Procurement of Safety Assessment of major road network in Himachal Pradesh using iRAP methodology

Terms of Reference

1. Background

The incidence of road crashes in the state of Himachal Pradesh (HP) is high and it ranks 4th in terms of persons killed per lakh population as per the road accident data of the year 2019 published by MoRTH. The fatality rate in the State is 15.8 people per lakh population compared to the national level fatality rate of 9.7.

To address this issue, Government of Himachal Pradesh (GoHP) has sought the support of the World Bank in preparing a project "Himachal Pradesh State Roads Transformation Program" with the objective of PDO is to enhance the efficiency of the transportation and Road Safety institutions and develop efficient logistics system for horticulture and overall economic growth in Himachal Pradesh. This also aligns with the Government of India's new legislation on road safety, the Motor Vehicle Amendment Act, effective September 1, 2019, which provides incentive for states to align with the new act postulations. The operation supports GoHP's vision for transforming transport, is 'to see Himachal Pradesh interconnected with safe, resilient and high standard transport infrastructure and services facilitating green growth.

Supported by the World Bank, the Himachal Pradesh Roads and Other Infrastructure Development Corporation (HPRIDC) has appointed a Road Safety Advisory Consultant (RSAC) with an aim to manage the state-wide road safety agenda and strengthen technical and institutional capacity for the Himachal Pradesh Department of Transport (HPDoT), which is the road safety lead authority for the state. The role of the RSAC is to ensure that the outcomes critical for sustainable long-term road casualty reduction are realized through supporting agencies to implement multi-sectoral interventions on the identified Safe Demonstration Corridor and other hazardous districts. The Safe Demonstration Corridor initiative will involve road infrastructure improvement, support to the state highway patrol by providing surveillance equipment (CCTV cameras for speed control, accident recording, etc.), variable messaging system (VMS), police training and establishing emergency response posts.

As part of these efforts, HPRIDC wishes to utilize proactive tools and procedures provided by iRAP[1] methodology for the identification of hazardous road infrastructure. For this, HPRIDC seeks to engage a firm (consultant) staffed with iRAP accredited personnel to perform all the required steps and prepare Star Ratings and Safer Roads Investment Plan (SRIP) for the state road network comprising of MDR (managed by PWD) and NH (managed by PWD, NHAI, and BRO) with a total length of approximate 7,000km. This road network will include the completion of a Safe Demonstration Corridor and the iRAP assessment will help to identify safety treatments necessary to reduce road crashes occurring on this corridor and other surveyed roads.

2. Study Objective

The objective of this assignment is to conduct a systematic safety video survey and assessment using iRAP methodology for the approximate 7,000km road network in Himachal Pradesh to

1. Prepare Star Ratings and identify affordable high-return safety engineering countermeasures for the road network in all the 12 districts
2. Prepare Star Ratings and identify safety treatments to be included in the implementation plan for the Safe Corridor Demonstration Program

[1] International Road Assessment Program, www.irap.org

3. Scope of Work

- **iRAP Road Surveys:** conduct road surveys to capture video images and GPS data following iRAP Survey Manual[2]. The survey shall be conducted using a network survey vehicle or set of equipment accredited[3] by iRAP and satisfying the requirements mentioned in the iRAP Survey Manual. The road surveys shall be conducted on about 7,000km of roads (centerline length) comprising of National Highways and Major District Roads listed in **Annex-A.** The road survey shall be conducted on both carriageways separately on a divided or dual carriageway road section. The supplier shall prepare Health and Safety Plan as specified in the iRAP Survey Manual and get approval from the client prior commencement of surveys. The supplier shall adhere to the specific requirements mentioned under Annex-B while conducting road surveys.

- **Supporting data collection and analysis:** Collect and analyze supporting data as specified in the iRAP Survey Manual. Separate surveys shall be conducted for different land use types for each road, and as needed to populate data for the iRAP analysis. The following supporting data needs to be collected during the conduct of road surveys,

  - ✓ Pedestrian and bicycle flow count for a peak hour of the day. These counts shall be conducted on the road with different land use types. The duration of each count shall be a minimum of one hour.
  - ✓ Count of motorized vehicles passing each location during the peak hour of the day. The count shall be conducted by categorizing vehicle types. The duration of each count shall be 8 hours. Where robust traffic data has been collected in the last couple of years for detailed project report is available with the client, the consultant can use the same for the purposes of iRAP analysis
  - ✓ Speed surveys shall be conducted to measure 85th percentile and mean operating speed using a radar speed gun (equipment). Separate surveys shall be conducted for different land use types.. The duration of each speed survey shall be a minimum of one hour. Speed surveys shall only be conducted during times of free-flowing traffic (LOS B or higher), without any noticeable impact of traffic congestion on vehicle speeds.
  - ✓ For details on number of locations refer table given below,

Table 1 Road length and number of sites for supporting data surveys

Road Classification	Length (Km)	Number of Sites for Speed Survey, Traffic Volume & Pedestrian Count
MDR	4,512	20
NH – NHAI	753	10
NH – PWD	752	10
NH – BRO	316	10
NH – Tourist corridors	658	10
Total	**6,991**	60

[2] http://resources.irap.org/Specifications/iRAP_Survey_Manual.pdf
[3] List of iRAP accredited inspection systems available at https://irap.org/accreditation/

In addition to the above, collate the available supporting data from other sources as specified in the *iRAP Star Ratings and Investment Plan Manual*[4] (available at: www.irap.org/specifications) and also the items listed below.

Table 2 Supporting data details

Sl.	Supporting data	Source
1	85th percentile and mean operating speeds	Field surveys on sample basis refer Table 1 plus any data available with HPPWD, HPRIDC and NHAI.
2	Traffic volume data (AADT) and % motorcycles in AADT	
3	Peak hour pedestrian and bicyclist volume	
4	Road crash data (number of deaths and serious injuries by specified iRAP road user type and crash type)	Coordinate with HPRIDC and RSAC to get this data from RADMS.
5	Local construction and maintenance costs for countermeasures (Countermeasure cost file)	Coordinate with HPRIDC and RSAC to update the existing countermeasure costs from iRAP assessments conducted in other states.
6	Economic data (required to estimate the economic cost of death and serious injury, as per the iRAP methodology; parameters to permit calculations of net present values (NPVs))	Published data by Govt. of India / Himachal Pradesh, e.g. latest Economic Survey, etc.

Refer to **Annex-C** for more details on the requirement of Supporting Data.

- **Coding:** Undertake road attribute coding using appropriate software system, ViDA, as specified in the iRAP Coding Manual[5].
- **Preparation of Upload File**: compile the road attribute coding and supporting data into an upload file as specified in the *Upload File Specification* (available at: www.irap.org/specifications).
- **iRAP Star Rating and SRIP:** Conduct analyses, process data in ViDA to generate Star Ratings and Safer Roads Investment Plan and prepare reports, as specified in the *iRAP Star Ratings and Investment Plan Manual* based on international best practices.
- **Quality Assurance:** External quality review to be performed by iRAP for the stages of Star Rating, Fatality Estimation, Investment Plan for datasets processed in ViDA, and written reports in accordance with iRAP protocols. The consultant should be prepared to correct the process to comply with the QA review recommendations. The Consultant is required to cover the cost of the Quality Review to be undertaken by iRAP. The Consultant shall contact iRAP to get estimate of this cost and include this in their financial proposal.

[4] https://resources.irap.org/Specifications/iRAP_Star_Rating_and_Investment_Plan_Manual_English.pdf
[5] http://resources.irap.org/Specifications/iRAP_Coding_Manual_Drive_on_Left.pdf

- **Learning activities**:
    - The consultant shall conduct a demonstration of the data collection activities to the site/field engineers of the PWD during the road surveys. The demonstration shall include the following but not limited to,
        - ✓ Explaining the purpose of iRAP road surveys
        - ✓ Brief information on the survey equipment and type of data collected during the surveys
        - ✓ Accompanying site engineer(s) in the survey vehicle during the conduct of survey
    - The consultant shall provide training to the officials of HPPWD and HPRIDC (in all 4 zones, 5 PWD staff per zone) to use the specific software for viewing the road survey images. For this the consultant shall submit a training plan mentioning the details of such training in the proposal

4. iRAP Accreditation and Training

To be qualified to undertake the road surveys, supporting data collection and analysis, coding, data analysis and reporting, the team members of the Consultant(s) must have a valid iRAP accreditation. Successful completion of the following iRAP training courses (available for online education and accreditation at https://www.irap.org/training/) is an added advantage.

- ✓ Introduction to iRAP
- ✓ Star Rating Essentials
- ✓ Advanced star rating and investment plan

5. Deliverables and Timeline

The deliverables for this assignment are:

1. An **Inception Report** including details on the following:
    a. Team members and roles
    b. Survey plan
    c. Health & safety plan
    d. Survey Team Details
    e. Survey Vehicle and Equipment specifications
    f. Survey Image Samples
    g. Daily Survey Records
    h. Traffic Flow & Speed Sampling
    i. Data Coding Schedule & timeline
    j. Description of Coding system/software to be used to view data & images
    k. Work plan for Star rating assessment and preparation of SRIP
    l. Quality & Compliance review plan
2. **Biweekly reports** summarising:
    a. Progress (measured in terms of Km length surveyed, coded and assessed)
    b. Health, quality and compliance review process completed
    c. Health, quality and compliance issues that have been identified and rectifications made
    d. Photos of activities
    e. Planned activities for the next two weeks, and
    f. Any issues that may affect the performance of the project.
3. An **electronic copy of the following**
    a. Geo--referenced images upon completion of the survey;
    b. Final coding for all the roads in .csv format that complies with the Upload File Specifications of iRAP and does not produce any validation errors in the Coding Verification Tool when uploaded on ViDA;
    c. Data compiled during the assessment and corresponding descriptive information for each sample location in Microsoft excel format;
    d. Traffic flow, pedestrian flow, bicyclist flow and traffic speed data (For more information on the supporting data refer to **Annex-C**); and
    e. Datasets in ViDA.
4. Electronic **copy of geo-referenced video survey images** collected during the road surveys shall be transferred to the Client with 4 licenced copies of the fully-functional desktop and online versions of the specific software to view, code, visualize, and present this data as applicable.
5. **Datasets in ViDA** processed with final upload file in ViDA with complete project setup as per *iRAP Star Ratings and Investment Plan Manual.* The dataset for Safe Corridor Demonstration

must be separate from the rest of the road network. The rest of the road network may be required to have datasets separate for each zone or road type. The Consultant shall consult with the Client during the course of the project to decide the number and type of datasets.

6. **Draft Results Report** that describes activities undertaken, the assessments, supporting data, network condition report, analysis results, and recommendations including the Star Ratings and Safer Roads Investment Plan. The QA report and its compliance details shall also be included in this report
7. **Final Results Report** including the customized and/or prioritized investment plans, addressing feedback and comments from the stakeholders.

The timeline for submission of the deliverables is given below.

Table 3 Deliverables timeline

Sl. No.	Report / Deliverable	Timeline*	% Payment
1	Mobilization and Inception Report	2 weeks	10%
2	Draft Results Report – SCDP[6] and 3 pilot districts	12 weeks	-
3	Final Results Report – SCDP and 3 pilot districts	16 weeks	15%
4	Electronic copy of supporting data	22 weeks	20%-
5	Dataset processed in ViDA	23 weeks	-
6	Draft Results Report (remaining 9 districts)	24 weeks	30%
7	Final Results Report (remaining 9 districts)	28 weeks	20%
8	Biweekly Progress Reports	Every 2 weeks	5%[7]
9	Training to key stakeholders consistent with iRAP specs, manuals, and guides.		

** Time from signing of the contract*

The Consultant's Client is the HPRIDC. RSAC appointed by HPRIDC will supervise and verify the Consultant's deliverables. The Consultant shall report to the HPRIDC and interact with RSAC at the instruction of and as directed by the HPRIDC. The HPRIDC shall have ownership and retain rights over any intellectual property generated in the course of this assignment, including the deliverables submitted by the Consultant.

[6] Safe Corridor Demonstration Project – this will be a corridor having a length of 50-80km, details of which will be informed before the commencement of the project.
[7] This will be paid after submission of all progress reports.

6. Team Composition

It is expected that the Consultant would establish a strong core team of specialists, which should include local personnel based in India. Required team composition with primary skills and experience are presented in Table 4 which reflects the client's knowledge of the local situation and desired outcomes. The Consultant may propose more than one expert for the position mentioned under Sl. 2 and 3 to deliver the tasks within the specified timeline (as given in Table 3).

The Consultant should deploy a team of coders so that the iRAP coding can be accomplished for the project roads within the specified timeline. The Consultant shall also complement the skills of the core team with sub-professionals or support staff with road safety and traffic data collection and analysis experience in India and/or internationally.

In their proposal, the Consultant shall name the individuals against each key-professional and provide full curricula vitae and provide an assurance that all members of the proposed team will be made available for the duration of the engagement and as specified in the proposal, if the Consultant is selected.

The minimum staff-months for the key-professionals shall be 12 staff-months, and for the team of coders should be 36 staff-months.

The Consultant team will be required to provide its own computers, printers, office supplies, vehicles, offices, etc. The Consultant will also have to take appropriate security arrangements, describe those in his technical proposal, and price those arrangements in the financial proposal.

Table 4 Key professionals' requirement

No..	Key professional	Responsibility	Numbers	Qualification/Experience
1	Road Safety Specialist (Team Leader)	iRAP data analysis, producing Star Rating and SRIP, technical and administrative management, coordination with Client	1	• Must have iRAP Accreditation for Analysis and Reporting. • He/she should be a Graduate Engineer/Planner and with prior experience in implementing an iRAP project in a developing country. He/she should have at least 10 years of professional experience working in road safety, road inspection, and data analysis.
2	iRAP Survey Specialist (Assistant Team Leader)	Conduct the field data collection work	1	• Must have iRAP Accreditation for Road Survey. • He/she should be a Diploma or Graduate Engineer/Planner with minimum of 5 years of experience. He/she should have conducted iRAP surveys in at least one iRAP assessment in LMICs.
3	Data Coding Specialist	Supervise the data coding work	1	• Must have iRAP Accreditation for Coding. • He/she should be a Diploma or Graduate Engineer/Planner with minimum of 5

				years of experience. He/she should have experience in supervising iRAP Coding in at least one project in LMICs.
	Sub-professionals	**Responsibility**	**Numbers**	**Qualification/Experience**
	Data Collectors	Conduct iRAP surveys and collect data	[8]As in footnote	• Support the iRAP Survey Specialist and Road Safety Specialist (team leader) to collect data • Prior experience of iRAP survey and collection of speed and flow data • He/she should be a Diploma or Graduate Engineer/Planner and could conduct iRAP surveys under the guidance of the iRAP Survey Specialist and Road Safety Specialist.
4	Team of Coders	Perform data coding work	[9]As in foot note	• Demonstrable prior experience of iRAP coding. • Should have iRAP Accreditation for Coding[10]

7. Confidentiality Statement

All data and information received from the HPRIDC for the purpose of this assignment are to be treated confidentially and are only to be used in connection with the execution of these Terms of Reference (ToR). All intellectual property rights arising from the execution of these ToRs are assigned to the HPRIDC. The contents of written materials obtained and used in this assignment may not be disclosed to any third parties without the expressed advance written authorization of the HPRIDC.

8. Ownership of Data and Materials

Any deliverables under this assignment in any form, including data collection and any communications material developed under this assignment, will be the property of the HPRIDC. All project deliverables, including reports and other creative work called for by these ToR, in written, graphic, audio, visual, electronic, or other forms shall acknowledge the support of the HPRIDC. HPRIDC can use the accumulated experience of this study to support other studies and projects in any other country in the world.

[8] Consultant to decide and deploy team required to complete the iRAP surveys and supporting data collection within the timeline as mentioned in the Scope of Work

[9] Consultant to decide and deploy team required to complete coding of the road network within the timeline as mentioned in the Scope of Work

[10] Those who do not have iRAP Coding accreditation should get accreditation within 2 months from commencement of the project

Annex-A: List of roads for iRAP safety assessment

Major District Roads				
No.	**Name of Road**	**District**	**Length, km**	**MDR No.**
1	Nahan Dadahul Haripurdhar	Sirmour	87	1
2	Solan Meenus (except State Highway-6 portion)	Sirmour/Solan	98	2
3	Banethi Rajgarh Chandol	Sirmour	127	3
4	Markanda bridge Suketi park Kala AmbTrilokpur	Sirmour	21.5	4
5	Kolar Bilaspur	Sirmour	13	5
6	Parwanoo Kasauli Dharampur Sabhathu Solan	Solan	65.32	6
7	Barotiwala Baddi Sai Ramshar	Solan	44.95	7
8	Kufri Chail Kandaghat	Solan/Shimla	57	8
9	Solan Barog Kumarhatti	Solan	13	9
10	Dharampur Kasauli	Solan	10.5	10
11	Arki DhundanB hararighat	Solan	18.7	11
12	Nalagarh Dhabota Bharatgarh	Solan	9.4	12
13	Shogi Mehli Junga Sadhupul	Shimla	49.4	13
14	Mashobra Bhekhalti	Shimla	18	14
15	Narkanda Thanadbar Kotgarh Bithal	Shimla	44	15
16	Rampur Mashnoo Sarahan Jeori	Shimla	62	19
17	Bakrot Karsog (Sanarli) Sainj	Mandi	41.8	21
18	Salapper Tattapani Suni Luhri	Mandi/Shimla	120.8	22
19	Mandi Kataula Bajaura	Mandi	51	23
20	Mandi Gagal Chail chowk Janjehli	Mandi	45.8	24
21	Chail chowk Gohar Pandoh	Mandi	29.6	25
22	Mandi Rewalsar Kalkhar	Mandi	28	26
23	Nore Wazir Bowli	Kullu	37	28
24	Bhuntar (Sainik Chowk)-MohalKullu (Ramshila)-Nagar-Manali Road	Kullu	52.345	29
25	Jia Manikarn	Kullu	33.5	30
26	Swarghat Nainadevi Bhakhra	Bilaspur/Una	55.7	31
27	Naina Devi Kaula Da Toba	Bilaspur	12.2	32
28	Bamta Kandrour	Bilaspur	6.7	33
29	Nagaon Beri	Bilaspur/Solan	37	34
30	Hamirpur Bhoranj Jahu	Hamirpur	30	35
31	Nadaun Sujanpur	Hamirpur	21	36
32	Barsar Deothsidh	Hamirpur	11.3	37
33	Sujanpur Sandhol Marhi	Hamirpur/Mandi	45	38
34	Nangal Santokhgarh Tahliwal Polian Jaijon (HP Boundary)	Una	17.5	39
35	Una Hoshiarpur Bankhandi Hoshairpur	Una	15	40
36	Tahliwal Garhshankar (H.P Boundary)	Una	8	41
37	Bharwain Chintpurni Kandrori Damtal	Una /Kangra	95.56	42
38	Baijnath Ladbharo lKandapattan	Kangra/Mandi	33	43
39	Rait Charhi Dharamshala	Kangra	20	45
40	Kaloha Pragpur Dhaliara Dadasiba Sansarpur	Kangra	60.92	46
41	Kandwal Damtal	Kangra	16.5	47
42	Dadh Malan	Kangra	4	48

Major District Roads				
No.	**Name of Road**	**District**	**Length, km**	**MDR No.**
43	Banikhet Dalhousie Khajiar	Chamba	29	49
44	Baroti-Rakhera-Dharampur-Marhi-Kamlah- Gallu Road	Mandi	33	53
45	Gumma-Baghi-Narkanda Road	Shimla	43.545	54
46	Parour-Lahla-Darati-Gopaipur-Ballah-Rakh- Ghamroat-Jayun-Sukeri-Kandi-Bundla- Palampur road.	Kangra	33.375	55
47	Baijnath-Jatehar-Goiwan-Draman-Anju- Chowki-Sainthal-Dohag-Joginder Nagar.	Kangra	85	56
48	Sandhapattan-Bharol-BagoraBagla-Hard- Ropri-Kalang -Traimbli-Basahi-Drubbal- Charonj -Banwar-Kun ka Tar-Mandonkhar- Bhargaon-Kotli road.	Kangra	85	57
49	AvahDevi Tihra Gandhidhar Sandhol Road	Mandi/Hamirpur	39	58
50	BaghiKhadralaSungriRohru Road	Shimla	54	59
51	KotkhaiKhanetyDeorighatTikkar road	Shimla	31	60
52	OddiKhanetiKotgarh Road	Shimla	21	61
53	Una Rampur HaroliPalkwahPolianJaijon (Punjab Border)	Una	23	62
54	Jalari to Deotsidh via Kangoo- Galore- SalauniBijhri	Hamirpur	51	63
55	Rohru- Chirgaon- DodraKwar	Shimla	93	64
56	Una- SantoshgarhMehatpr via Nangran-ChatterpurDhada Road	Una	21	65
57	TutiKandi Bifurcation to Sanjauli Dhalli Bye pass Junction via Chotta Shimla and Sanjuli Chowk	Shimla	11.195	66
58	Victory tunnel to Sanjauli dhalli bye pass lakkar bazaar junction and dhalli	Shimla	8.61	67
59	Seghali-Baggi-Prashar-Jawalpur-Pansarsaroad	Mandi	62.305	68
60	Rohru bye pass road from Mehndli to Samoli	Shimla	5.705	69
61	Chamba Khajjiar Road	Chamba	19	70
62	Chamba Sahoo Road	Chamba	21	71
63	Harnota-Banoli-Chachian-Mastgarh-Jountaroad	Kangra	21.5	72
64	Chhaila Neripul Yashwant Nagar Oachghat Kumarhatti	Shimla/ Sirmour/ Solan	86.3	73
65	SainjChopalNerwaShallu	Shimla	90	74
66	ShalaghatArkiKunjharBrotiwala	Solan	80.4	75
67	ShamlaTatapani Mandi	Shimla/ Mandi	185.6	76
68	Shimla Kunihar Ramshehar Nalagarh Ghanoli	Shimla/Solan	112.3	77
69	Dharamshala Dadh Palampur Holta Chadhiar Sandhol (Except NH portion)	Kangra/Mandi	90	78
70	Jogindarnagar Sarkaghat Ghumarwin (except NH portion)	Mandi/Bilaspur	83	79
71	Jawalamukhi Dehra Jawali Raja-ka-Talab	Kangra	79.6	80
72	Mehatpur Una Mubarikpur Daulatpur H.P. Boundary (except NH portion)	Una	67	81
73	Pong Dam Fatehpur Jassur	Kangra	53	82
74	Nurpur Lahru Tunuhatti	Kangra/Chamba	42.2	83
75	Una-Aghar Barsar Jahu Bhambla Nerchowk	Una/ Hamirpur/ Mandi	126.3	84

Major District Roads				
No.	**Name of Road**	**District**	**Length, km**	**MDR No.**
76	Chamba-Tissa	Chamba	62	85
77	Hamirpur Sujanpur Thural Maranda	Hamirpur/Kangra	59	86
78	Shahpur- SihuntaChowari	Chamba	52	87
79	Ranital to 32 mile (Kotla) 0/0 to 39.600	Kangra	39.6	88
80	Bathri-Sundle-Langera J&K Boundry Road	Chamba	96.94	89
81	Pandoh Kandah Road	Mandi	24	90
82	Lambatach Shilibagi Kalhani Kashaud Pandil Bakhali Pandoh Road	Mandi	68	91
83	Kotla Amroh Road	Kangra	5	92
84	BarohJandrah Tikka Talli Dolla Kardiana Lagru Seorballa Khundian Road	Kangra	49.4	93
85	Paonta Puruwala Singhpura Bhagani Gojjar DakPathar Road	Sirmour	26.5	94
86	Panol Jhandutta Namd Nagraon Road	Bilaspur	19	95
87	Thalout -panjain-Thachi- Naraingallu- Shetadhar-Chet-Chiuni-km 0/0 to 75/0 Lambathach road	Mandi	75	96
88	Pallingi to Nichar via Gramang	Kinnaur	21.2	97
89	Gagret-Loharli-Chururu Road	Una	13.69	98
90	Karchham-Sangla-Chitkul	Kinnaur	62.7	99
91	Prour-Kharoth-GaggalKhas-Dheera-Tapa- Thaliyal-Purba road	Kangra	17	100
92	Alampur-Dehru-Shakoh-Talwar-Kaluhi- Lambagaon-Jaisinghpur-Dalu-Khalta- Harsipattan road	Kangra	26.24	101
93	AaraChowk to Jaurbar road	Kangra	10	102
94	Rakkar-Chaplah-Upper Bharoli-Tikkar- Shantla Road	Kangra	15.6	103
95	Sujanpur to Kot Via ChouriPatlanderChaminana	Hamirpur	23.7	104
96	Tauni Devi to bJangleberi via UhalKakkar and Bajrol	Hamirpur	30.915	105
97	Uhal to BirBagehra Via PahunjJandroo	Hmirpur	27	106
98	Panjain Bali ChowkiThattaTikkiShettadharGhatTapnaliGadagushaini	Mandi	70	107
99	Patsari-Nakrari-Jharag-Brall-Sheelghat road	Shimla	19.21	108
100	Kharapather-Sheelghat-Sharontha-Tikkar road	Shimla	33.56	109
101	PuccaTiala -JammanGhatta-Bhiri	Kangra	9.575	110
	Total		**4,512**	

National Highways							
No.	**NH No. (Old)**	**NH No. (New)**	**Name of NH**	**Length with State PWD (km)**	**Length entrusted to NHAI (km)**	**Length with BRO (km)**	**Total Length (km)**
1	22	5	Haryana Border-Solan, Shimla, Theog, Narkanda, Rampur, Chini and proceeding to the Border	212.3	109.626	93.61	415.536

National Highways							
No.	**NH No. (Old)**	**NH No. (New)**	**Name of NH**	**Length with State PWD (km)**	**Length entrusted to NHAI (km)**	**Length with BRO (km)**	**Total Length (km)**
			between India and Tibet near Shipkila				
2	72	7	Haryana Border-Paunta- Sahib-Uttarakhand Border	57			57
3	88	103	Junction with NH-3 near Hamirpur and connecting terminating near Ghaghas on NH 154		76.7		76.7
4	21A	105	Junction with NH-5 near Pinjore in Haryana connecting Baddi, terminating at its junction with NH-205 near Swarghat	31.275	17.6		48.875
5	20+21	154	The Highway starting from its Junction with NH-154 near Pathankotin Punjab connecting Junction with NH-205 near NauniinH.P.		267.8		267.8
6	21+88	205	Punjab Border- Swarghat, Nauni, Darlaghat- junction with NH-5nearShimla	7	114		121
7	20A+88	303	Highway starting from Nagrota at Junction on NH-154 connecting Ranital- Jawalamukhi and terminating atNadaun on NH-3	39	31.4		70.4
8	72B	707	The Highway starting from its Junction with NH-7 near Poanta Sahib connecting Rajban-Shillai-Minus in H.P. and passing through Minus-TiuniinUttrakhand and terminating at Hatkoti in H.P.	118.835	0		118.835
9	73A	907	Junction with NH-7 near Paonta Sahib- Haryana Border	7.42	-		7.42
10		305	The Highway starting from SainjonNH-5 connecting Luhri -Ani-Jalori-Banjar and terminating at Aut on NH-3 in the State of H.P	97	-		97
11	70+21	3	Naduan- Hamirpur- Toni Devi-Awa Devi- Mandi- Kullu- Manali-Gramphoo-Kyelong	182	136	222.39	540.39
			Total	**752**	**753**	**316**	**1,821**

Main Tourist Corridors				
No	**Name of Road**	**Category**	**Section**	**Length**
1	Chandigarh- Mandi -Manali Road (Portion Garemora to Manali)(HP boundary starts from Garemora)	NH	Garemore to Manali 82/00 to 310/00	228
2	Parwanoo- Shimla Road	NH	Parwanoo to Shimla Km. RD 62/200 to 145/00 =82.800Km (upto Crossing) Shimla to Dhalli Tunnel Bye Pass 0/00 to 24/00 =24.00, Dhalli to Kufari Km RD 153/00 to 161/400=8.400Km. Narkanda at Km RD 208/300= 46.900Km. Rampur at Km RD 275/00 =66.700Km. Total Km. 228.800	228
3	Pathankot- Chamba- Dalhousie Road (Portion in HP only)	NH	KatoriBanglow(39/0) to Banikhet(74/0) is NH Banikhet (74/0) to Dalhousie(80/0) is MDR	41
4	Chandigarh- Dharamshala Road (Portion Mehatpur to Dharamshala Road)	NH	Mehatpur –una -Bharwain Dharmshala- 135 km	135
5	Swarghat Naina Devi Bhakhra Road (Portion kenchimore Naina Devi Bhakhra Road)	MDR/NH		26
	Total			**658**

Annex-B Road Survey Specifications

The road survey shall be carried out in accordance with the following requirements.

Survey Vehicle Specifications

1. The survey vehicle must be in a safe, well-maintained condition. Vehicle safety details should be highlighted in the Supplier's health and safety plan (e.g. seat-belts for all passengers, air-bags and safe mounting of equipment).
2. The survey vehicle shall meet all licence and registration requirements (e.g. width, height, signage) for operation in the survey country.
3. The survey vehicle must be clean and presentable (suitable for media, steering committee, stakeholder and promotional activities).
4. The Supplier should be prepared, at the request of the Client, to arrange for high quality logos of the stakeholder organisations to be placed on the survey vehicle for the duration of the road survey.
5. The road survey vehicle must have sufficient space for the necessary survey team plus provision for additional stakeholder personnel and their luggage who may participate in parts of the road survey. These additional personnel may assist in navigation and local awareness-raising among project stakeholders throughout the duration of the project.
6. The vehicle shall be available for viewing and inspection during a commencement mission and official project launch. Details of such events shall be negotiated with the Client.

Survey Staff Specifications

1. The road survey team should include:
    - Professional driver or suitably trained person to operate the survey vehicle.
    - Road survey specialist with appropriate technical qualifications and has successfully completed a similar project within the past 3 years.
2. The survey team should include a person who is designated to represent the project and present basic information at stakeholder briefings throughout the survey period. This could be the Road Survey Specialist, the Team Leader or another person. The ability to speak the local language would be of great benefit.
3. The road survey team shall conduct demonstrations of the survey vehicle during stakeholder briefings.
4. All road survey team personnel shall have necessary travel documentation and approvals.
5. The road survey team shall be suitably attired to participate in stakeholder briefings and demonstrations as required.
6. Road survey team members shall be responsible for, and act in accordance with, the Supplier's health and safety plan and ensure all safety and security issues are adequately addressed.
7. Additional stakeholder personnel may participate in the road survey at any time. This may include a local navigator from the local road agency to ensure all road referencing details align to authority practices. Other stakeholder(s) may participate in the road survey from a training and awareness raising perspective. The relevant authority will meet all costs associated with these people travelling with the survey team.

Annex-C: Supporting Data Requirement

To ensure the iRAP Star Rating and Investment Plan project outcomes reflect local conditions, practice and experience, a range of supporting data is required in addition to the road survey and coding data. The Consultant is expected to conduct field surveys to collect the supporting data on sample sites mentioned in Table 1 of Scope of Work. In addition to these sample sites, if any reliable data is available from road authorities such as from detailed project reports from recent studies and from toll plazas, the Consultant should secure and use this data for analysis.

This supporting data should include, but is not limited to, the following:

- vehicle speed data,
- vehicle and motorcycle vehicle volume,
- pedestrian and bicyclist volume,
- crash data (number of deaths and serious injuries by road user type and crash type),
- local construction and maintenance costs for countermeasures,
- data required to estimate the economic cost of a death and serious injury, as per the iRAP methodology.

The template for this data is provided in RAP-SR-3.2 Supporting data template[11].

1.1. Supporting Data - Speed Data Requirements

Vehicle speed influences both the likelihood of a crash occurring and its severity. Speed is therefore a critical aspect of managing a safe road system, and influences iRAP's Star Ratings and Safer Roads Investment Plans.

For the purpose of Star Ratings, the maximum of 85th percentile and the speed limit is utilised. The 85th percentile speed is therefore critical for the Star Rating and also consistency from one iRAP assessment to another. As 85th percentile speed is highly variable the purpose of the speed data collection is to generate appropriate adjustment factors to adopt across the network when considering 85th percentile speeds.

For the purpose of fatality estimations, mean speeds is utilised. This reflects that in many highly congested roads the traffic volume may be high but associated Fatal and Serious Injury outcomes are significantly affected as the speeds travelled are very slow during the high-volume peak periods.

The outcome is to deliver the following for use across the network being assessed. Refer to RAP-SR-3.2 Supporting data template[11] for full template. The template form should be used once for 85th percentile speed and once for mean speed adjustments for use across the network. Many fields may be blank if those speed limits or land-use categories are not applicable. Miles per hour categories are provided below km/h.

The Consultant shall make necessary estimates based on the sample field data collected as specified in the *iRAP Star Ratings and Investment Plan Manual* (available at: www.irap.org/specifications).

1.2. Supporting Data – Vehicle Volume Requirements

The total volume of all motorised vehicular traffic within a 24hr period is required for each 100metre record. The data is required in Annual Average Daily Traffic (AADT) in vehicles format and should not be adjusted to passenger car equivalent (PCU) volumes. AADT is the total volume of vehicular

[11] RAP_SR_3.2: http://resources.irap.org/Specifications/RAP-SR-3-2_Supporting_Data_Template.xlsm

traffic of a road for a year divided by 365 days. The vehicle volume data requirements are as follows:

1. Vehicle volume data shall distinguish between motorcycle and vehicle traffic and as a minimum include a percentage estimate of heavy vehicles (>2 axles).
2. The Consultant shall collate recent detailed traffic volume data from the relevant road authority, or other reliable source, for each of the road corridors within the project network.
3. The Consultant shall provide traffic volume data representative for the road network as a minimum requirement. The traffic counts shall be conducted on sample basis to collect this data for the number of sites as specified in the Scope of Works for each road type.
4. If recent existing traffic volume data is not available to the required level of detail, the Consultant may apply an appropriate growth factor to existing historical data in order to estimate current volumes or agree with local road authority traffic engineers the volumes to be applied along the relevant sections of the network. This may be based on local experience and knowledge and can be supplemented by the video data collected as part of the survey component of the project.

1.3. Supporting Data – Pedestrian & Bicycle count Requirements

Vulnerable road users account for a significant proportion of global road deaths and many of the world's road network do not adequately and safely cater for pedestrian and bicycle movements. Detailed pedestrian and bicycle count data is rare in most road agencies and in many cases the iRAP project may represent the first occasion where estimates of pedestrian flows are undertaken at a network wide level.

The pedestrian and bicycle flow data does not directly impact the Star Rating of the road for pedestrians or cyclists, with the Star Rating representing the safety of the location for an individual pedestrian or cyclist. The pedestrian or bicycle flow may however have a significant impact on the Star Rating policy target for a location. The flow data will directly impact the final allocation of fatalities across the network and the subsequent estimate of benefits associated with upgrading pedestrian and bicyclist provision at a location.

The iRAP coding process undertaken as part of the road survey includes an assessment of where pedestrians and cyclists are observed. As this video-based assessment represents only a single point in time the data should only be viewed as one of many inputs to the final decision on pedestrian and cyclist peak-hour flow.

For the purpose of iRAP assessments an estimate of the pedestrian and bicycle peak hour flows must be determined for every 100m segment along the road network. With the data grouped into relatively large categories frequent changes of the peak hour flow data range are not generally expected except where there is a significant change in pedestrian demand. For example, a commercial shopping centre may have the same peak hour flows (26-50) for the full length, with a spike in crossing flows adjacent to a major public transport station.

Local specifications should be referred to if available or alternatively refer to PBIC Data Collection Case Study or the Highway Capacity Manual or similar peak document for guidance on assessment methodology.

The Consultant shall make necessary estimates using the flow data measured in the sample surveys, as specified in the *iRAP Star Ratings and Investment Plan Manual* (available at: www.irap.org/specifications).

1.4. Supporting Data – Crash Data Requirements

The iRAP Star Rating and Investment Plan protocol is designed to work within the known limitations of crash data availability. For countries with limited or no crash data the experience from other iRAP countries and/or global data sources can provide an indication of likely death rates. Where more detailed crash data is available that should be collected and analysed to determine appropriate deaths across the network being assessed.

1.4.1. Collection of Existing Fatality Data

The Consultant, in coordination with HPRIDC shall contact the relevant authorities and collate the available crash data from RADMS. Ideally the data sourced should permit the completion of the fatality data template provided as part of RAP-SR-3.2 Supporting data template

The key data fields required across the surveyed road network are:

- Crash outcome (fatality, serious injury – crash severity definitions used should be documented)
- Crash user types (vehicle, motorcyclist, bicyclist, pedestrian)
- Crash type (head-on, run-off road, intersection, rear/end side/swipe, hit cyclist, hit pedestrian)
- Crash type detailed (overtaking, loss of control, crossing road etc.)
- Sample Period (3 years data or 5 years data)

1.4.2. Estimation of Fatality Data

Where the quality of available crash is insufficient then the Consultant shall engage with suitable experts in country to develop reasonable and well-documented assumptions to enable the completion of the "**Fatality Data Summary**" sheet provided in RAP-SR-3.2 Supporting data template[12].

Sources of information include but are not limited to:

- The available crash data with adjustments made as required
- Consultations with Police, road safety professionals and health professionals
- The latest version of the "Global Status Report on Road Safety" published by the World Health Organization.
- Data on average fatal and/or serious injury crash rates from within the country or similar countries

1.5. Supporting Data – Countermeasure Cost Requirements

The Consultant shall collect the countermeasure cost data file utilized in the most recent iRAP assessment conducted in India and update the costs in consultation with HPRIDC and relevant road authorities. Details on the cost and treatment life of various countermeasures are recorded within the Countermeasure Costs worksheet within RAP-SR-3.2 Supporting data template[13]. This data must meet the following criteria for upload to ViDA:

- Format: CSV file
- Costs in local currency
- Columns:

[12] RAP_SR_3.2: http://resources.irap.org/Specifications/RAP-SR-3-2_Supporting_Data_Template.xlsm
[13] Ibid

1. Countermeasure ID (a unique code assigned to the countermeasure type)
2. Countermeasure name (a unique name assigned to the countermeasure type)
3. Carriageway code (reflects whether the treatment is specific to an undivided road only, an individual carriageway can be treated in isolation, or the treatment is generally applied to and impacts both / multi carriageways)
4. Unit of cost (the basis for determining costs for each countermeasure. This allows the costs to reflect the actual site conditions e.g. lane widening will apply to each lane and is costed per lane km)
5. Service life (the length of time that the countermeasure will last before requiring replacement or full refurbishment)
6. Rural low upgrade cost– the cost for treatments at rural locations where the upgrade cost field as defined in iRAP Coding Manual14 has been recorded as low.
7. Rural medium upgrade cost – the cost for treatments at rural locations where the upgrade cost field as defined in iRAP Coding Manual has been recorded as medium.
8. Rural high upgrade cost – the cost for treatments at rural locations where the upgrade cost field as defined in iRAP Coding Manual has been recorded as high.
9. Urban low upgrade cost – the cost for treatments at urban locations where the upgrade cost field as defined in iRAP Coding Manual has been recorded as low.
10. Urban medium upgrade cost – the cost for treatments at urban locations where the upgrade cost field as defined in iRAP Coding Manual has been recorded as medium.
11. Urban high upgrade cost – the cost for treatments at urban locations where the upgrade cost field as defined in iRAP Coding Manual has been recorded as high.
12. Divided carriageway cost multiplier – A cost multiplier that defaults to 1, but allows for a cost multiplier to be applied to site-specific "Multi-carriageway" treatments like intersections and pedestrian crossings that have triggered on divided roads and where the fact the road is divided will significantly increase the costs as compared to a treatment on an undivided road.
13. Hide – Where the treatment is triggered but the results are hidden as the effects are uncertain or do not warrant reporting until further investigation (e.g. speed management)
14. Ignore – The treatment is deemed inappropriate in a certain jurisdiction or project and it is removed from the analysis completely such that it will not trigger or be considered for implementation anywhere across the network.

1.6. Supporting Data – Economics Data Requirements

The Consultant shall collect the following data to enable the economic analysis. Ideally the data sourced should permit the completion of the "**Demographics and Economics**" template provided as part of RAP-SR-3.2 Supporting data template. A summary of the data to be collected includes:

1. Side of the road driven on: is either left or right to reflect the side of the road that vehicles drive on For example: left in India.
2. Analysis Period: The number of years over which the economic benefits of the Safer Roads Investment Plan is calculated (note this is not the treatment life of individual treatments –

[14] http://resources.irap.org/Specifications/iRAP_Coding_Manual_Drive_on_Right.pdf

refer Countermeasure Costs). The default analysis period is 20 years although the number can be updated to reflect local client requirements as needed.

3. Gross Domestic Product (GDP) per capita, current prices, in national currency for year of survey. Refer to IMF World Economic Outlook Databases[15] or data published by Government of India or Govt. of Himachal Pradesh. This figure is used to estimate the economic value of life in the event that there is not an official value of life used in the country.
4. Discount rate (%): is used to estimate net present values. The discount rate is typically set to 12% however this can be adjusted depending on the usual practice in the country.
5. Minimum attractive rate of return: is the minimum rate of return that the government or road owner is willing to accept before investing in the various road engineering countermeasures. The default is provided as the discount rate divided by 100.
6. Internal Rate of Return: The internal rate of return (IRR) is a measure of the profitability of investments. The minimum Internal Rate of Return threshold may be used in iRAP assessments to determine whether a countermeasure is included in the Safer Roads Investment Plan.
7. Value of life multiplier: The iRAP research paper *The True Cost of Road Crashes*[16] provides an estimate of the value of life in a country based on a multiplier of GDP per capita recorded above. This provides the basis of all economic assessments and is recommended as 70x (for low and middle-income countries) where an official figure for value of life is not available.
8. Value of life: The figure should reflect the official national or jurisdiction value of life if available. If not available, the default value of GDP per capita x Value of Life multiplier can be used.
9. Value of serious injury multiplier: The iRAP research paper *The True Cost of Road Crashes* provides an estimate of the value of serious injury in a country based on a multiplier of the value of life recorded above. This provides the basis of all economic assessments and is recommended as 0.25 x Value of Life where an official figure for value of life is not available.
10. Value of serious injury: The figure should reflect the official national or jurisdiction value of serious injury if available. If not available, the default value of 0.25 x Value of Life multiplier can be used.
11. Serious injury to fatalities ratio: is the number of serious injuries to each fatal. The default value is 10. This may be changed based on supporting evidence.

The Safe Road System comment fields are optional and are provided to allow a discussion and appreciation of the key factors influencing all aspects of the safe road system. Comments on Data Systems and Crash and Traffic Records, Speed Limit and Behaviour, Alcohol and Drug Driving, Helmet Wearing, Seat Belt Wearing, Vehicle Fleet Standards and Post-crash Care and Trauma Response can be documented. This may help understand and explain the varying crash performance experienced on road networks or sections of similar Star Ratings from one country to another.

[15] http://www.imf.org/external/data.htm

[16] McMahon and Dahdah (2008) *The True of Cost of The True Cost of Road Crashes: Valuing Life and the Cost of a Serious Injury*