MATHERAN TRANSPORT, PART V

Challenge to make Matheran Transport Monsoon proof. Preventive Measurements to secure Road and Railtrack from Destruction caused by heavy Monsoon Rainfall, that

could be done,
but have not been done!

By F.A. Wingler
Matheran November 2019

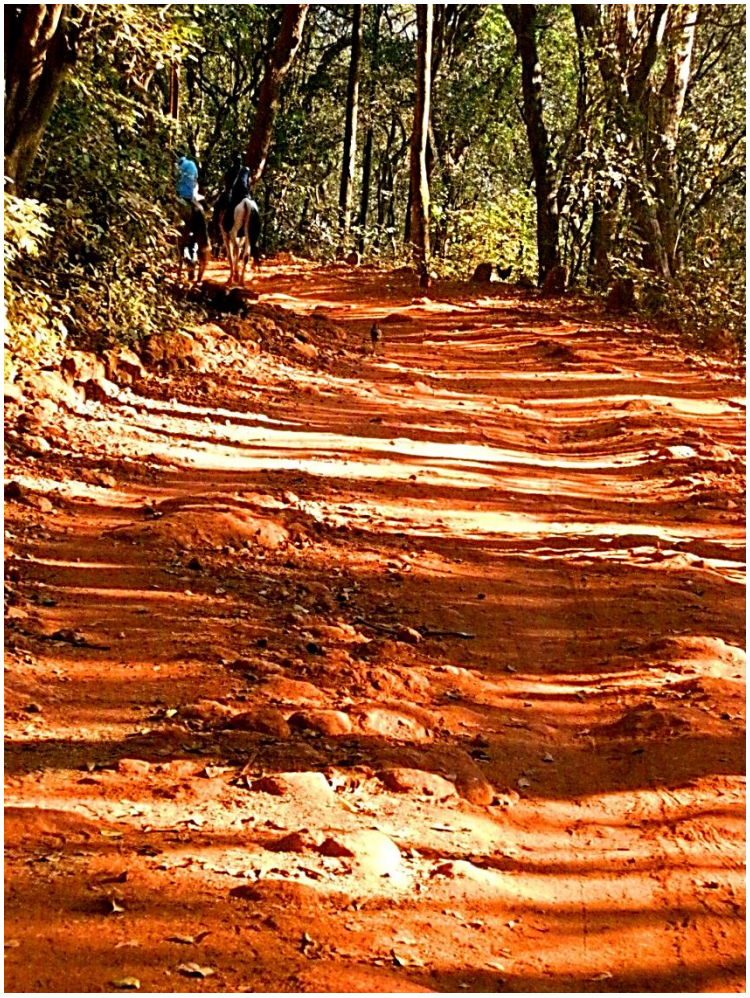
I. Neral-Dasturi: The "Only" Road

The "***ONLY ROAD***" from Neral to Matheran/Dasturi is now in good shape. However, some short sections have to be secured from Rock-Fall and Hill-Slide by **ROCKFALL MITIGATION** and **SLOPE STABILISATION**. This "only road" must be fit to withstand the impact of heavy monsoon rainfall. One cannot wait for a better alternative road from Dhodani to Porcupine Point:

Loose pending Rocks endangering the "Only" Road waiting to be removed or stabalised; Pict. by N. Savant

Rocks endangering the "Only Road"; Actions needed, Pict. by Nitin Savant

The existing stony cart-road from Dasturi to Matheran Market is still in a horrible bad state of affairs. In dry season a lot of dust mixed with hors dung is produced polluting the air of Matheran and staining terribly the adjacent shops, restaurants, hotels and foliage in this so-called "eco-sensitive" hill station. During rainy season this lifeline turns into a mud path.



Stony unpaved Cart Road in a horrible State of Affairs

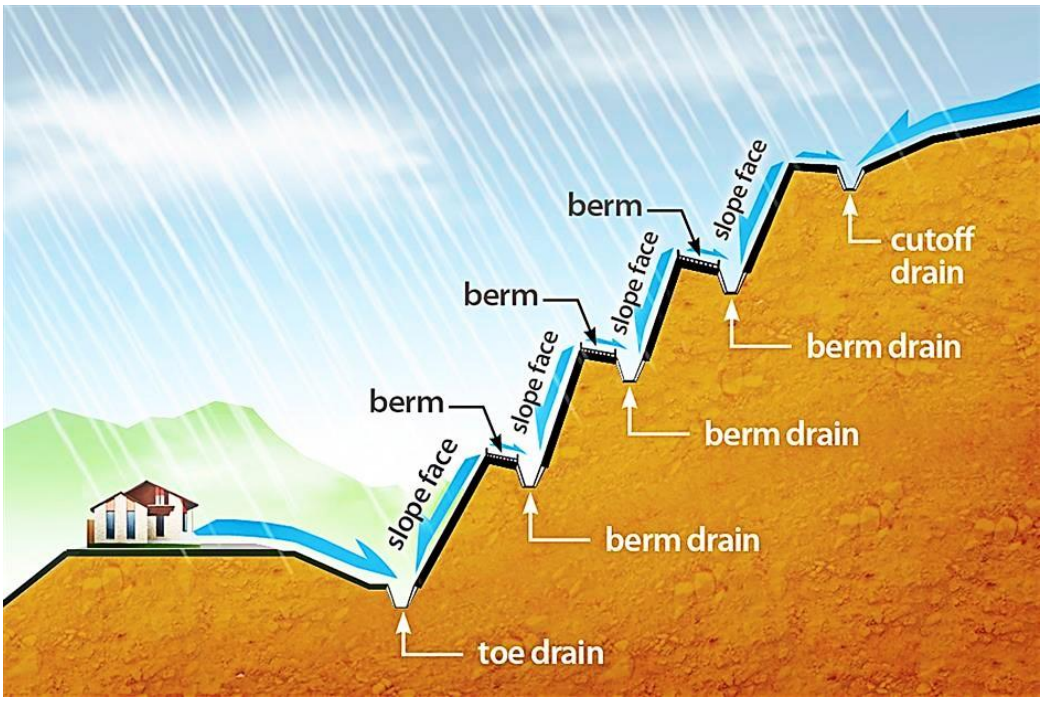
Foliage along the unpaved Cart Roads and Pathways stained by stirred up Laterite Dust mixed with Horse Dung

All goods for Matheran have to be carried on hand pulled carts or on horses over this unpaved lane with steep gradients:

All Goods for Matheran have to be carried on Hand pulled Carts or on Horses over this unpaved Lane with steep Gradients

The “Only” Road Neral-Matheran and the Dasturi-Matheran Cart Road run in a terrain prone of hill-, rock- and mud-slides.

Essential for hillside stabilization is a comprehensive **SURFACE WATER MANAGEMENT**: The rainfall water has to be cached/intercepted in so-called **CATCH-DRAINS (intercepting or brem drains)** above the roadways, before it can penetrate into the formation leading to rock-falls, mud- and hill-slides. The intercepted water has to be brought down into the valley in a controlled manner by step culverts. See PART II of paper on ***BALLAST, FORMATION AND DRAINAGE***; Part I & II; *published on: September 18, 2016 January 1, 2017 free for download from* http://www.drwingler.com. See also: T.C. Sheng WATERSHED MANAGEMENT FIELD MANUAL; FAO CONSERVATION GUIDE 13/6 FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS Rome, 1990.



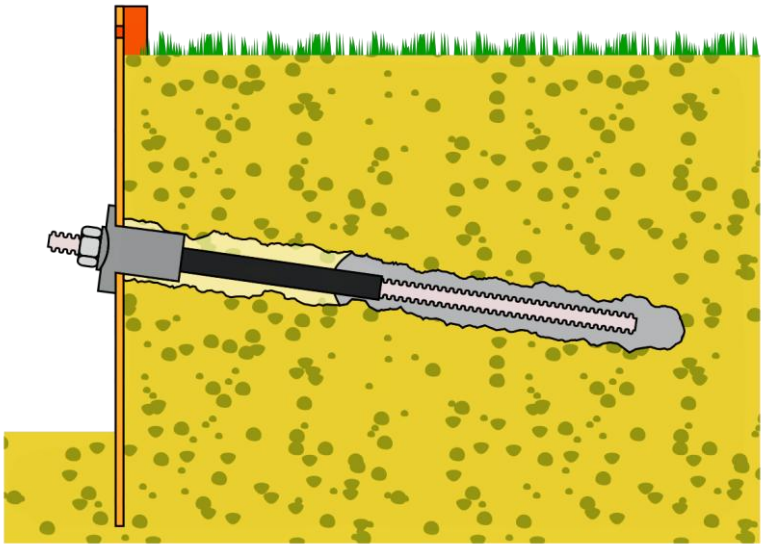
Hillside Stabilization with Catch/Berm Drains

Steel-nets and shotcrete have only a limited stabilization effect. If the load becomes too high, those protection measurements will rapture:

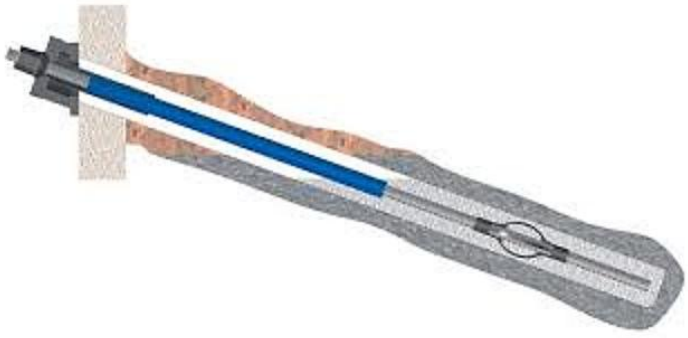
High Tension Steel Mesh Rock Stabilisation

Slope Stabilisation with Shotcrete, Australia

Mitigation measurements are removal of loose rocks before they can fall down causing damage and stabilization of the road-endangering rocks by **ROCK-ANCHORING**; see the following pictures. The anchors have to be cemented in long drilled shafts, reaching the solid strata of the hill:



Rock-Anchor



Rock-Anchor

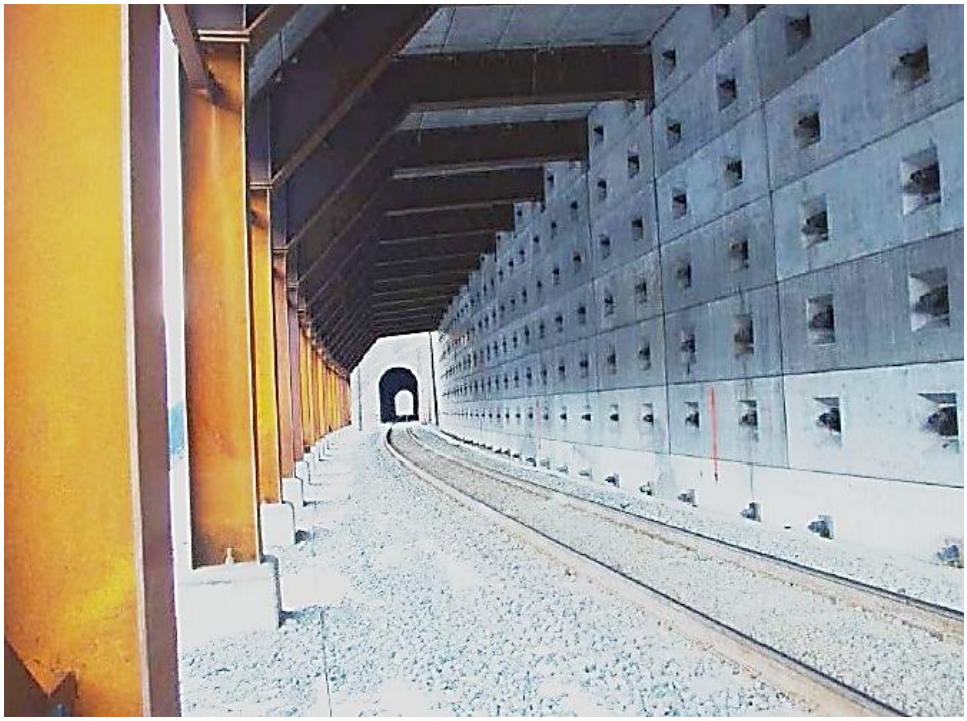
Slope-Stabilization with anchored Concrete Beams

Rock/Slope-Stabilization with anchored Concrete Blocks

Rock-Anchoring

Solid Railtrack Retaining-Wall Stabilisation of Katra-Banihal Railway near Chenab River Bridge with DYWIDAG Rock-Anchors

Anchored Concrete Retaining Wall for Roads and Rail-Tracks



Inside of Protection Gallery, Canadian National Railroad, Canada, with anchored Retaining Wall to protect the Railroad from Rock-Falls

Hillside Anchoring

Slope/Rock-Fall Protection with rolled out Concrete Canvas on Tegaon-Chindoda Ghat Section of Indian Railways

The author proposes to get an aerial survey of the relevant sections done by **GeoKno,** Kanpur/Hyderabad with LiDAR Technology, to find out the vulnerable spots prone for hill-, mud-, and stone-slides, the areas to be well drained with catch drains and the sides in need of anchored retaining walls.

However, the Forest Department will probably not allow the implementation of needed surface water management systems with a dens network of catch/intercepting drains and culverts and the preventive rock-fall mitigation measurements above the routes. The outlook is therefore brim.

II. State approves INR 25 Crore for "Makeover" of Matheran`s unpaved Roads and Pathways

To boost tourism, the Maharashtra State Government has approved the development project with clay paver blocks for covering the unpaved roads and pathways.

When giving Matheran a "***MAKEOVER"*** by laying clay paver blocks on the cart roads one has to consider, that the terrain near Beatrice Cliff is not stable. The section, which went adrift and slit down during the 2005 monsoon rainfall, the so-called 2005 Maharashtra

floods, is still yielding and flowing. This can be made out at the gabions heaped up after the 2005 calamity along the rail track on the hillside and on the loss of alignment of the rail-track after the last 2019 rainfall.

To prevent further hill slip, the whole area has to by catch-drained to prevent the water soaking into the ground and causing further earth slips. This has to be well understood.

The e-battery operated cart and rickshaw transport will not work economically. The energy to lift the heavy loads 50 m up from the height of Aman Lodge up to Matheran Market has to be stored in the batteries. After one run they will be exhausted and need to be re-charged, which will take longer than one run. The present manual coolie practice will remain cheaper and more economical. It gives also income to local people. However their work should be made easier by flattening the steep gradient at the hairpin curvature between Aman Lodge and Way Side Inn. But probably, this will not be done or prevented by the forest department.

Land-, Hill- and Mud-Slide prone Terrain near Beatrice Cliff; Pict.: Source Google

III. Dilemma with the Matheran Toy Train Rail-Track

The 19th August 2019 rainfall with over 400 mm has triggered off massive rock-, stone- and mud-slides damaging the Matheran Toy Train track at 21 spots. Water has washed out rail-track subgrade.

The **PATCH REPAIR WORKS** of the last years with gabions and not anchored retaining walls have proved as **NOT STABLE** during the August 2019 heavy monsoon rainfalls:

Rock-Slides and Water have damaged again the vulnerable Patchwork repaired Track of Matheran Railway; Pict. by midday

Not long-lasting 2005/2006 Patch Repair Works on Matheran Railway with Gabions: Again washed out by the August 2019 Rainfall

August 2019 Track Damage: The next Monsoon Rainfall is on the Way to come!

Two Locomotives together with 8 coaches of the Shuttle Train got stranded at Matheran Hill-Station. The umbilical cord to the repair/maintenance workshop cum running shed at Neral had been cut by the heavy August 2019 rainfall. Now over 20 Crore Rupees are asked to restore this lifeline before the shuttle service can be put back in operation.

Stranded Locomotives at Matheran Hill Station, cut off from Maintenance, Repair, Service and Overhaul at Neral Workshop; Pict. by F. Wingler; Status of Dec. 2019

One has to consider, that over 100 years ago the toy train has not been constructed as a **RAILWAY** but as a **PRIVATE LIGHT TRAMWAY**. The other Indian heritage and scenic hill-railways, Kalka-Shimla, Mettupulayam-Ooty and Joginder Nagar-Pathankot have been built as stable Railways with Railway technology. The vulnerable 86 km long Darjeeling NG scenic Railway, built along the old Cart Road, is a declared UNESCO heritage and hence has to be kept alive. International private organisation support the maintenance and operation financially. The Joginder Nagar-Pathankot NG Himalayan Railway is on the tentative UNESCO heritage list. The Matheran Train is not on the UNESCO heritage list.

It is not so much a question of being ***"sensitive on history and needs of locals***", but a question of **COST-BENEFIT CONSIDERATIONS**. It is a question of the **FEASIBILITY** to keep the fragile toy train service alive and always to rebuild after each monsoon damage the rail-track by patch repairs.

In order to secure the long term existence of the scenic and heritage Neral-Matheran Railway, massive investments would have to be made to upgrade the tracks in order to make the route resistant to the rigors of Mother Nature in the rainy seasons. Technically, it is possible to upgrade the rail track to withstand in a long run the influence of heavy rain falls. If the required investment does not happen and the current patch repairs remain the rule, the toy train has no future.

The Matheran Rail-Track is not up to Indian Railtrack Standards in regard of stability and safety (see: J. Mundrey & F. Wingler ***INDIAN RAILWAY TRACKS – A TRACK ENGINEERING COMPENDIUM***, free for download from http://www.drwingler.com).

As the author suggest since 15 years, an **electric light Rail-Car Shuttle Service** between Aman Lodge and Matheran Market could be a feasible and economical solution:

Snaefell Mountain electric NG Light Mountain Tram on Isle of Man; UK

An electric Light Shuttle Tram Service is cheaper to operate, maintain, service and repair than the present shuttle service train set consisting of 8 coaches and two heavy 4 axle articulated and un-ecological push-pull Diesel-hydraulic locomotives of the system ***JUNG*** motorised with two Diesel-engines each. The installed 2 x 1200 hps = 2400 hps for a shuttle unite is not needed. However, two locomotives in push-pull mode are necessary as a safety measurement against a run-off, because the track at Aman Lodge Station has a gradient. When shunting of only one locomotive, the passenger coach set cannot be left without a locomotive. An electric shuttle could be maintained at Matheran Hill without the need of the umbilical cord to the Neral loco-shed.

The author`s proposal for an electric shuttle service is a 2 ½ feet NG track. The only tight curve between Aman Lodge and Matheran Market at Beatrice Cliff could be eased by a bridge over the cliff, allowing water and mud to pass under it. This will allow also longer rail-cars. With a proper preventive surface water management with catch drains, the risk of further landslides on this 3 km route could be mitigated.

In addition, what also might be feasible between Dasturi and Matheran Market, is a goods conveyor ropeway:

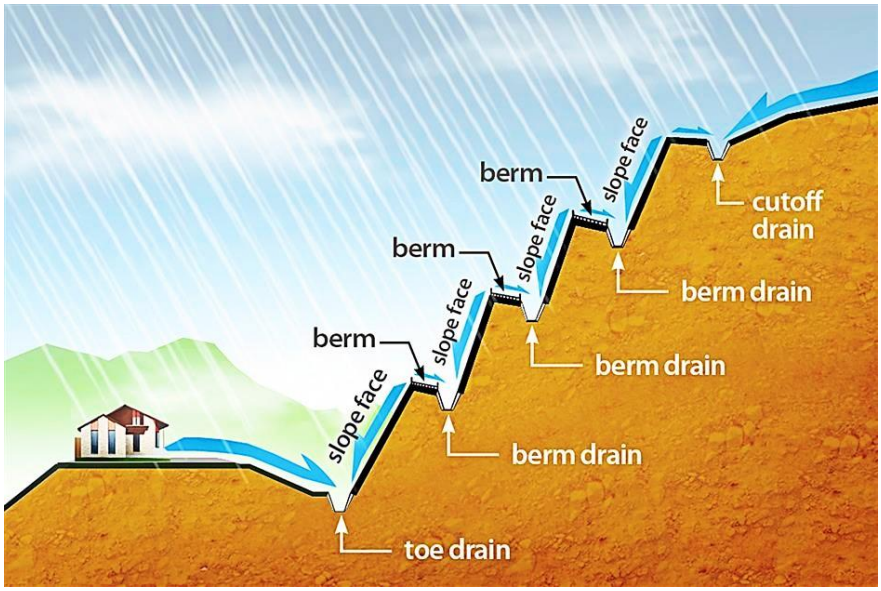
Goods Conveyor Ropeway

IV. In a Nutshell:

"WHAT COULD BE DONE"

Monsoon Impact Mitigation by preventive, permanent and long-lasting monsoon resistant Road and Track Stabilisation Engineering consisting of:

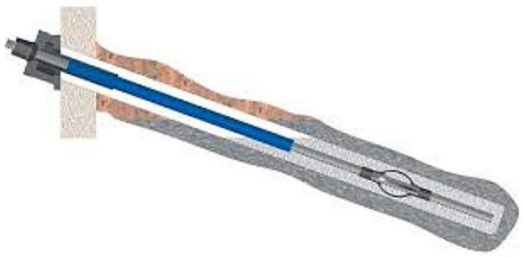
1. A comprehensive Surface Water Management with a dens Network of Catch/Interception Drains above the Routes:



Hillside Stabilization with Catch/Berm Drains

2. Preventive Removal of loose Rocks and Gravel endangering the Routes.

3. Rock- and Slope-Stabilisation with Rock Bolt-Anchors:



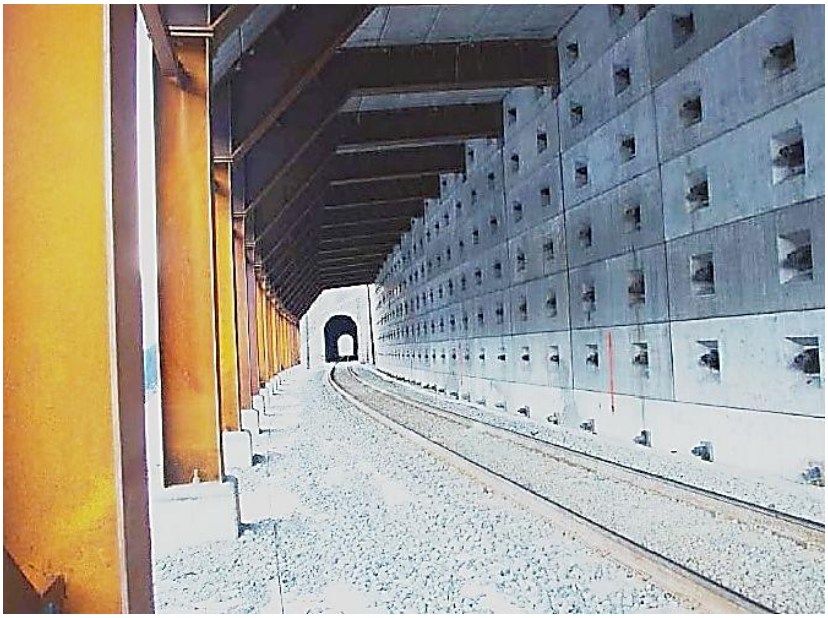
Rock-Anchor

4. **Well anchored Retaining Walls.** Gabions, as erected after the 2005 Calamity, are only a short-term Solution and not long-lasting!!!:

Solid Railtrack Retaining-Wall Stabilisation of Katra-Banihal Railway near Chenab River Bridge with DYWIDAG Rock-Anchors

5. Solid Protection Galleries:

Protection Gallery of Meter Gauge Rhätic Railway Switzerland



Inside of a Protection Gallery of Canadian National Railroad, Canada, with anchored Retaining Wall

6. Use of Hill/Slope-Side Bridges at vulnerable Spots and Corners:

Erecting hillside bridges over unstable ground and/or vulnerable sections offers a permanent solution to overcome ground and formation instabilities. This strategy is currently used at km 117 of the third up-line on the Bhor Ghat railway section between Karjat band Lonavala after heavy monsoon rainfall water has under-washed an abutment. In a massive rehabilitation drive an approx. 40 m yielding section will be excavated, stabilised with micro pillars and overbridged by a new railway-bridge; see Ajit Mahale: ***Bhor Ghat Bridge to be ready by Jan. 15th;*** The Hindu, November 20th. 2019:

Excavation of vulnerable and instable Railtrack Formation to be overbridged at km 117 of Up-Line on Bhor Ghat Section as a permanent Solution, India

Tough task: The track at the section runs between a valley over 50 metres deep on one side and a rock face around 50 metre high on the other. | Photo Credit: Special arrangement

Bhor Ghat Section Reconstruction at km 117

If CR will pay the Neral-Matheran Track the same attention in reconstructing as at km 117 on the Bhor Ghat Section, then there will be hope, that the Neral Mathern Track will survice the forthcoming monsoon rainfall impacts.

Araku Valley Hill/Slope-Side Bridge, KK-Line, India

Hill/Slope-Side Bridge, Konkan Railway; India

Hill/Slope-Side Bridge of Kuranda Scenic Railway, Queensland, Australia

However, there is no hope, that those mitigations and preventive measurements with long-lasting results can and will be financed, organised and executed. There is no hope, that such long-lasting state-to-the art preventive mitigation measurements "will be done"!

V. Fundamental Rules in Safety and Risk Management

In **SAFETY AND RISK MANAGEMENT** it is fundamental rule:

"What did not happen yesterday (in the past) is more likely to happen tomorrow (in the future)"

"From the non-occurrence of a bad and unwanted event in the past one cannot make any prediction for the future".

"An unsafe organisation can be lucky to face for a longer period no bad unwanted event. But from this, one cannot declare an organisation as "SAFE", if it had no unwanted bad occurrence in the past".

However, those are principle mistakes made often by politicians and higher echelons and as well by people in Matheran coming with the argument, that for 100 years there had been no major mischief with the Toy Train,

Maharashtra's only Hill Railway wrecked by heavy Rain

TNN | Aug 28, 2019, 08.54 AM IST by Manthan K. Metha and Umesh K.Panida

Underneath the Track there is only loose Earth and Gravel waiting to be washed out by the Monsoon Rail-Fall

The Matheran toy train is expected to remain shut for at least a year because of extensive rain damage to its narrow-gauge tracks. Central Railway (CR), which runs the service, has estimated restoration work to cost Rs. 20 crore, and has decided on a feasibility study before undertaking repairs. The study would look at whether the route, which has been repeatedly damaged because of natural factors, is sustainable in the long run.

Against an annual average of 3,038 mm, Matheran has recorded 5,217mm rainfall so far this monsoon, leading to landslides, cave-ins, washed-out sleepers and uprooted rails at nine locations along the 21km route of the state's only hill railway. This is the worst disruption since 2005, an extreme-rain year when over 50% of the tracks were washed away, and extensive damage was reported at 35 spots. Back then, restoration work took two years, before services were resumed in March 2007.

"Restoration is challenging in the absence of any road to ferry equipment and material to the tracks. We will have to start from the ground, at the Neral-end, and gradually move up the hill as the stretches get repaired. This is time-consuming," said a senior official. A shorter, faster road link, along with taxi services, exists between Matheran and Neral and is the route of choice for locals. The toy train, which offers picturesque views of hills and valleys, is majorly of heritage importance.

CR is considering a plan to first restore services in the shortest and last section of the route — Aman Lodge to Matheran —, which hasn't been majorly damaged. But there's a catch. "Right now, maintenance facilities are at the base, in Neral. Even coaches and locomotives roll in here for upkeep. If services in the uppermost section are to be resumed, the maintenance yard will have to be shifted to Matheran," said CR's chief public relations officer, Shivaji Sutar.

Every year, toy train services are closed during the monsoon between Neral and Aman lodge, and resumed in October. This year, the entire route has had to be shut because of the rains. "At many places, even embankments, which are sturdy structures, have been washed away," said a senior CR official.

He said that because nature unleashes its fury on the Matheran Hill Railway so very often, CR authorities aren't sure if restoring the route yet another time is a good idea at all.

“There is a question mark on the service right now. We are waiting for a cost-benefit analysis before taking a decision. A point to note is that this route doesn’t generate much revenue,” said the official. “The railways may spend crores, but we will be back to square one if torrential rains damage the line again during the next monsoon. In any case, approval for the funds needs to come from the railway board, not to speak of environmental clearances since Matheran lies in an eco-sensitive zone.”

Locals aren’t convinced of CR’s reservations. “Toy train services in Shimla and rain-slashed Darjeeling work properly because state leaders care for heritage,” said Manoj Khedkar, who lives in Matheran. “I wish our leaders were equally sensitive to history and to the needs of locals.”

CR to partially open Neral-Matheran Line this Weekend, Work may be completed next Year

Published: Dec .26th, 2019, 12:41 IST | Rajendra B Aklekar | Mumbai ; midday

Stranded Shuttle Trainset going back to Neral Workshop

The work on the entire Neral-Matheran stretch has also begun simultaneously and is expected to be completed before rains in 2020.

The Central Railway undertook trials between Aman Lodge and Matheran stations and said it will start services by the New Year weekend.

The work on the entire Neral-Matheran stretch has also begun simultaneously and is expected to be completed before rains in 2020.