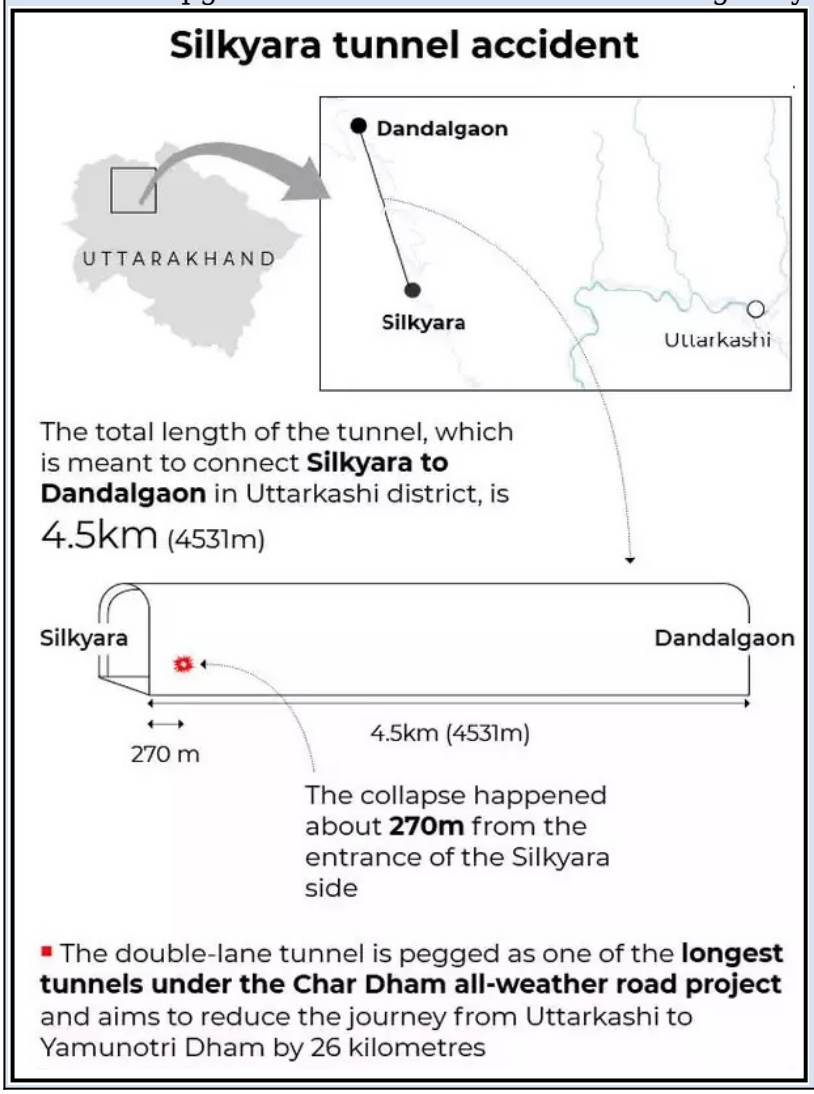
Uttarakhand Tunnel Collapse

Why in news?

Recently, an under-construction Silkyara-Barkot tunnel in Uttarakhand collapsed trapping 40 workers inside.

Silkyara-Barkot Tunnel

• **Location**- The 4.5-km tunnel is being constructed between Silkyara and Dandalgaon on the Brahmakhal-Yamunotri portion of the National Highway.
• It is a part of the Char Dham all-weather road project connecting 4 sacred sites of Hindus.
- Chardham Mahamarg Vikas Pariyojana is a Central government initiative to improve the road connectivity of 4 sacred sites in Uttarakhand - Gangotri, Yamunotri, Kedarnath and Badrinath.
• **Aim-** To upgrade and widen the 1100 km of highways into all-weather roads.



What are the possible reasons for the collapse of the tunnel?

- The collapsed section is located around 200-300 metres from the mouth of the tunnel.
- **Loose patch of rock -** It could have happened due to a loose patch of rock, which wasn't visible during the construction.
- The patch might have consisted of fractured or fragile rock with a lot of joints that may have made it weak.
- **Water seepage**- Water could have entered through loose patch, eroding the loose rock over time creating a void on the top of the tunnel, which can't be seen.
- **Shear zone-** It is created when there is movement between two rocks and the rock gets crushed.
- This crushed rock can change its behaviour, it may have clay, or it may get weathered over time.

How the tunnel can be excavated?

Excavation Methods		
	Drill and Blast method (DBM)	**Tunnel boring machine method**
Description	Involves drilling holes into the rock face and blasting it with explosives to break it into fragments	Involves a shielded machine that bores through the rock with a rotating cutter head
Tunnel length	Adopted for shorter tunnel range up to 3km	Adopted for long tunnel up to 25 km
Suitability	For hard rocks and high mountain tunnel	For soft rock and low mountain tunnel
Environmental impact	Causes more vibrations, noise, dust, and gas emissions	Faster, safer and environment friendly than DBM
Cost	Cost effective for shorter tunnels and smaller projects	Requires high initial investment and more technical expertise
Example	Himalayan regions including Jammu & Kashmir and Uttarakhand	Underground tunnels for the Delhi metro

- **Rescue operation**- Defence Research Development Organisation (DRDO) deployed the *Remote Operated Vehicle - **Daksh*** that is specifically designed to be used on a pan-tilt platform to help reach the risky terrain.
- It can operate continuously for 3 hours, covering distances ranging from 100 to 500 meters.

What are the challenges in constructing tunnel in Himalayan region?

- **Young mountain-** Himalayas are still growing due to the collision between the *Indian and the Eurasian tectonic plate.*
- **Geological complexity**- They are characterized by a complex combination of rock types, fault lines, and seismic activity.
- **Extreme weather variations** - Heavy snowfall and freezing temperatures in winter to

intense monsoons and landslides during rainy season significantly impact tunnel construction projects.

- **High altitude**- The challenges include logistical complexities, limited accessibility and increased transportation costs for manpower and construction materials.
- **Seismic vulnerability**- The Himalayas are situated in a seismically active zone, making earthquake preparedness a top priority during tunnel construction.

What lies ahead?

- Guidelines on safety practices in tunnel construction prepared by the *International Tunnelling and Underground Space Association* say that particular attention should be given "to the means of escape in an emergency situation in contingency planning".
- Periodic monitoring of the tunnel construction is important.
- Time and resources must be spend on studying the rock before starting the tunnel project.

Related links - Sikkim flash floods, Joshimath crisis

References

1. Indian Express- What led to Uttarakhand tunnel collapse
2. Indian Express- Building Himalayan tunnel
3. Indian Express- 5 point plan to rescue workers