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Research Article

Low Cost Mountain Road Network Maintenance Impact and Infrastructure

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Abstract

The essential focal point of our investigation is to distinguish the difficulties and challenges that we face and to track down some possible arrangements while developing and upkeep of roads in the territory of Jammu and Kashmir. The roads go through the wraps that are generally ice inclined, situated at high heights and we experience freezing temperature there. Aside from its sloping nature, the climatic conditions are extremely cruel for most piece of the year, in which the precipitation is more, generally as snow that covers the entire of the land including roads. The valley has a couple of ways out as public thruways that go through hilly ranges at high heights, where the snowfall is weighty during cold weather months. The state being overwhelmed by undulating geography, road is the excellent methods for transport. The cutting of roads and their upkeep through the consistent rugged reaches has become a test for the architects and constructors. The reason for concern is that Kashmir has the road thickness of 35.71 km for each 100 sq km; this is one of the least in the country. In this paper, we present a portion of the materials and a portion of the improved strategies in street development to conquer the difficulties that we experience during development and support of roads in Kashmir.

Keywords: *Drift, Frost, Maintenance, Mountain, Transportation*

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Introduction

Ai greati deali ofi worki hasi beeni donei toi distinguishi developmenti andi supporti difficultiesi ini coldi andi bumpyi territories.i Thei informationi werei organizedi abouti howi toi keepi thei roadsi fromi icingi andi gettingi roadsi developments.i Thei datai ini regardsi toi thei development,i checkingi andi avoidancei ofi ice arrangementi becausei ofi surfacei andi sub-surfacei water.i Thei techniquei fori developmenti andi thei mistakei ini panningi andi planningi ofi Roadi promptsi thei icei arrangementi .i Basedi oni differenti pasti investigates,i ai systemi wasi createdi toi forestalli developmenti ofi icei .i Seveni proceduresi werei createdi toi lesseni thei icei development.i Thei cuti offi channelsi oughti toi bei giveni toi keepi wateri fromi arrivingi ati thei streets.i Thei quantityi ofi avalanchesi ini ai specifici territoryi reliesi oni itsi separationi fromi focali point,i thei inclinationi ofi slanti whichi isi expresslyi identifiedi withi sheari strengthi andi thei dirti sort.i Expansioni ini thei poweri ofi tremori sizei causesi upsurgei ini thei quantityi ofi avalanchesi .i Thei reasoni fori avalanchesi becausei ofi seismici tremorsi isi thei decreasei ini slanti strengthi becausei ofi constanti shaking.i Thei avalanchesi happeni wheni thei sheari poweri beatsi thei sheari strengthi ofi thei interfacei promptingi unsteadinessi ofi thei inclinei thati causesi thei uprootingi ofi soili particlesi lastlyi thei massi development.i Thei examinationsi werei donei oni thei asphaltsi thati werei immersedi becausei ofi floods.i Thei asphaltsi freei itsi solidarityi rapidlyi fori initiali sixi toi abouti twoi monthsi andi afterwardi consistentlyi ini oppositioni toi thei anticipatedi plan.

A. Geographical features of Kashmir valley

Thei provincei ofi Jammui andi Kashmiri hasi beeni announcedi asi slopingi statei byi "Branchi ofi Geologicali studyi ofi India".i Kashmiri isi ai valley,i encircledi byi strongi mountainsi oni thei entirelyi ofi itsi sides.i Thei primaryi Kashmiri Valleyi [34.1667°i N,i 74.i 7500°i E]i runningi 132i kmi longi andi 32i kmi widei coversi thei regioni ofi 15,520.3i km^2i withi thei risei ofi 6,070i fti abovei oceani level.i Thei environmenti staysi coldi fori mosti piecei ofi thei yeari primarilyi fromi Novemberi toi walki thati encountersi greatesti snowfall.i Thei yearlyi precipitationi isi 1530i mmi andi thei normali snowfalli isi 195i cm.i Thei recordedi highi temperaturei isi 33°Ci andi thei recordedi lowi isi -i 18°C.i Thei valleyi ofi Kashmiri liesi ini zonei 4i andi zonei 5i ofi tremori draftingi accordingi toi "Divisioni ofi topographicali reviewi ofi India".i Thesei zonesi arei viewedi asi thei seismici tremori inclinedi zones.i Thei insidei streetsi arei inclinedi toi floodingi whilei ai largei portioni ofi ouri significanti roadsi goi throughi highi heightsi ofi Pir-panjali rockyi reaches,I particularlyi thei fundamentali waysi outi ofi valleyi likei Jammu-Srinagari publici thruwayi thati goesi throughi Patnitopi ati ai heighti ofi 6640i ft,i Mughali Roadi thati goesi throughi Piri kii Galii ati ai risei ofi 11500i fti andi thei Anantnag-kishtwari roadi thati goesi throughi sinthani topi ati thei elevationi ofi 12500i fti fromi meani oceani leveli streetsi arei presentedi toi extremelyi unforgivingi climatici conditionsi likei heftyi snowfalli andi discontinuousi downpours.i Thesei conditionsi leadi toi differenti imperfectionsi ofi soils,i rocks,i inclinesi throughi whichi thei streeti passesi thei ati lasti promptsi enduring,i decreasei ini sheari strengthi ofi soil,i insecurityi ofi slantsi otheri thani differenti streeti deformitiesi ofi streets.i

Subsequently,i wei facei ai toni ofi difficultiesi whichi buildingi andi keepingi upi streetsi ini thesei regions

Fig.i 1 *Thei map ofi Jammui andi Kashmiri (studyi area)*

Challenges

Floods

Thei inneri roadsi associatingi differenti areasi insidei thei Kashmiri valleyi arei bothi uneveni roadsi justi asi plaini roads.i Thei streetsi arrangedi ini plaini regioni includingi thei Nationali thruwayi thati separatesi Kashmiri intoi twoi sectionsi extendingi fromi northi ofi Kashmiri valleyi toi thei extraordinaryi south,i isi thei roadi ofi vitali significancei [16].i Thisi roadi slacksi seepageiframeworki andi isi morei inclinedi toi flooding,i sincei iti movesi correspondingi toi thei waterwayi Jhelum.i ati whateveri pointi therei arei substantiali downpoursi duringi summers,i iti getsi enormousi amounti ofi wateri fromi itsi catchmenti regioni includingi differenti feedersi likei Lidder,i vaisho,i sindi andi soi forthi andi iti floods,i iti immersesi thei publici interstatei viz,i NH-1Ai andi alli thei significanti areai andi towni streetsi thati comesi ini itsi manneri directlyi fromi southi ofi thei valleyi upi toi northi endi [17].i Therei isi noi floodi channeli presenti toi depletei awayi thei water,i ini spitei ofi thei facti thati there wasi onei directi builti ini thei Srinagari cityi howeveri thati doesn't existi anyplacei nowibecausei ofi infringementsi andi strongi garbagei removali there.i Thei newi surgei ofi 2014i impededi thei augmentingi interactioni ofi publici roadwayi becausei ofi immersioni ofi thei entirei zone.i Presentlyi thei publici authorityi hasi showedi somei drivei toi developi floodi channeli fromi Awantiporai thei willi takei additionali releasei fromi thei waterwayi andi willi emptyi thei intoi thei Wuluri lake.i Becausei ofi this,i ai toni ofi enormous stretchi ofi publici parkwayi willi bei kepti fromi immersion.i Somei low-lyingi streetsi stayi loweredi fori quitei ai while,i becausei ofi that;iThey buildi upi thei differenti deformitiesi likei potholes,i settlementi ofi subgradei andi deprivingi ofi bitumen.i Thei zonei encompassingi waterwayi Jhelumi hasi ai dirti thati remainsi fori thei mosti parti soakedi andi consequentlyi holdsi morei water.i Sincei thei regioni hasi primarilyi thei

adaptablei asphalts,i ai greati deali ofi settlementsi happeni therei eveni ati lesseri burdensi [18]. Therei isn'ti ai loti of effecti oni thei inflexiblei andi semi-unbendingi asphaltsi despitei thei facti thati therei mighti bei refectioni breaking becausei ofi differentiali settlementsi ini thei subgrade.i Subsequentlyi floodi predominantlyi influencesi thei asphalti andi thwartsi thei developmenti work.

Ground Frost

Ini thei slopingi territoriesi ofi Kashmir,i thei temperaturei goesi underneathii 15°Ci ini wintersi andi neveri surpassesi 15°Ci eveni ini thei midi yeari longi stretchesi ofi Junei andi July.i Ini coldi weatheri months,i thesei roadsi stayi coveredi byi dayi offi thei icei activityi happens.i Thei dregsi ofi frigidi andi glaciolacustrinei causei arei morei icei touchy.i Icei profundityi isi relianti oni thei yearlyi icei aggregatei thei grainі sizei ofi thei dirt,i andi snow profundity.i Thei capillarityi ofi soili ini significantlyi morei influencedi byi itsi icei affectability.i Thei narrowi ascenti ofi wateri cani bei upi toi 3i mi ini siltyi soils.i Becausei ofi hairlikei ascenti ofi wateri toi thei surface,i iti freezesi andi structuresi isolatedi icei layers.i Thei residuei holdi wateri oni ai superficiali leveli andi structurei icei hurlsi thati isi thei principlei worryi fori roadi constructors.i Thei frozeni groundi isi viewedi asi thei settledi soili andi iti can'ti makei anyi issuei excepti ifi iti staysi frozen.i Asi thei dayi temperaturei builds,i defrosti startsi andi iti conveyingi limiti isi lost.i Icei defrostsi firsti ati thei focali pointi ofi thei streeti andi structuresi ai sectioni likei icei tablei ini thei streeti bank,i whichi defersi thei seepagei ofi liquefyiwaters.i Becausei ofi this,i thei wateri movei alongi thei streeti surfacei ratheri thani seepageiframeworki built,i bringingi abouti thei developmenti ofi longitudinali breaksi oni thei banki sides.i Thei lopsidedi icei hurlingi causei thei disintegrationi ofi asphalt,I longitudinali andi crossi overi breaksi andi potholes.i Oni thei offi chancei thati groundi icei staysi fori longeri period,i iti willi prompti mishapsi becausei ofi elusivei conditionsi oni thei roads.

Snow Drift

Thei entirei Kashmiri staysi underi snowi coveri fori mosti piecei ofi thei yeari andi thei significanti spotsi inclinedi toi blizzardi incorporatesi Banihali topi andi Patnitopi oni publici interstate,i Sinthani topi oni Anantnag-Kishtwari roadi andi Peeri kii Galii oni Mughali Road.i Thei icei soi framedi andi thei constanti freezingi andi defrostingi activity,i fallsi aparti thei wearingi coursei andi iti scrapsi offi thei upperi layeri ofi thei streeti wheni wei attempti toi cleani thei icei upi thei streetsToi anticipatei snowi gatheringi ini variousi climate,i Finnishi designersi havei utilizedi ai Russiani equation

$$Q=Lh_m\Phi\eta\beta \qquad (1)$$

Where Q = the depth of snow on one meter wide strip
L = the length for which snow accumulates
h_m = mximum snow depth in 10 year period
Φ = erosion threshold value for the wind speed 5 to 7 m/s in differentenvironments: 0-0.1 steep, vegetated landscape
B = sublimation coefficient of snow, normally 0.7
η = coefficient of the steadiness of the wind drift from different directions

Thei lengthi fori whichi snowi accumulatesi asi follows:

- 15,000–20,000i goodi topographyi ori icyi surface
- 12,000–17,000i openi hillyi area
- 3000–6000i hillyi area,i somei vegetation
- <500i steepi slopes,i vegetated
- <600i forest

Maximumi snowi depthi ini 10i yeari periodi (higheri valuesi arei usedi withi windi speed)i 5i m/s;

Erosioni thresholdi valuesi arei asi follows:

- 0.2–0.3i hillyi tundra,i scatteredi vegetation
- 0.4–0.5i open,i hillyi place
- 0.7–0.8i open,i eveni place
- 0.7–0.9i open,i frozeni surface
- 0.8–1.0i mountainousi summit

Earthquakes and Landslides

Thei Kashmiri valleyi liesi ini thei zonei 5i ofi quakei drafting,whichi isi viewedi asi thei tremori inclinedi zone,i wei regularlyi experiencei largei quakesi causingi thei relaxingi ofi soili andi ati lasti thei colossali massi developmenti ofi earth.i Thei Srinagar-Jammui publici parkwayi goesi through thesei Himalayani reachesi thati arei inclinedi toi avalanches.i Thei Himalayasi werei shapedi approximatelyi 26i millioni yearsi prior,i andi eveni todayi iti isn't ini stablei condition.i Thei massi slidesi rosei soi rapidlyi thati eveni todayi itsi inclinesi arei ini shakyi condition.i Therei arei heftyi rainsi andi snowi during coldi weatheri monthsi ini viewi ofi highi RLi ofi thisi spoti thati hasi broughti abouti profoundi enduringi profiles,i oni slantsi thati arei noti reallyi steady.i Thisi aggregationi ofi wateri ini soili atomsi createsi pressurei thati promptsi thei sheari disappointmenti ofi thei dirti andi hencei thei massi developmenti ofi thei dirt.i Thesei avalanchesi andi snowi torrentiali slidesi movingi alongi thei slopei slanti ati exceptionallyi rapidi obliteratei thei streetsi situatedi underneathi thei slope.i Thei avalanchesi thesei daysi havei becomei ai standardi nowi asi opposedi toi exemption,i eveni ai littlei delugei promptsi thei avalanchesi andi henceforthi thei conclusioni ofi thei roadways.

Thei piecei ofi publici thruwaysi fromi Banihali toi Rambani includingi Penthal,i Digdol,i Ramsui andi soi forthi arei morei inclinedi toi avalanchesi sincei theyi comprisei ofi sedimentaryi rocks.i Thesei stonesi fluctuatei ini thicknessi fromi 0.5i mi toi 3i mi howeveri regularlyi iti isi 1i m.i Asidei fromi this,i differenti sandstonei bedsi exist.i Thesei stonesi arei permeablei andi exceptionallyi penetrablei ini lighti ofi thei facti thati theyi havei beeni blamedi toi createi littlei brokeni stonei masses.i Wateri entersi profoundi intoi itsi surfacei andi causei enduringi zonesi andi createsi pressingi factori andi greasei ini disappointmenti planes.i Consequentlyi thei stonesi losei theiri solidarity.i Thei loweri Himalayasi arei

comprisedi ofi Metai morphici rocksi thati arei seriouslyi collapsedi andi brokeni andi arei henceforthi morei inclinedi toi enduring.

E. Drainage Problems

Thesei streetsi goingi throughi slopesi needi morei considerationi takingi everythingi intoi account.i Therei arei noi "tricki wateri channels"i toi redirecti andi catchi thei wateri fromi thei slopei slant.i Ati whateveri pointi iti downpours,i therei isi gigantici mass-developmenti ofi earth,i thei garbagei ofi avalanchesi andi thei aggregatedi snowi blocki thei wastesi alongi thei sidei ofi thei road.i Thei amassedi snowi alongi thei sidei ofi thei roadi softeni consistentlyi wheni thei daysi becomei morei swelteringi andi consequentlyi becomei ai dangeri fori itsi upkeep.

Mosti extremei lengthi ofi streetsi ini Kashmiri goi throughi thei loweri parti ofi thei slopesi becausei ofi which,i thei wateri fromi thei slantsi overviewi andi causei decayi ofi asphalti ofi surface.i Thei aggregationi ofi wateri promptsi thei undulationsi becausei ofi differentiali settlementsi thati isi causedi becausei ofi thei maintenancei ofi dampnessi ini thei subgradei soil.i Thisi issuei generally winsi ini thei streeti extendsi whichi is encircledi byi thei twoi slopesi wherei noi daylighti comes..

Fig. 2 *Deteriorated condition of road (a) due to heavy snow fall (b) because of floods*

Fig. 3i *Roadi closurei duei toi landslides*

F. Material Transportation Issuess

Thei uniquei considerationi andi treatmenti fori streeti developmenti ini veryi chillyi climatei conditionsi beginsi fromi activationi ofi assets.i Conveyingi asphalti developmenti materialsi toi ai highi heighti isi troublesomei wherei thei temperaturei isi lowi andi cani bei exceptionallyi uneconomical.i Iti isi hardi toi keepi upi thei highi temperaturei ofi bitumeni thati isi fundamentali fori thei achievementi andi longi existencei ofi anyi asphalt.i Asidei fromi this,i workingi ini freezingi temperaturei cani prompti thei disintegrationi ofi wellbeing,i profitabilityi andi workmanshipi ofi laborers,i artisansi andi designersi workingi ati thei site.i Thei primaryi illnessesi relatedi withi chillyi climatei workingi arei Frostbitei andi Hypothermia.i IniFrostbitei therei happensi thei reali freezingi ofi tissue.i Uncoveredi skini getsidefenselessi againsti frostbitei wheni thei airi isi cold.i Hypothermiai happensi wheni thei bodyi centeri temperaturei dipsi underi 35°C.i Wheni thisi happensi thei bodyi losesi itsi capacityi toi forestalli heati misfortunei andi isi losingi heati morei rapidlyi thani iti cani makei heat.i Thei apparatusi plantedi ati thei sitei deali withi thei issuesi likei freezingi ofi fillsi andi greases.i Ini thisi manneri decreasesi thei proficiencyi ofi machines.

G. High initialiconstruction andimaintenanceicosts

Ati thei underlyingi stage,i ini bumpyi regions,i thei streeti developmenti costsi ai lot.i Thisi isi ai resulti ofi heftyi earthworki andi impactingi ofi hardi shakesi thati willi bei finished.i Thei timei hasi comei devouringi cyclei andi requiresi ai veryi longi timei toi finishi thei task.i Thei four-laningi ofi thei parkwayi wasi beguni ini 2015i andi missedi itsi firsti cutoffi timei andi nowi itsi cutoffi timei hasi beeni seti asi 2019.i Thei measurei ofi 2136.97i crorei hasi beeni endorsedi fori thei Udhampur-Rambani areai andi 2168.i 66i cr.i wasi endorsedi fori thei Ramban-Banihali area.i Iti missesi ai largei numberi ofi thei cutoffi timesi ini lightofi severei climatei thati winsi ini thisi piecei ofi thei world.i Thisi yeari becausei ofi heftyi snowfall,i iti staysi shuti fori mosti piecei ofi thei coldi weatheri monthsi subsequentlyi deterringi thei work.i Thei persistenti avalanchesi ini thei Banihal-Rambani areai andi wastei disappointmentsi havei promptedi incrementi ini supporti worki ini thisi area.i Ini thisi manneri consistently,i itsi upkeepi costi incrementsi andi devoursi ai greati deali ofi assets.

Solutıons

1. Thei concretei essentiallyi Chunami andi Ferro-concretei utilizedi ini thei developmenti ofi inflexiblei asphaltsi oughti toi havei thei underlying relievingi seasoni ofi underi 2.5i hi andi lasti settingi seasoni ofi ati leasti 5.2i h.i Thei totalsi ofi stonei andi carbonatei rocksi cani bei utilized.
2. Thei sub-basei thicknessi ofi noti lessi thani 0.i 5i mi shouldi bei usedi toi preventi frosti heavei andi differentiali settlements.
3. Thei developmenti ofi toe-dividersi essentiallyi thei massi gabioni dividersi toi forestalli thei low-sumi avalanchei garbagei fromi enteringi thei streeti thati mayi harmi streeti asphalti andi seepage
4. Thei cut-offi drainsi withi trapezoidali cross-sectioni shouldi bei providedi ati numerousi placesi fori betteri drainage.

5. Toi capturei generallyi freei soil,i geti fencesi principallyi ofi block,Iconcretei mortari ori stonesi thati arei richlyi accessiblei cani bei utilized.
6. Toi forestalli singulari breakingi causedi becausei ofi entrancei ofidampnessi ini lighti ofi delayedi precipitation,i breaki fixingi containingi jutei fiberi blendedi ini withi cut-backi bitumeni cani bei utilized.
7. Toi fixi hugei troubledi territory,i thei fixi worki shouldi bei possible,i hazei sealsi comprisingi black-topi emulsionsi andi water,i chipi sealsi asi bituminousi layeri andi slurryi sealsi bituminousi emulsionsi cani bei utilizedi fori surfacei treatment
8. Increasingi vegetationi isi thei effectivei methodi toi preventi soili erosion,i snowi driftingi andi weathering
9. Toi preventi snowi drifting,i thei snowi fencesi cani be constructedi andi thei roadsi havei toi bei placedi paralleli toi thei windi direction.
10. Thei visuallyi impairedi dumpi cani bei developed,i andi thei porousi geotextilei cani bei presentedi oni thei topi surfacei andi thei sidei ofi leakagei layeri toi permiti drainagei intoi thei jettison.i Thei basei andi sidesi shouldi bei impermeablei toi forestalli leakagei intoi thei bank.
11. Ani adaptablei wastei cani bei utilizedi ini avalanchei inclinedi territories,i sincei littlei breakingi won't influencei theiri activity

Conclusion

Accordinglyi fromi ouri investigationi wei presumei thati iti considerablyi morei hardi toi buildi andi keepi upi roadi neglectedi andi uneveni localesi likei thati ofi Kashmiri valley.i Wei recognizedi thei difficultiesandi trackedi downi somei reasonablei difficultiesi toi counteri them.i Iti wasi trackedi downi thati thei significanti developmenti andi upkeepi challengei isi toi buildi roadsi ini thei icei coverededistricts.i Thei territoryi beingi morei inclinedi toi tremorsi oni thei groundsi thati broadi avalanchesi thati expandsi thei supporti worki andiexpensesi ofi thei road,i ini thisi wayi hampersi thei traffici streami outi andi abouti andi stopsi thei upkeepi cycle.i Thei anotheri difficultiesi distinguishedi wasi thei massi developmenti ofi earthi promptingi thei conclusioni ofi streetsi ,i thati causei heftyi harmi toi streeti otheri thani botheri andi perili toi thei voyagersi becausei ofi substantiali gridlocks.i Thei besti arrangementsi werei recognizedi toi defeati thesei difficultiesi thati arei affordable,i plausiblei andi simplei accessible.

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