REGION: Northern Region
DIVISION/ PROJECT: Landslide Division
SUPERVISORY OFFICER: ……,

1. FSP Basic Details:

Parent Mission	Fundamental & Multidisciplinary Geosciences	**Year of Initiation**	2019
Sub Mission	Geotechnical and Geohazards Management	**Year of Completion**	2020
Theme	Research Item	**First Approving Authority**	CHQ
Type Code	M4ARP	**Field Season Year**	2019-2020
Commercial Code	Non Commercial	**FSP ID**	-
Region	Northern Region	**Base FSP ID**	-
State Unit	P & HP	**Proposal ID**	-

2. Field Season Programme Details:

Title	Development of appropriate method for landslide susceptibility mapping on scale 1:10,000 (meso-scale) in Himachal Himalaya.
Background Info (Max characters allowed: 4000)	For past five years, GSI is involved in the preparation of macro-scale landslide susceptibility map using region specific robust methods developed for the purpose. In March 2020, this nation-wide exercise will culminate in the preparation of seamless landslide susceptibility map for areas that are known to be susceptible to landslide. This map providing a regional picture, alongwith the individual geofactor maps that form the basis for the susceptibility map will provide baseline database to the administrators to plan the developmental activities on a regional scale and decide on budgetary provisions to tackle landslide related issues. It is necessary that the macro-scale effort is followed by a meso-scale (1:10,000 scale) landslide susceptibility map preparation in select areas spread across the country with a view to generate a user friendly output that will be of direct use in decision making for planning risk mitigation in much smaller areas. An initiation in this regard was already made few years ago in parts of Sikkim Himalayas by using method advocated by Ghoshal et al. (2013). This method essentially makes use of Slope Mass Rating (SMR) in rocky slopes and Shear Strength parameters in overburden laden slopes besides other factors to compute 'Total Estimated Susceptibility Values (TESV)' using rating and weights that are heuristically derived. The output is a qualitative landslide susceptibility map that divides the area in low, moderate and high susceptibility classes without any reference to any specific landslide process and type. In a recently concluded (held on 12th November 2018) Brain Storming Session (BSS), the experience gathered by applying methodology advocated by Ghoshal et al. (op. Cit.) was discussed at length and it was decided that although the said method is found to be quite useful in Sikkim area, it needs to be tested in other parts of the country. Owing to these uncertainties about the utility of the existing method in other parts of the country and need to make the final product of meso-scale landslide susceptibility mapping more 'user friendly' it was decided that before launching a country-wide meso-scale landslide susceptibility mapping programme from FS 2020-21, a pilot study covering landslide susceptible parts located in NW Himalayas, Maharashtra and the southern peninsular India be conducted for a period of one field season with an aim to develop appropriate method for meso-scale landslide susceptibility mapping. The present item is a fall out of these decisions taken at the BSS. In the proposed study, it is intended to 1) use a topomap derived either from 10 m Carto DEM/ Cartosat PAN data or DEM obtained by using 3D laser scanner with support from GHRM Centre,

	CHQ/1:10K toposheet from SOI; 2) rely on ratings and weights of thematic variables selected by understanding the process/ type of existing &/ or likely landsliding in a given domain and 3) integrate the database in GIS through raster/ vector modelling. [detail of project area, why the site chosen, Figure 1 etc may be included WORD LIMIT 800-1000 character] The output of the project will be an improved methodology for user friendly meso-scale landslide susceptibility mapping for a road corridor in the Himachal Himalaya and development of the SOP. **Bibliography**: Casagli N., Catani F., Puglisi C., Delmonaco G., Ermini L., Margottini C., 2004. An Inventory-based approach to Landslide Susceptibility Assessment and its Application to the Virginio River Basin, Italy. Environmental & Engineering Geoscience, Vol. X, No. 3, pp. 203–216. Ghoshal T.B., Bodas M.S., Ghosh S., 2013.A multi-thematic and deterministic-cum-heuristic methodology for meso-scale (1:5,000/10,000) landslide susceptibility zonation. Indian Journal of Geosciences, 67(3):217-228. Hindayar J.N., Dasarwar P., Ibrahim M., Kumar N., 2016. Report on meso scale (1:10,000) landslide susceptibility mapping in and around Mangan urban area, North district, Sikkim. Unpub. GSI Report of FS 2014-16. Karmakar R., Baraik S., Kumar S., Singh P., Tewari H., 2017. Mesoscale landslide susceptibility zonation and monitoring of the identified vulnerable zones of Chibo locality, Kalimpong Sub-Division, Darjeeling district, West Bengal. Unpub. GSI report of FS: 2015-17.
Objective (Max characters allowed: 4000)	1. To identify the geo-factors on meso-scale responsible for slope instability in different landslide types. 2. To develop suitable method for characterizing landslide susceptibility in the Himalayan terrain at meso-scale.

Submission Date		**Stage of Investigation**	NA
Tentative Start Date	4/1/2019	**Spin-off of Other Item**	NA
Actual Start Date	4/1/2019	**Is GPM item already covered by GCM or vice-versa**	NA
Item Type	Standard	**Collaborative Item**	NA
Item Duration	1	**Sponsored Item**	NA
Item Linked With	Annual plan of GSI	**Name of the Sponsor**	NA
Keywords	Landslide, Meso-scale, Susceptibility, Landslide domain, GIS.	**FSP Project Status**	New

3. Report Preparation:

Report Type	Final	**Circulation Required**	No
First Draft Report Date	6/15/2020	**Report submission Date**	7/31/2020
Report Scrutiny Date	6/30/2020	**Research Paper Submission Date**	-
Report Finalization Date	7/15/2020		

4. Participating Info:

Participating Unit																
Sl. No	Site Name	Site Type	Personnel Stream Category	No. of Persons	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
1	PHP	Primary	Geology	1		20					20	20				
			Geology	1		20					20	20				
2	GHRM	Secondary	Geology	1		10										
3	Geophysics Division, NR	Secondary	Geophysics (Exploration)	1		15										
			Geophysics (Exploration)	1		15										

Cruise Details						
Sl. No	Cruise No.	Leg	ETD	ETA	Port of Embarkation	Port of Disembarkation
NA	NA	NA	NA	NA	NA	NA

5. Geo Info:

Boundary Selection			
Max X	31.00N	Min X	31.750N
Max Y	77.00E	Min Y	77.250E
State Selection			
Sr. No.	State	District	Basin
1.	Himachal Pradesh	Mandi	Himalayan Belt
Area Selection			
Sr. No.	Area of Survey		
1.	xxxxx		
Toposheet Selection			
India	Series No.	Degree Sheet No.	Toposheet No
	53	53E	53E2

6. Quantitative Targets:

Data synthesis-compilation				
Activity name	Target	Total Workload	Work Completed	
Preparation thematic maps (sq. km)	10	10		
Publication	1	1		
Field sample collection				
Core sampling (Number)	25	25		
Geological				
Landslide susceptibility mapping (sq. km)	10	10		
Geophysics				
Geophysical- Resistivity profiling (sq. km/Lkm)	10	10		
Vertical Electrical Sounding (no of stations)	4	4		

Mapping				
Large scale mapping (12500/10000) (sq. km)	10	10		

7. Qualitative Targets:

Sr. No	Task	Target	Timeline		Workload	Lab Name	Analysis Type
			From	To			
1	Procurement of CartoDEM		4/1/2019	5/1/2019			
2	Detailed landslide map including ground deformation, creeps etc		4/1/2019	5/30/2020	10 sq.km		
3	Preparation of thematic maps for different geofactors on scale10,000 (slope morphometry, Land use/land cover map, Landforms, Slope Forming Material, engineering geological, landslide domain, Overburden thickness, geotechnical maps etc)		4/1/2019	5/30/2020	10 sq.km		
4	Facet map		4/1/2019	7/31/2020	10 sq.km		
5	Geotechnical analysis of rock and soil samples		8/30/2019	12/31/2019	25	Geotechnical Lab NR	Analysis of rock and soil samples for physical properties and shear strength parameters

8. Drill Unit:

Working Area	NA
Drilling and Coring Requirements	NA
Estimated Lithology and Mineralized Zones	NA
Geophysical Logging	NA

9. Vehicle:

Vehicle Type	Quantity	*Tentative km	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar

10. Expense:

Operational Expense						
Expense Head	Expense Type	Budget	Quarter1	Quarter2	Quarter3	Quarter4
Research & Development	RCA-Wages					
Research & Development	RCA-Other Charges**					
Research & Development	RCA-POL##					

Consumable Item			
Consumable Item	Quantity	Item Expense	Total

Non-Consumable Item			
Non-Consumable Item	Quantity	Unit Price	Total

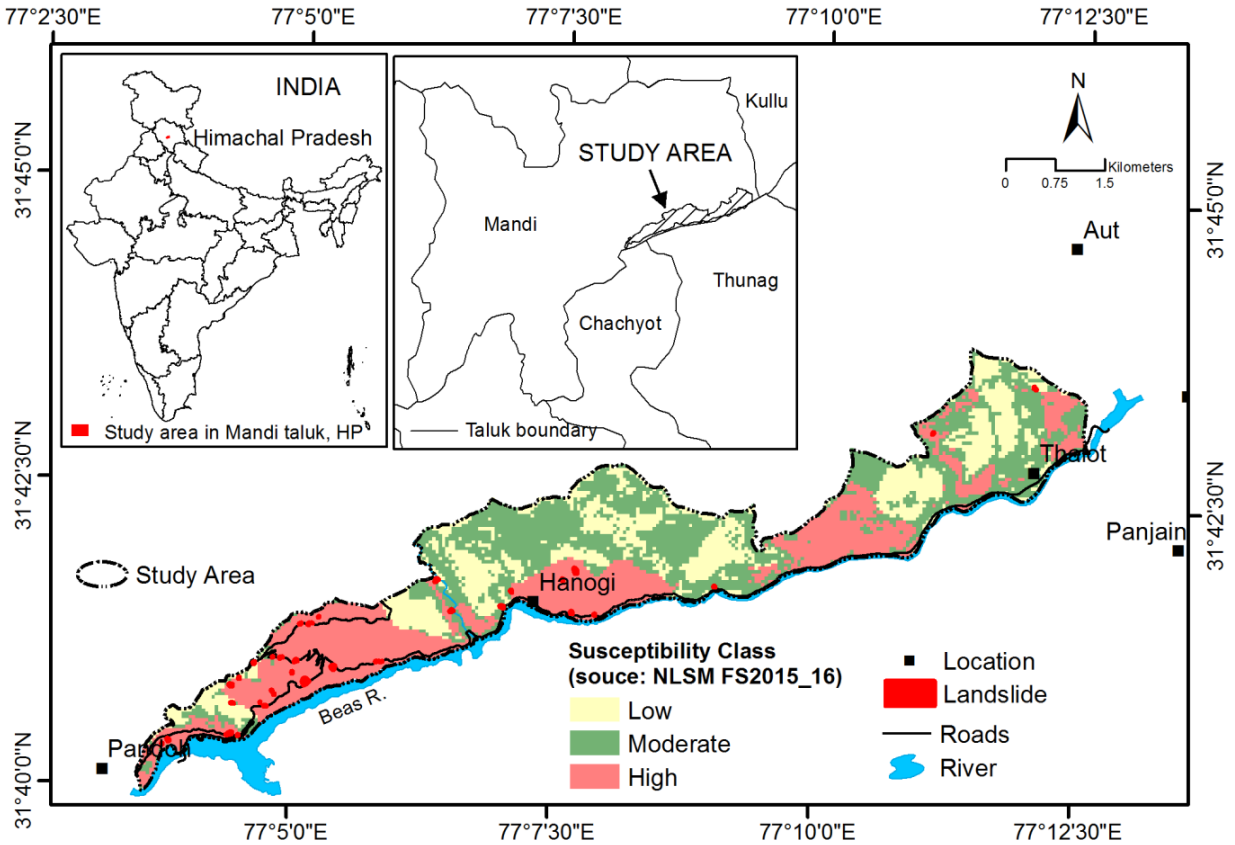

Figure 1. Proposed study area for developing the methodology on meso-scale landslide susceptibility in Himalayan terrain.