Expanding Asset Register and data use for basic network level Multi-Year Planning

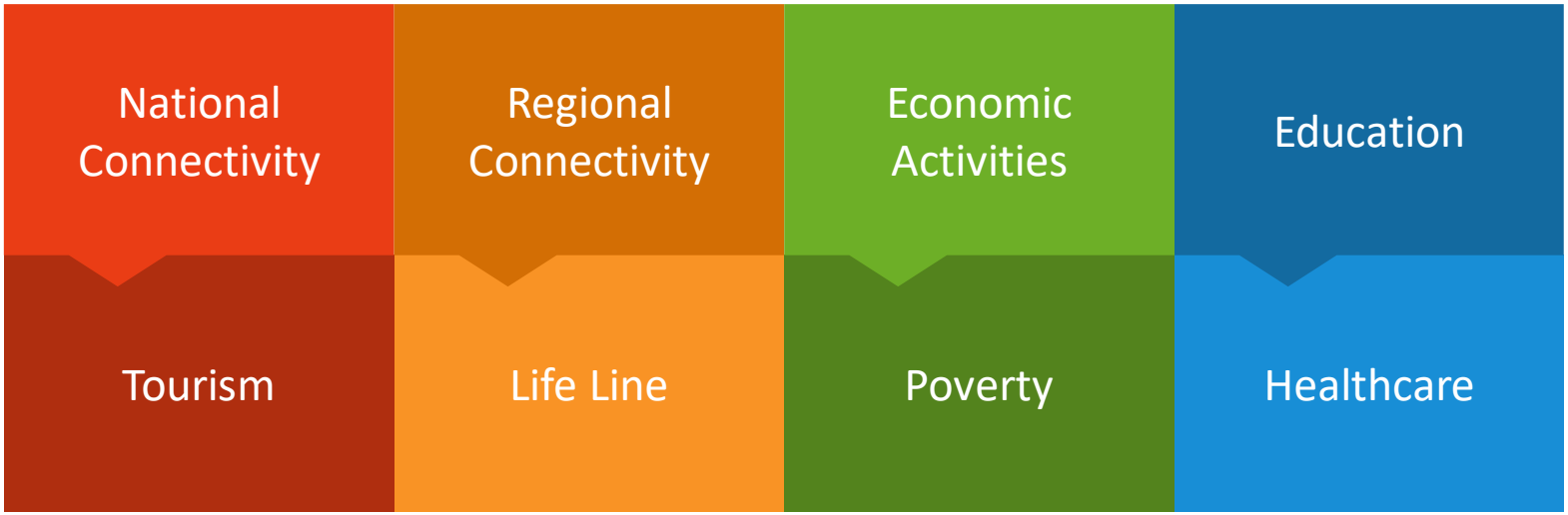
Initial Note:

Most of the Road Agencies in CAREC countries:

- Have basic Condition and Traffic Data
- Use GIS, (ESRI ArcMap or QGIS)
- Have HDM4 License
- Have tools for basic road data processing

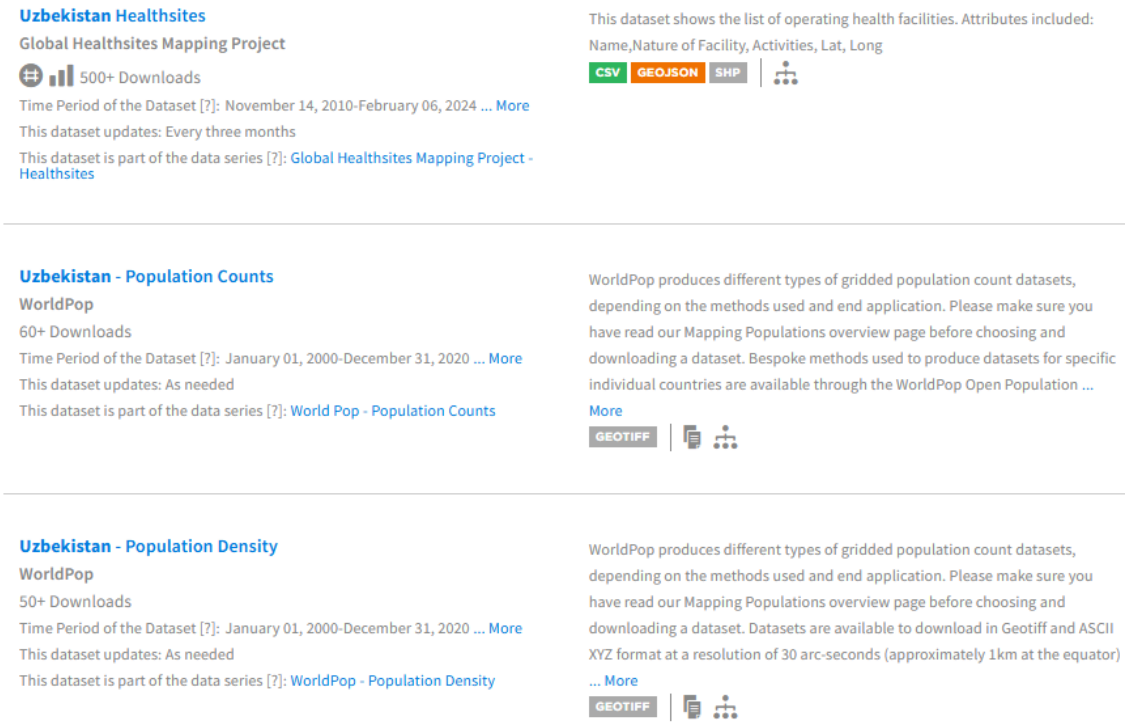
Objective of the session is an overview of basic multi-year planning process and the potential of incorporating socioeconomic data into planning and prioritization

Integration and consideration of additional factors is critical for sound prioritization.



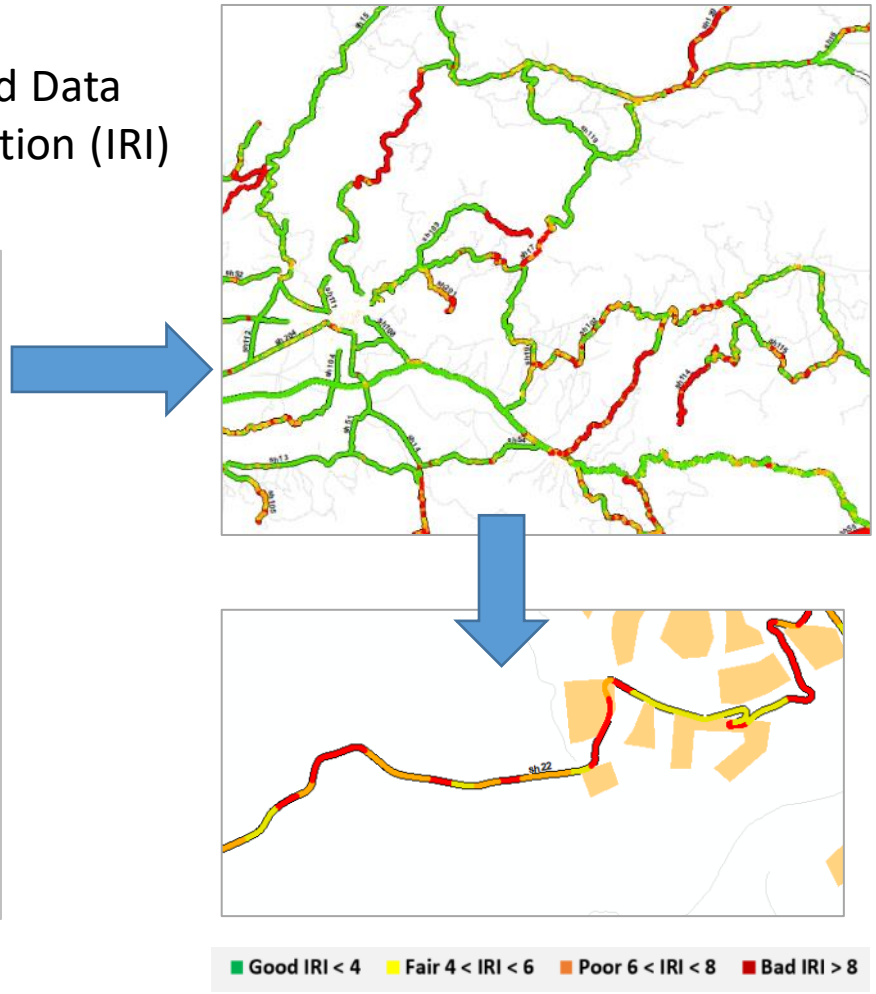
- Network level planning requires consideration of different data types, these include population density, access to healthcare, education, tourism, poverty, etc.
- Not all data type required for planning has to be collected and maintained by road agency
- Ideally, if available, data should be obtained from national government organizations
- Public sources can be a good alternative, such us OSM
- Humdata.org provides good compilation of GIS data that can be easily integrated into RAMS operations

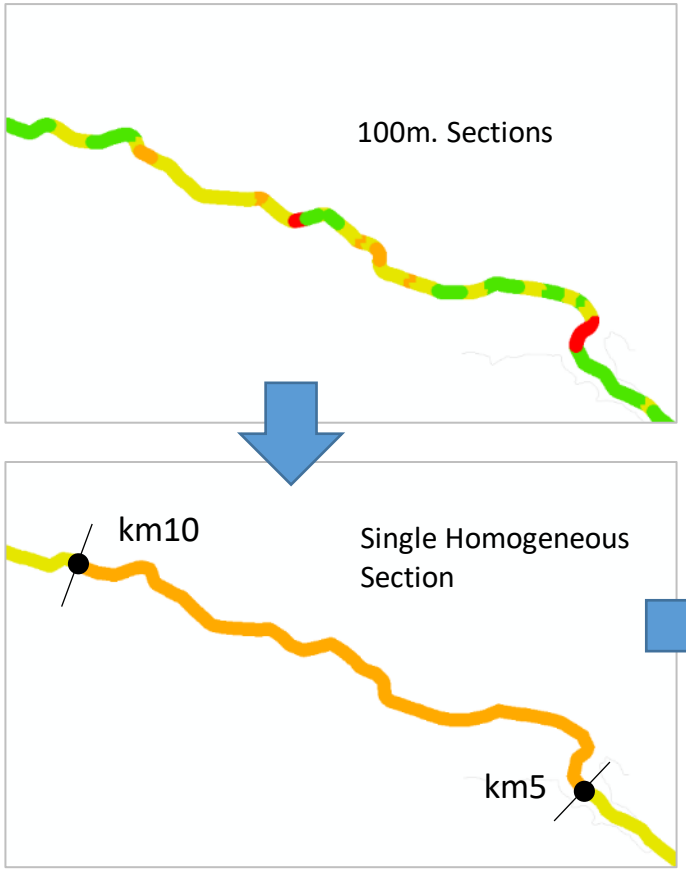
https://data.humdata.org/



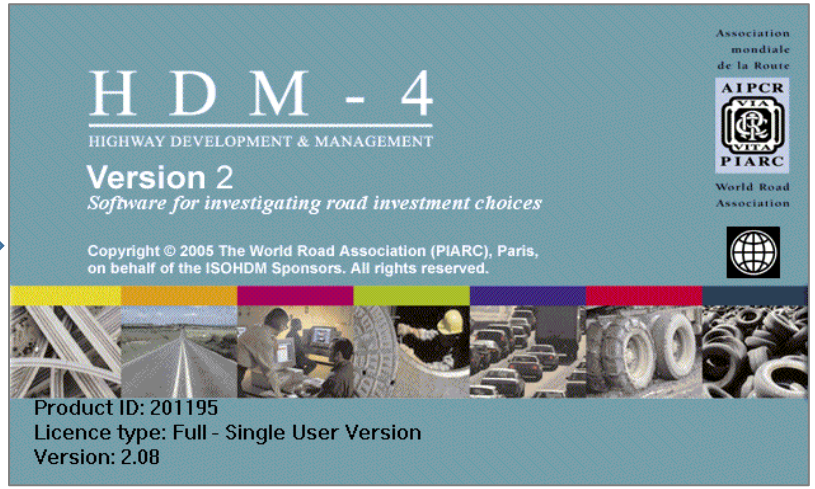
What is commonly available within agency is road Data Table, commonly with 100m intervals with Condition (IRI) and Traffic

ID	RoadID	RoadName	SectionFrom	SectionTo	SurfaceType	SectionWidth	AADT	SNP	IRI	Rutting	SR	In
1	sh01	Batumi-Akhaltsikhe	0	0.1	0	7	13414	2.2	7.55	5.89	24.8	
2	sh01	Batumi-Akhaltsikhe	0.1	0.2	0	7	13414	2.2	6.46	5.89	24.8	
3	sh01	Batumi-Akhaltsikhe	0.2	0.3	0	7	13414	2.2	4.03	5.89	24.8	
4	sh01	Batumi-Akhaltsikhe	0.3	0.4	0	7	13414	2.2	3.71	5.89	24.8	
5	sh01	Batumi-Akhaltsikhe	0.4	0.5	0	7	13414	2.2	4.04	5.89	24.8	
6	sh01	Batumi-Akhaltsikhe	0.5	0.6	0	7	13414	2.2	5.1	5.89	24.8	
7	sh01	Batumi-Akhaltsikhe	0.6	0.7	0	7	13414	2.2	4.84	5.89	24.8	
8	sh01	Batumi-Akhaltsikhe	0.7	0.8	0	7	13414	2.2	7.82	5.89	24.8	
9	sh01	Batumi-Akhaltsikhe	0.8	0.9	0	7	13414	2.2	3.4	5.89	24.8	
10	sh01	Batumi-Akhaltsikhe	0.9	1	0	7	13414	2.2	4.74	5.89	24.8	
11	sh01	Batumi-Akhaltsikhe	1	1.1	0	7	13414	2.2	4.31	5.89	24.8	
12	sh01	Batumi-Akhaltsikhe	1.1	1.2	0	7	13414	2.2	4.9	5.89	24.8	
13	sh01	Batumi-Akhaltsikhe	1.2	1.3	0	7	13414	2.2	3.79	5.89	24.8	
14	sh01	Batumi-Akhaltsikhe	1.3	1.4	0	7	13414	2.2	6.39	5.89	24.8	
15	sh01	Batumi-Akhaltsikhe	1.4	1.5	0	7	13414	2.2	4.48	5.89	24.8	
16	sh01	Batumi-Akhaltsikhe	1.5	1.6	0	7	13414	2.2	4.68	5.89	24.8	
17	sh01	Batumi-Akhaltsikhe	1.6	1.7	0	7	13414	2.2	2.68	5.89	24.8	
18	sh01	Batumi-Akhaltsikhe	1.7	1.8	0	7	13414	2.2	3.41	5.89	24.8	
19	sh01	Batumi-Akhaltsikhe	1.8	1.9	0	7	13414	2.2	4.42	5.89	24.8	
20	sh01	Batumi-Akhaltsikhe	1.9	2	0	7	13414	2.2	3.53	5.89	24.8	
21	sh01	Batumi-Akhaltsikhe	2	2.1	0	7	13414	2.2	2.91	5.89	24.8	
22	sh01	Batumi-Akhaltsikhe	2.1	2.2	0	7	13414	2.2	3.41	5.89	24.8	
23	sh01	Batumi-Akhaltsikhe	2.2	2.3	0	7	13414	2.2	5.49	5.89	24.8	
24	sh01	Batumi-Akhaltsikhe	2.3	2.4	0	7	13414	2.2	6.18	5.89	24.8	
25	sh01	Batumi-Akhaltsikhe	2.4	2.5	0	7	13414	2.2	3.55	5.89	24.8	
26	sh01	Batumi-Akhaltsikhe	2.5	2.6	0	7	13414	2.2	2.68	5.89	24.8	
27	sh01	Batumi-Akhaltsikhe	2.6	2.7	0	7	13414	2.2	3.05	5.89	24.8	
28	sh01	Batumi-Akhaltsikhe	2.7	2.8	0	7	13414	2.2	5.06	5.89	24.8	
29	sh01	Batumi-Akhaltsikhe	2.8	2.9	0	7	13414	2.2	2.96	5.89	24.8	
30	sh01	Batumi-Akhaltsikhe	2.9	3	0	7	13414	2.2	2.72	5.89	24.8	
31	sh01	Batumi-Akhaltsikhe	3	3.1	0	7	13414	2.2	3.23	5.89	24.8	
32	sh01	Batumi-Akhaltsikhe	3.1	3.2	0	7	13414	2.2	5.51	5.89	24.8	
33	sh01	Batumi-Akhaltsikhe	3.2	3.3	0	7	13414	2.2	3.25	5.89	24.8	





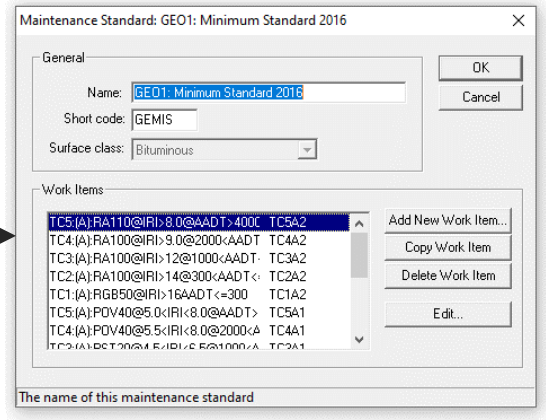
- Most RAM systems have built-in functionality for generating Homogeneous road network
- This allows full country network modelling and export to HDM-4



Maintenance Strategies assigned in HDM4

Type	Traffic Class (TC5) Work activity	Intervention Criteria for Rehabilitation program				Cost) (Economic
		Base Alternative	Minimum	Moderate	Required	
Periodic maintenance	Surface dressing with shape correction 20 mm	Routine maintenance + Rehab@IRI16	5.5 < IRI < 6.5	5.0 < IRI < 6.5	4.5 < IRI < 6.5	21 GEL/m2
Periodic maintenance	Overlay 40 mm Shape Correction 20 mm			7.5 < IRI < 8.0	7.0 < IRI < 8.0	38 GEL/m2
Rehabilitation	Asphalt mix on stabilized base 50 mm		IRI>16	IRI>15	IRI > 10	60 GEL/m2

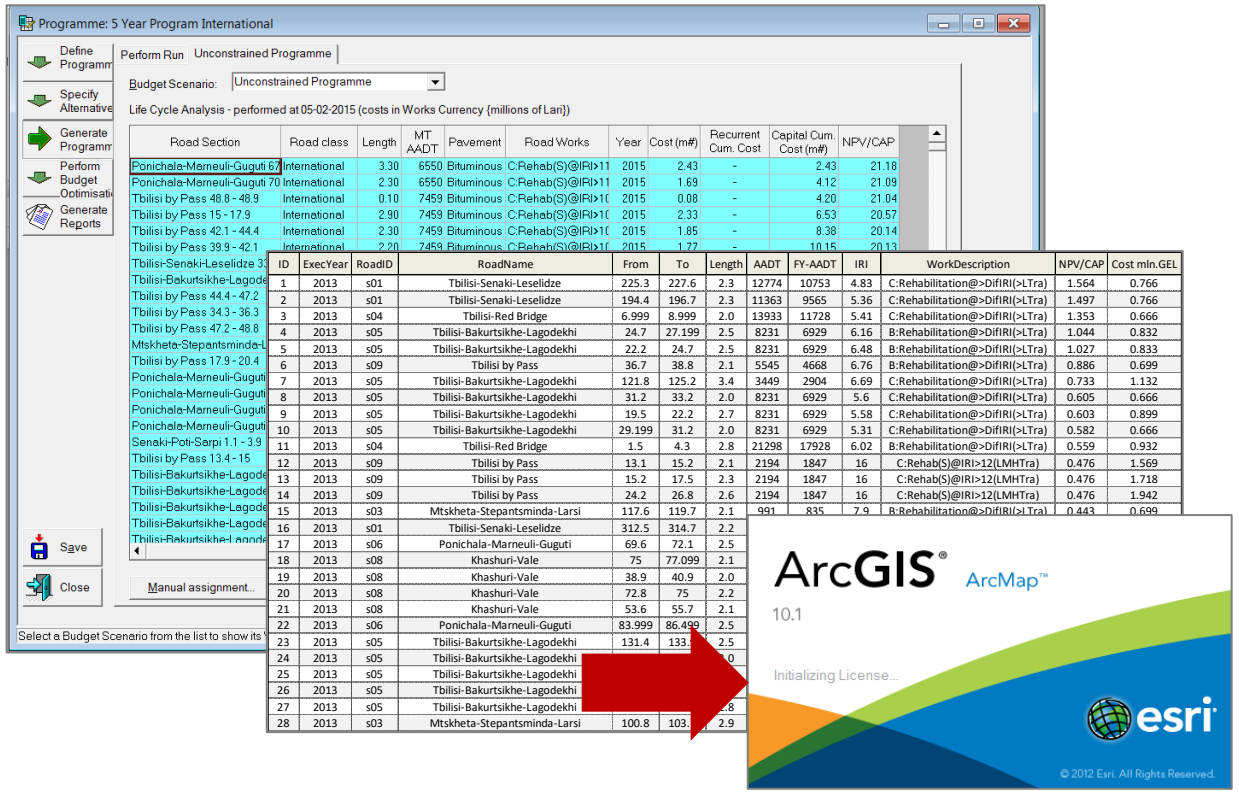
HDM-4 Maintenance Standard



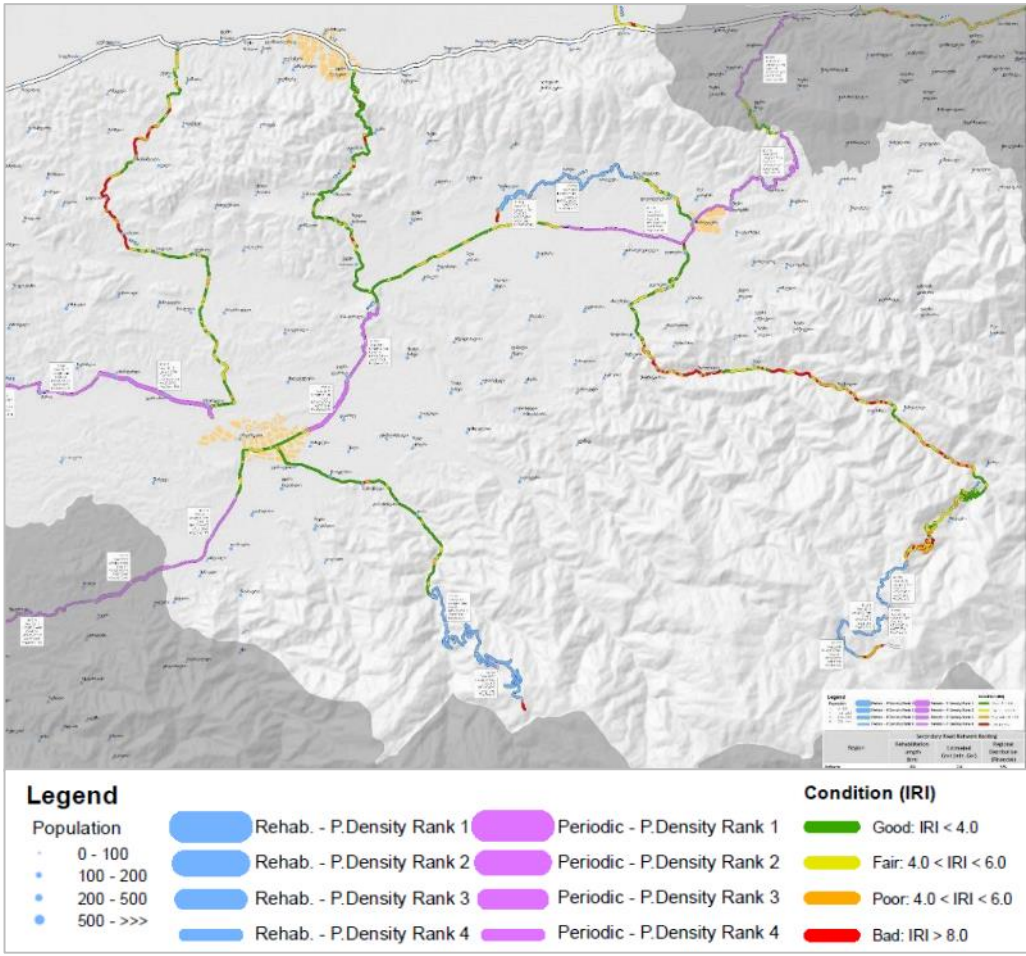
Commonly defined for each traffic class (range of AADT) with intervention criteria and associated road work

Basic HDM4 program output - Unconstrained Work Program

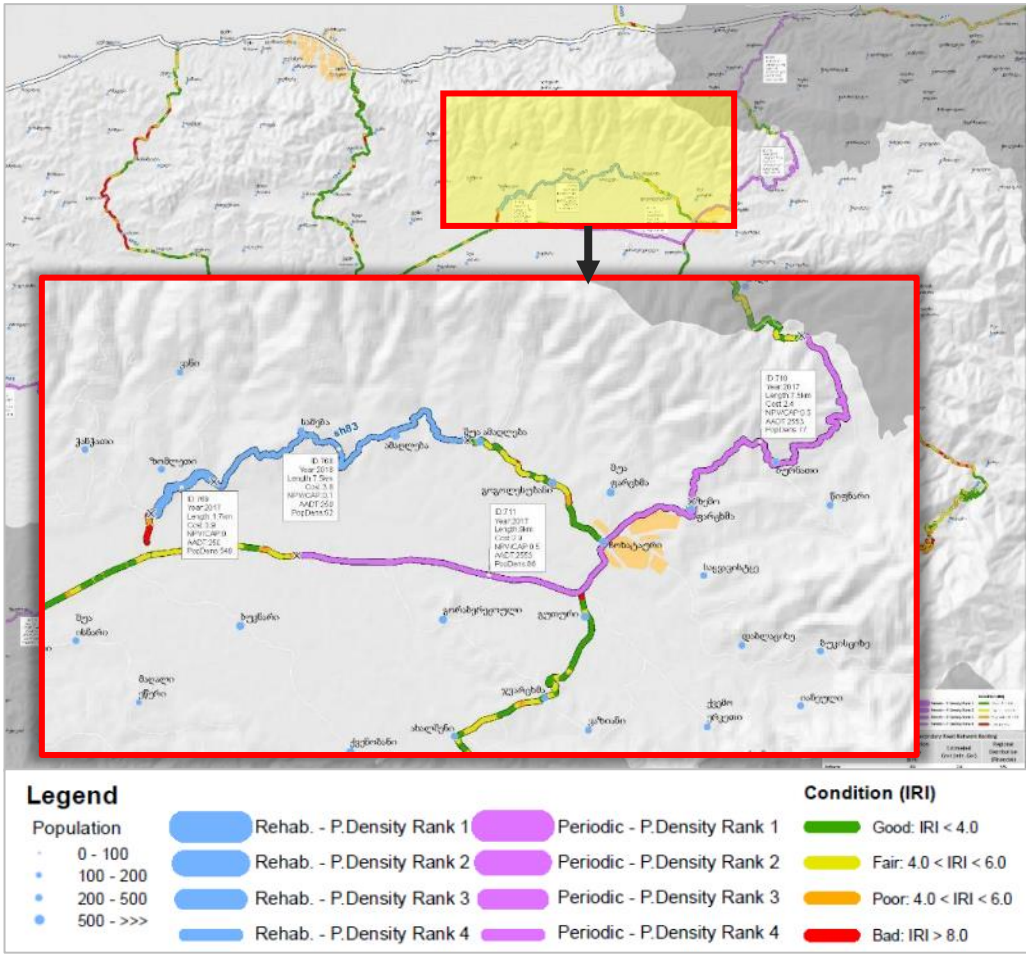
- HDM-4 program simulated for multi year period (5-10 year)
- Resulting output is unconstrained work program for whole country road network
- HDM-4 assigns each individual section optimal maintenance strategy and specific work based on maintenance strategy
- Each activity has relevant cost estimate and economic indicators, NPV/CAP, EIRR, NPV



- HDM-4 output is than exported to GIS to visualize unconstrained work program with proposed road works, cost estimates and economic indicators
- At this point, data for prioritization using economic indicators is available and one could easily select projects with high NPV and IRR
- However, for balanced work program only economic indicators are not sufficient, especially for low volume roads
- Some additional considerations are also necessary for addressing social needs

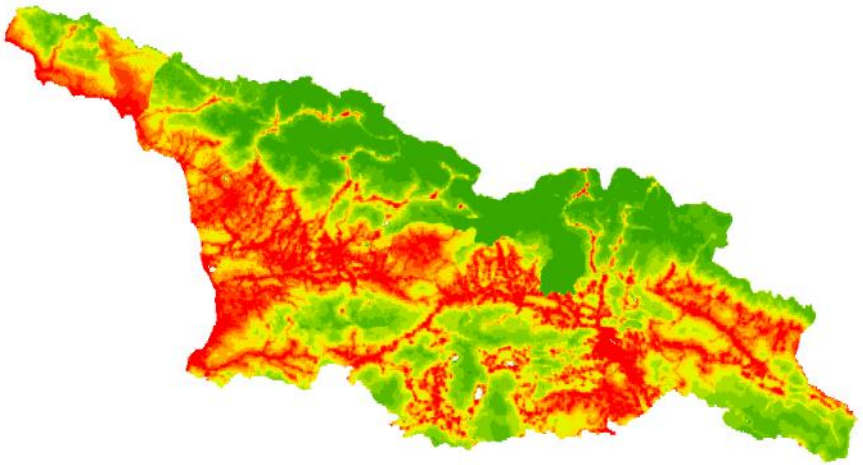


- HDM-4 output is than exported to GIS to visualize unconstrained work program with proposed road works, cost estimates and economic indicators
- At this point, data for prioritization is limited to economic indicators IRR/NPV
- For balanced work program only economic indicators are not sufficient, especially for low volume roads
- At this stage, the socioeconomic data needs to me incorporated.
- Focus is on automation of such integration so that no individual sectional assessment is needed.

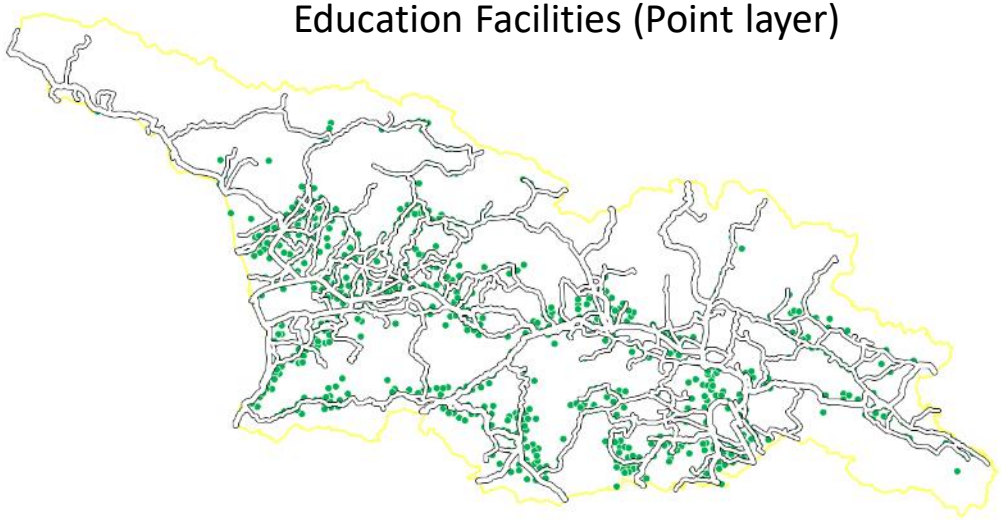


Socioeconomic GIS datasets can be downloaded Humdata.org

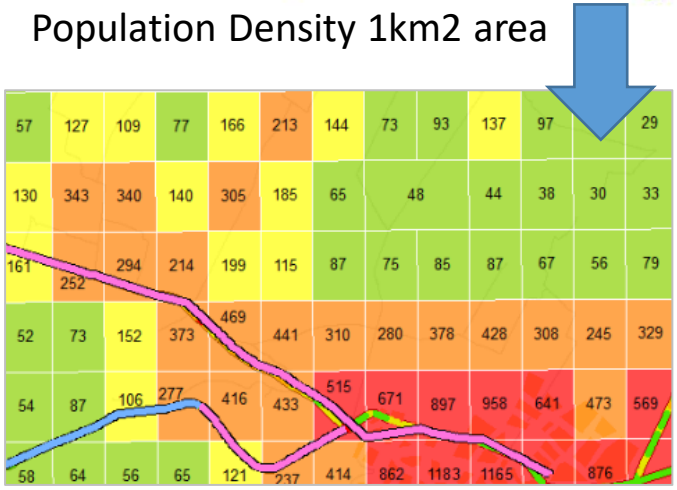
Datasets are available for most countries on population density, education, healthcare, tourism, etc. limited climate and hazard datasets may also be available



Education Facilities (Point layer)



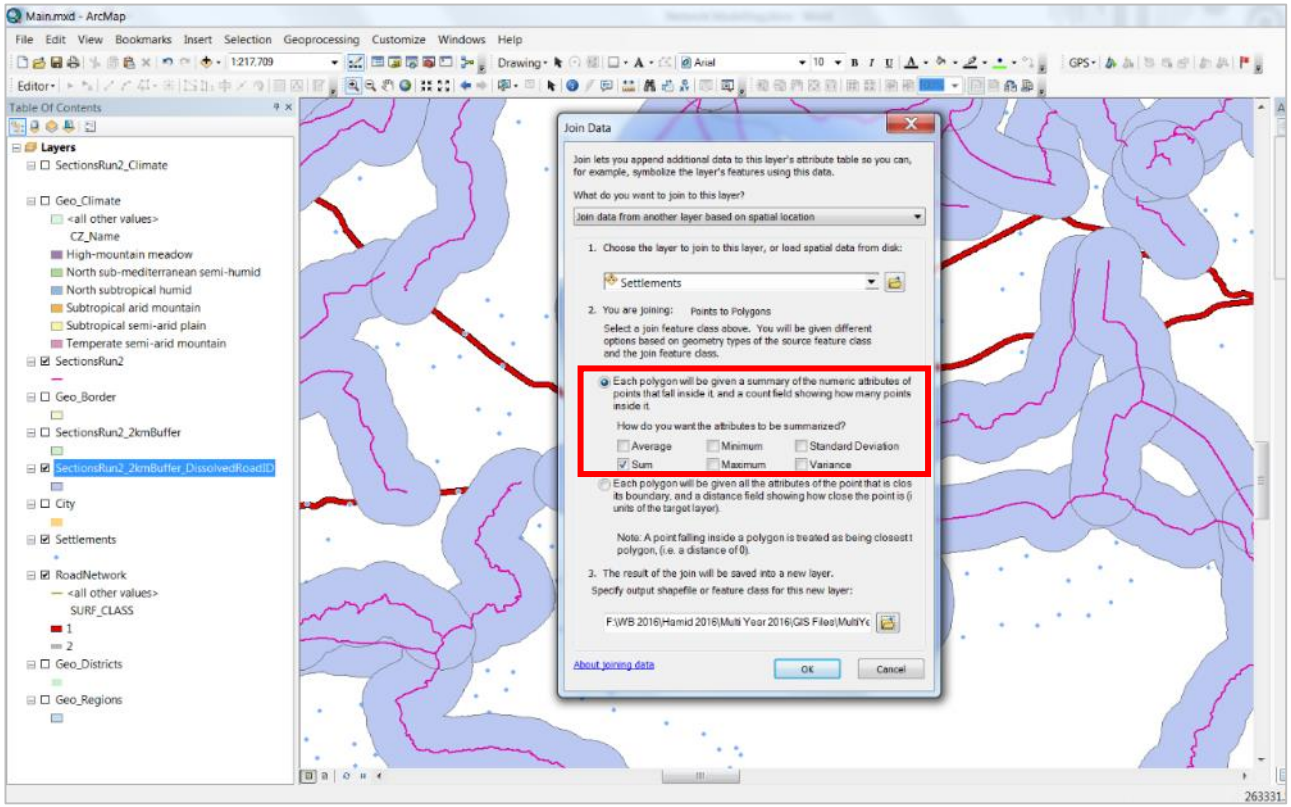
Population Density 1km2 area



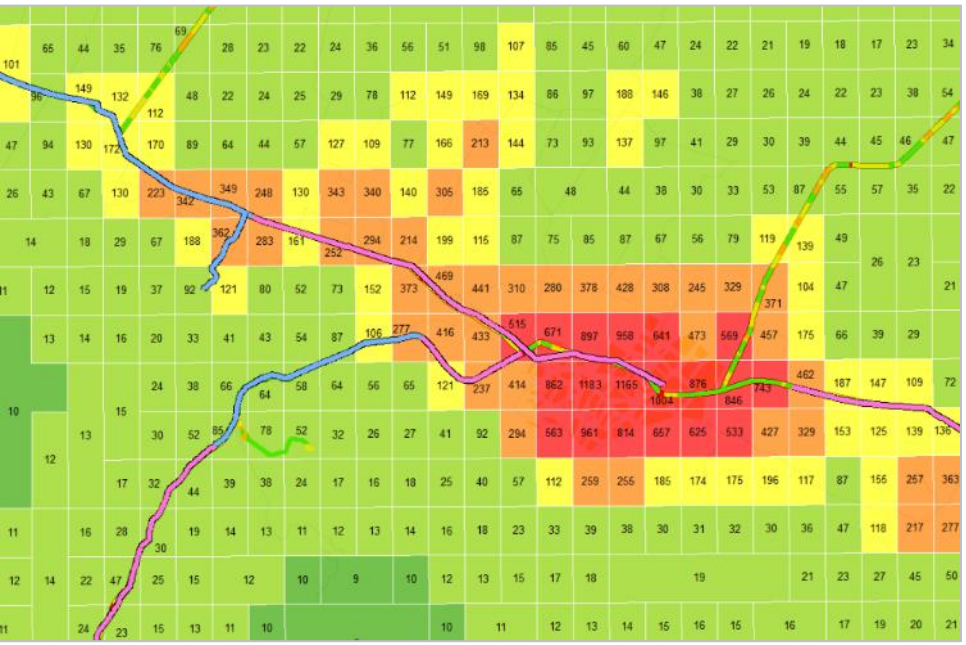
Application of Socio-Economic indicators

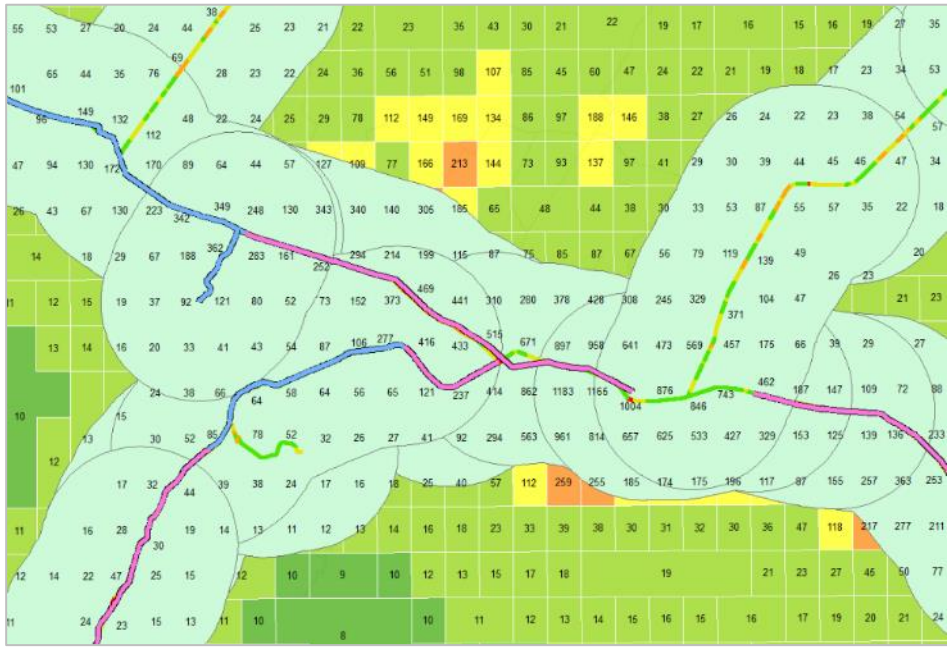
- ArcGIS Spatial Analysis enable automated calculation and assignment of socio-economic indicators and assignment to individual sections.
- Population density, number of tourist attractions, schools, hospitals etc.

Example of using Spatial Join to calculate population within 2km buffer of each road section



With ArcMap Spatial Join and Buffer functions population density can be assigned to all individual sections under the Unconstrained Work Program





Population within 1x1km

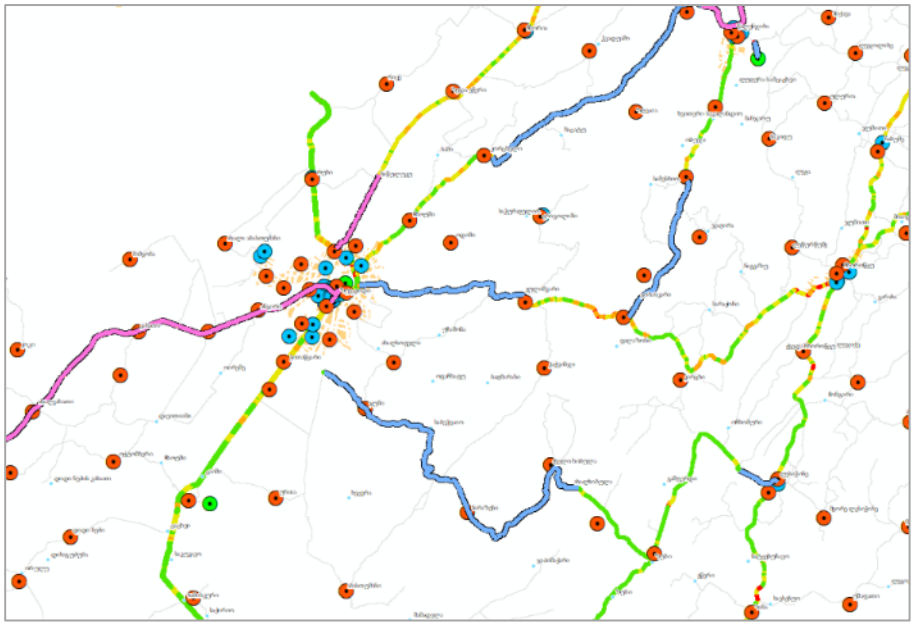
- 0 - 10
- 11 - 100
- 101 - 200
- 201 - 500
- 501 - 13286

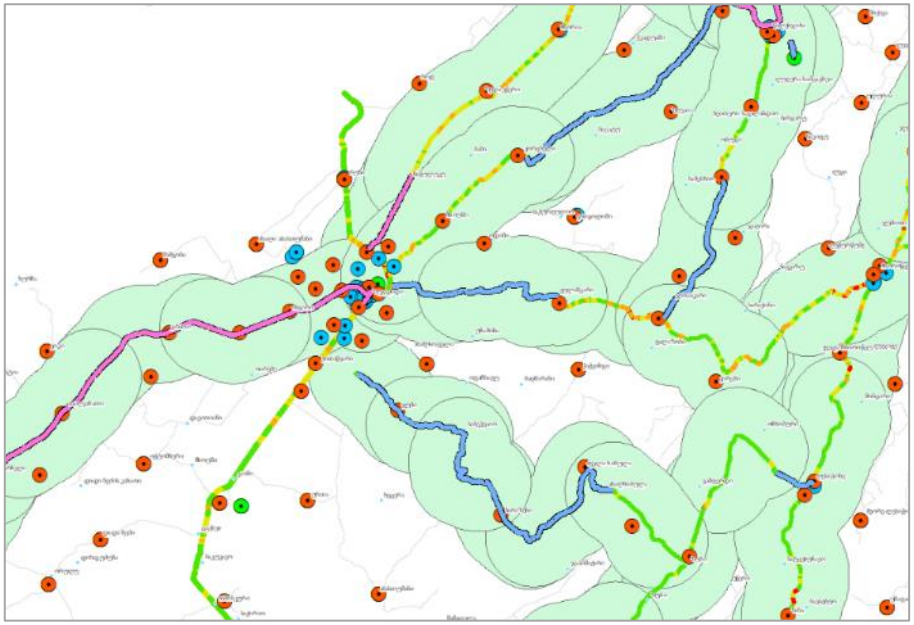
2km buffer

Periodic

Rehabilitation

For Point layers such as Education, Healthcare, Tourism etc. Number of Facilities can be assigned





Educational facilities

Healthcare facilities

Tourism attractions

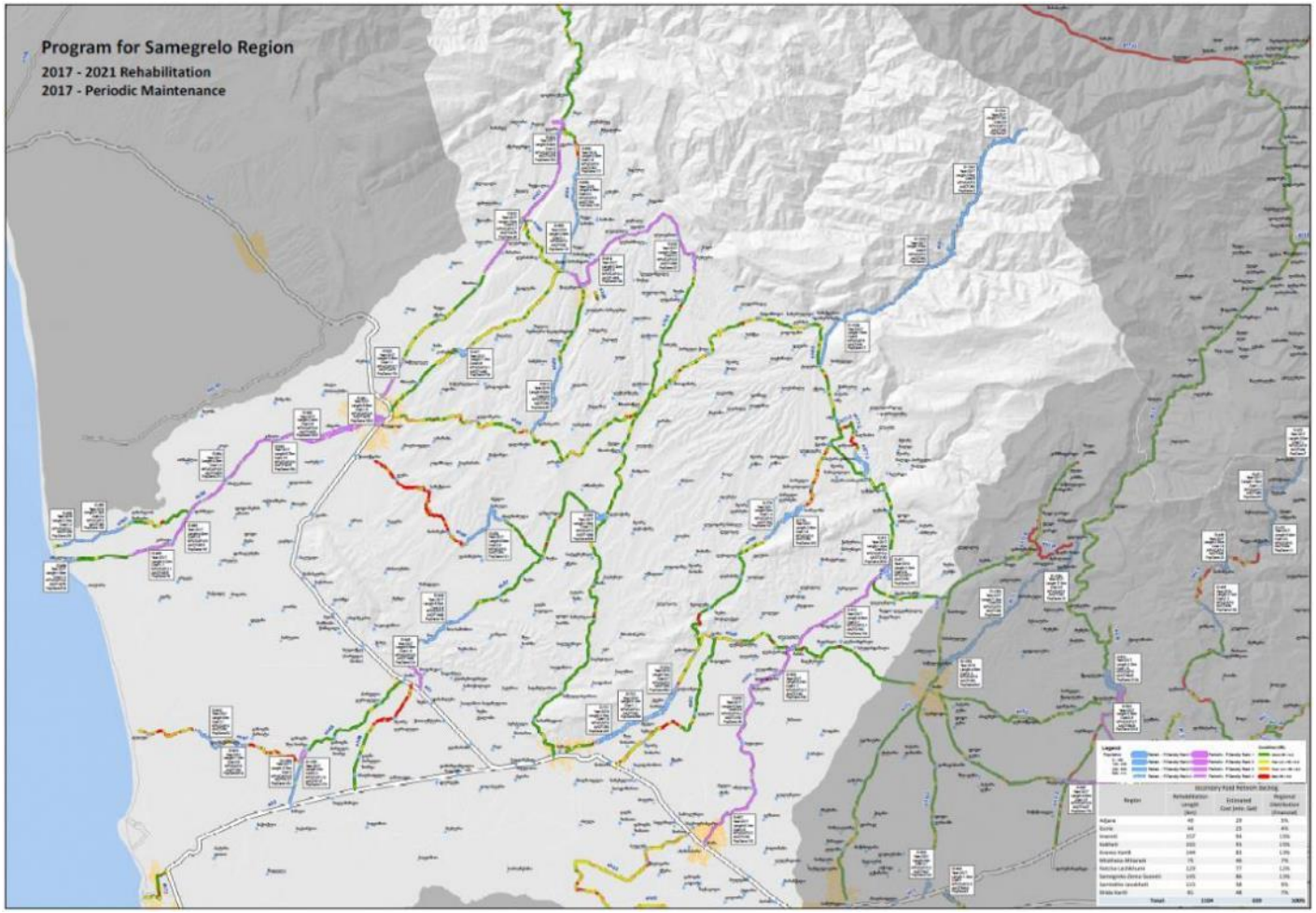
2km buffer

Periodic

Rehabilitation

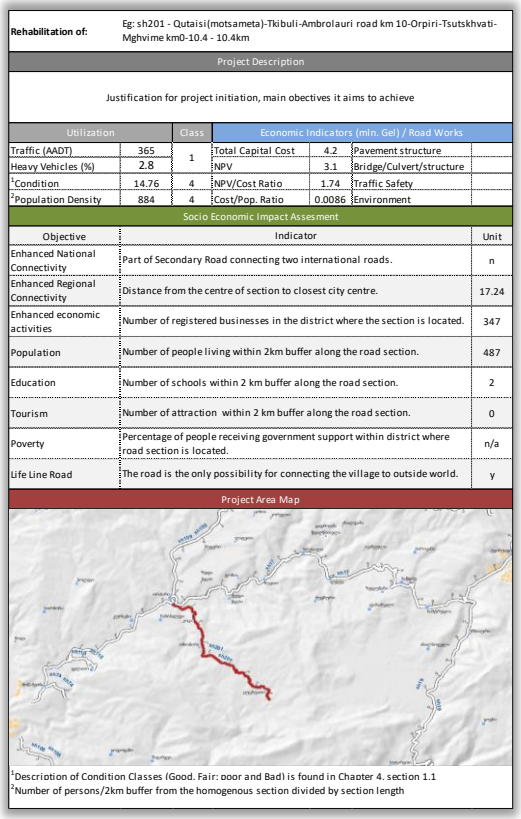
Resulting unconstrained program will have expanded prioritization indicators for whole country network:

- EIRR
- NPV
- Population Density
- Number of Educational Facilities
- Number of Healthcare Facilities
- Number of Tourism Attractions
- Etc.



Example of “Fact Sheet” for individual section under work program

Rehabilitation of:	Eg: sh201 - Qutaisi(motsameta)-Tkibuli-Ambrolauri road km 10-Orpiri-Tsutskhvati-Mghvime km0-10.4 - 10.4km					
Project Description						
Justification for project initiation, main obectives it aims to achieve						
Utilization		Class	Economic Indicators (mln. Gel) / Road Works			
Traffic (AADT)	365	1	Total Capital Cost	4.2	Pavement structure	
Heavy Vehicles (%)	2.8		NPV	3.1	Bridge/Culvert/structure	
[1]Condition	14.76	4	NPV/Cost Ratio	1.74	Traffic Safety	
[2]Population Density	884	4	Cost/Pop. Ratio	0.0086	Environment	



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Socio Economic Impact Assesment

Objective	Indicator	Unit
Enhanced National Connectivity	Part of Secondary Road connecting two international roads.	n
Enhanced Regional Connectivity	Distance from the centre of section to closest city centre.	17.24
Enhanced economic activities	Number of registered businesses in the district where the section is located.	347
Population	Number of people living within 2km buffer along the road section.	487
Education	Number of schools within 2 km buffer along the road section.	2
Tourism	Number of attraction within 2 km buffer along the road section.	0
Poverty	Percentage of people receiving government support within district where road section is located.	n/a
Life Line Road	The road is the only possibility for connecting the village to outside world.	y

Project Area Map

[1]Descriotion of Condition Classes (Good. Fair: poor and Bad) is found in Chapter 4. section 1.1
[2]Number of persons/2km buffer from the homogenous section divided by section length

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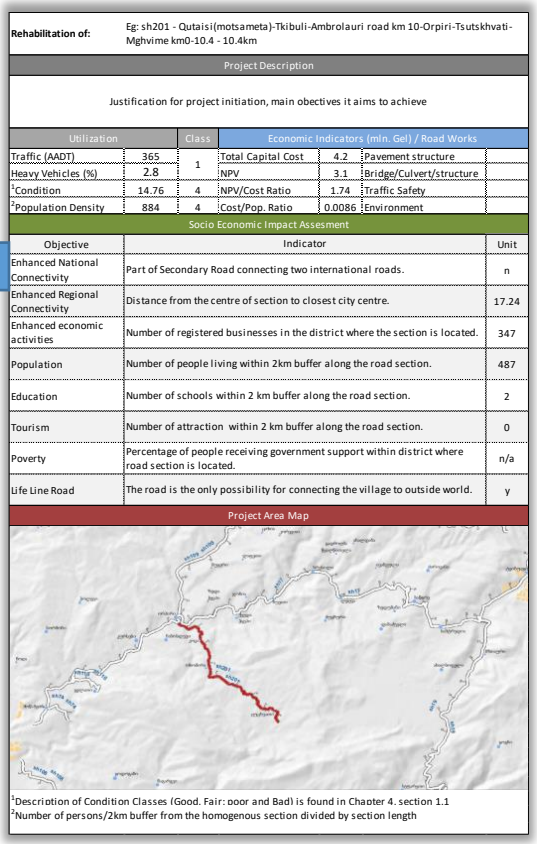

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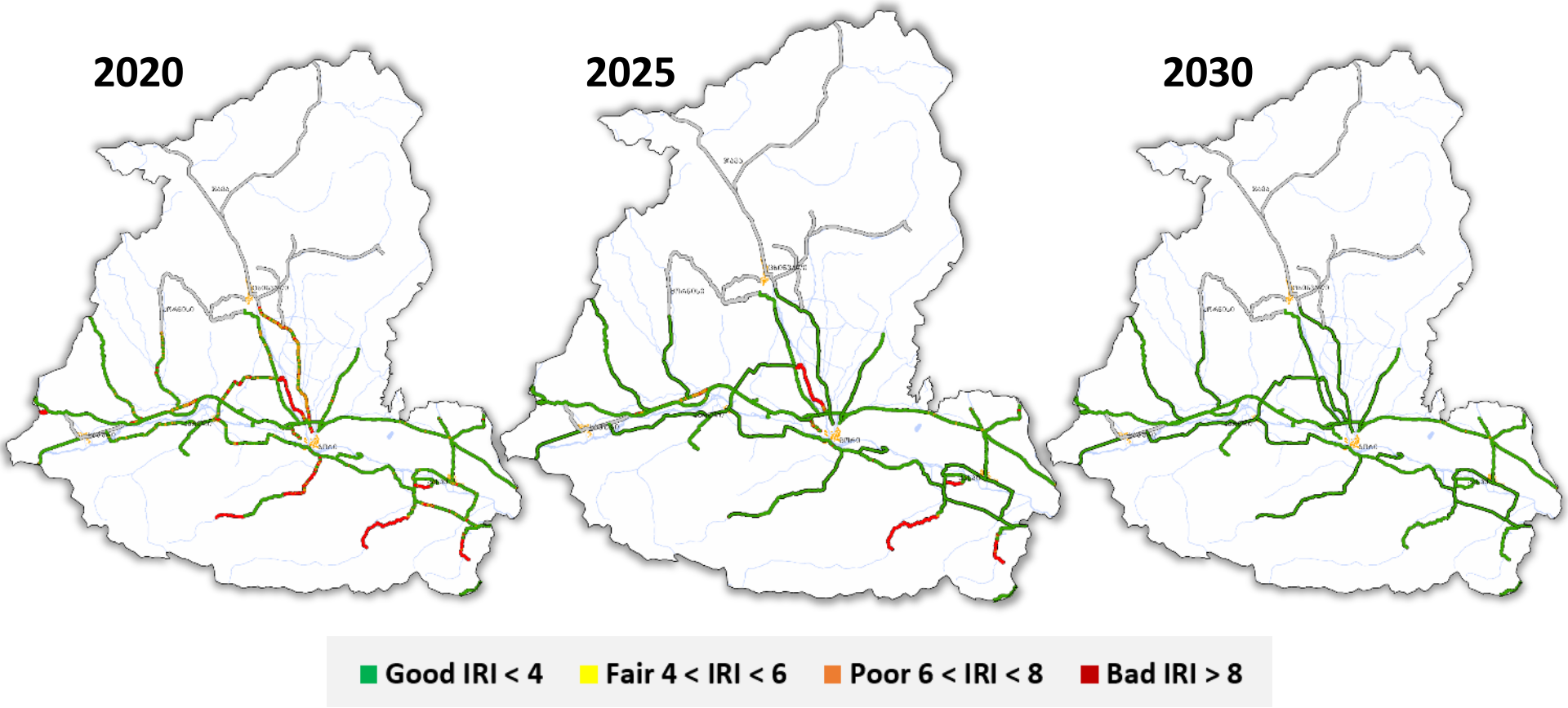
Work Program can be used for Long Term Condition Projections



Summary notes:

- Importance of expanding asset register
- Can be done without extensive additional resources
- *Possibility of incorporating socioeconomic data with just COTS GIS*
- *Supporting Data Use and overall capacity for data processing/analytics*
- *Allowing basic projections and KPIs*

Thank you.