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A Magnificient project to increase the fame of the Hon'ble Chief Minister of Tamil Nadu, Thiru.M.K.Stalin

Soil nailing project to prevent landslides and protect people

The Nilgiris district is a part of the Western Ghats. Ooty, the queen of hills, is the capital of this district. Major hill habitats such as Coonoor and Kotagiri are located in this district.

The word 'Nilagiri' means '(நீலநிறம்)blue color + giri (mountain)'. In Tamil literatures, it is mentioned as 'Iraniyamuttam'. Nilgiri Hills got their name from the purplish blue flowers of Neelakurinji.

The Nilgiris district lies at the place where the Western Ghats and the Eastern Ghats meets together. It is a large plateau region at an altitude of 2000 m (6600ft) above mean sea level. At least 24 peaks of the Nilgiris range were above 2000m.

Thoddapetta, the highest peak in South India 2637 m (8652 ft) above MSL is located 9 km from Ooty. The unique feature of this district is that there are numerous tourist spots that attract a lot of tourists.

The scenic Nilgiris district is mainly prone to natural calamities such as landslides. In order to prevent such landslides, a new technology was introduced in Ooty - Kothagiri - Mettupalayam road near Kodappamandu of Nilgiris District to prevent landslides by installing soil nails and water seeding system to increase the stability and strength of the soil on 22.12.2021 under the guidance of the Hon'ble Chief Minister, Thiru.M.K.Stalin, accompanying the Hon'ble Minister of Public Works and Highways, Thiru.E.V. Velu, Hon'ble Tourism Minister, Thiru.K.Ramachandran.

This new soil nailing method reduce the construction cost by 50% when compared to conventional methods used to prevent landslides in the past. This trail based method is eco-friendly. Since, the construction of retaining walls is totally avoided, the quarrying of natural resources like stone jelly, sand, etc., are prevented. This method will be used to prevent landslides in mountainous areas like Kodaikanal and Yercaud, if found successful in future.

Considering the factors causing landslides in Nilgiris, Soil nailing method is the best way to prevent it.

1.1. Landslides in Nilgiris district

Landslides are common in the Nilgiris district. For example, a beautiful valley called Avalanche located 26 km from Udhagamandalam got its name from a massive landslide in 1824.

In November 1891, the Kothagiri Mettupalayam road was badly damaged by a landslide in the valley of the Coonoor range.

On 25 October 1990, more than 25 families were killed in a landslide, caused by cloudburst in ketti.

On November 11, 1993, there was a massive landslide due to a cloudburst on the wooden bridge. Hundreds died in this landslide and several kilometers of road were closed, which led to complete inundation of Nilgiris district.

In November 2009, a major landslide occurred in Ketti due to the northeast monsoon and 500 landslides occurred in the district causing great destruction. Due to series of landslides, in that particular year, 42 people died in 48 hours and also Mettupalayam via Coonoor road to Ooty was heavily damaged in the same year.

On 8th August, 2019, 82 cm of rain recorded in Avalanche within 24 hours. Due to this, landslides occurred in 140 places across the district and caused heavy damages to the infrastructures.

1.2. Factors causing landslides in Nilgiri district

Due to climate change, the Nilgiris district continues to suffer from heavy rains, floods and landslides. Large-scale destruction of forest lands, encroachment of water bodies and changes in land use patterns are major factors for this disaster.

2. Landslide Management and Landslide Prone Areas in Nilgiris District

2.1 Landslide Management

Landslide management can prevent loss of life to a great extent and properties damage by applying modern science, technology and taking appropriate safety measures at the right place.

The major factors causing landslides are climate changes, increased rainfall, sudden floods and soil erosion

2.2 Natural calamity prone areas in Tamil Nadu

Tamil Nadu State Disaster Management Department identified 4170 areas as natural calamity prone areas in Tamil Nadu.

In which,

Most affected areas	– 321
More affected areas	– 801
Moderately affected areas	– 1102
Least Affected Areas	– 1946

2.3. Areas affected by natural calamities in Nilgiris district

284 areas were identified in niligiris as areas prone to natural calamities especially landslides.

In which,

Most affected areas	– 68
More affected areas	– 89
Moderately affected areas	– 79

3. Steps involved new technological method

The landslides on the steep slope of the hill shall be prevented by adopting soil nailing, installation geo grid, grass growing by hydro seeding method.

- Preparation of Surface of the hillside.
- Soil nailing using steel rods and cement slurry to strengthen the slope of the hill surface.
- To prevent soil erosion, water seeding method known as hydro seeding is carried out.
- To ensure soil strength and to increase soil stability, reinforcement of soil with geo grid to prevent subsidence.
- Carrying out maintenance works periodically.

3.1 Preparation of Surface of the hillside

In this method, the slope of the hill should not exceed 70 degree. This is done by removing loose soil and levelling the surface.

3.2. Soil nailing to strengthen the slope of the hill surface (Soil Nailing)

Soil nailing is a modern technique of fixing reinforced steel bars into the soil by drilling to prevent landslides on steep hillsides.

Steps:

1. Boreholes of 75 mm to 200 mm diameter for length of 3 m to 5 m are drilled at 2 m intervals on the slope face of the hill area.

1.1. Drilling of Soil Slope

1.2. Insertion of Dowel bars into

the drilled holes

2. A steel rod called Dowel Bar of size 32 mm is installed in the holes.
3. A mixture of cement and sand is shotcreted under high pressure to ensure bond to stabilize the steel bar (towel bar) with the soil in this hole.

1.3 Shotcreting with cement slurry

3.3 Using of Hydro Seeding, a method of water seeding to prevent soil erosion.

Hydroseeding is a method of using a seed slurry created by mixing of grass seed, mulch, fertilizer, seed growth promoters and water.

- This seed slurry is sprayed on hill steeps using High Pressure Pump & Hose.
- Using of quality seeds, mulch and Tackifier will ensure fast growth of grass.
- Composed materials like mulch, chopped bark, straw etc., will absorb and store water and ensures the growth of grasses without drying out.

This method of creating grassland is found economical when compared to construction of retaining wall and the same is considered as the best method in steep hilly areas.

1.4. Spraying of seed slurry

1.5. After Hydro seeding

3.4. To ensure soil strength, prevent subsidence

Reinforcement by Geo Grid:

Generally concrete retaining walls are built to prevent landslides, due to which vegetation does not grow on the surface of the hill.

Instead of this, three Dimensional Steel Wire Mats called Geogrid, made of polymer materials (Woven or knitted) are used in this new method.

These geo grid mats are spread over the top of a steep hill along with grass seeds and attached with soil nails

- These geo grid mats have high tensile strength and durability.
- It prevents soil erosion.

1.6. Geo-grid in hill slopes

1.7.Installation of Geo-grid

3.5. Carrying out maintenance work

After completion of the above said works, water sprinkling should be carried out and maintained for atleast 3 months.

4. Preliminary locations where new green technology is applied

Greening of hill slopes and high rainfall areas : Based on preliminary survey, the above method to control the landslides in slopes is being carried out on a trial basis by the Highways Department at the following two locations,

Ooty – Kothagiri – Mettupalayam Road Km 1/10 (near Kotapamandhu)

Ooty – Kothagiri – Mettupalayam Road Km 16/8 (near Bhagya Nagar)

Further, this new soil nailing technology are also being implemented at Valparai Hill, Kolli Hill and Yercaud Hill and the same are under progress.

This method will be very useful in preventing humans and wildlife casualties. Further, the people living in Nilgiris and its tourists, vehicles plying to-and-fro the hill are being benefited by this technology.

It is imperative to identify and quickly implement new environmental friendly, cost-effective and safe means of preventing soil erosion and controlling landslides in the hill tracks of the Nilgiris district. With all these as challenging goals, new efforts are being made by the Tamil Nadu Highway Department through modern technology to avoid the risk of landslides during monsoons.

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