating food and healthcare to the poor people, migrants should be priority for the regions where transport facility is not available. e.g. Over 500 hunger relief centres were set up by the Delhi government. One nation One ration card scheme by Union government.
- Relief measures also needs to be announced. For instance, Soon after the nationwide lockdown was announced in late March, Finance ministry announced a ₹1.7 lakh crore spending plan for the poor. This consisted of cash transfers and steps to ensure food security.
- Short-term measures have focused on immediate relief and protection. Longer-term responses are now required, creating ways to sustain the delivery of basic needs including food, water, health, jobs, and shelter.
- The exodus of migrant workers presents new opportunities for rural revival. Existing rural employment schemes could be targeted to upgrade existing infrastructure and create new community assets, supporting high-value, labour-intensive activities beyond farming.
- Failures of government relief and social safety nets during the pandemic have shown the need for universal social protection, free from identity and residency requirements.
- State and local agencies should adopt a community-based model for recovery. Responses in the state of Kerala, and Dharavi, Asia's largest urban slum, involved civil society organisations and community leaders in screening and contact tracing.
- Education system was totally dependent upon the spread of internet therefore there should be focused effort the bridge the digital divide which is hampering education.Further the pedagogy needs to be remoulded for the pandemic ages with sensitivity towards working parents and the rural children.

- There needs to be regular and free mental health counselling until the pandemic gets over to provide psychological support.NGO's which work in this sector should be encouraged to take a lead in this.
- A dedicated portal at local level for women to report their issues especially related to domestic violence and a community policing model as followed in Kerala to tackle this menace.
- Until the economy is back on track and lost jobs are retrieved there should be monthly support to families below poverty line to sustain themselves and tide overt the pandemic.

Conclusion

India's size and diversity mean blanket national responses will not always be effective.Hence a decentralised response to the specific issues of each state and vulnerable groups is necessary to make it a more targeted approach.For this it is prudent that both the Central and State governments work in tandem to come with civil society to have a cohesive response in this difficult time.COVID-19 is a once in century event and therefore response to it has to be different from traditional patterns followed until now.This will bring India back on path of growth and induce resilience for future crises.