DREAM – Learning Event IV

The Need for Regional Planning: the Case of Gully Control near to Jigjiga Town

'The Need for Integrated Spatial Development Planning: the Case of Gully Control near Jigjiga Town'

Gully Hazard Rapid Assessment Report

Biophysical Overview of Jigjiga Watershed

August 2021

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DEUTSCHE ZUSAMMENARBEIT

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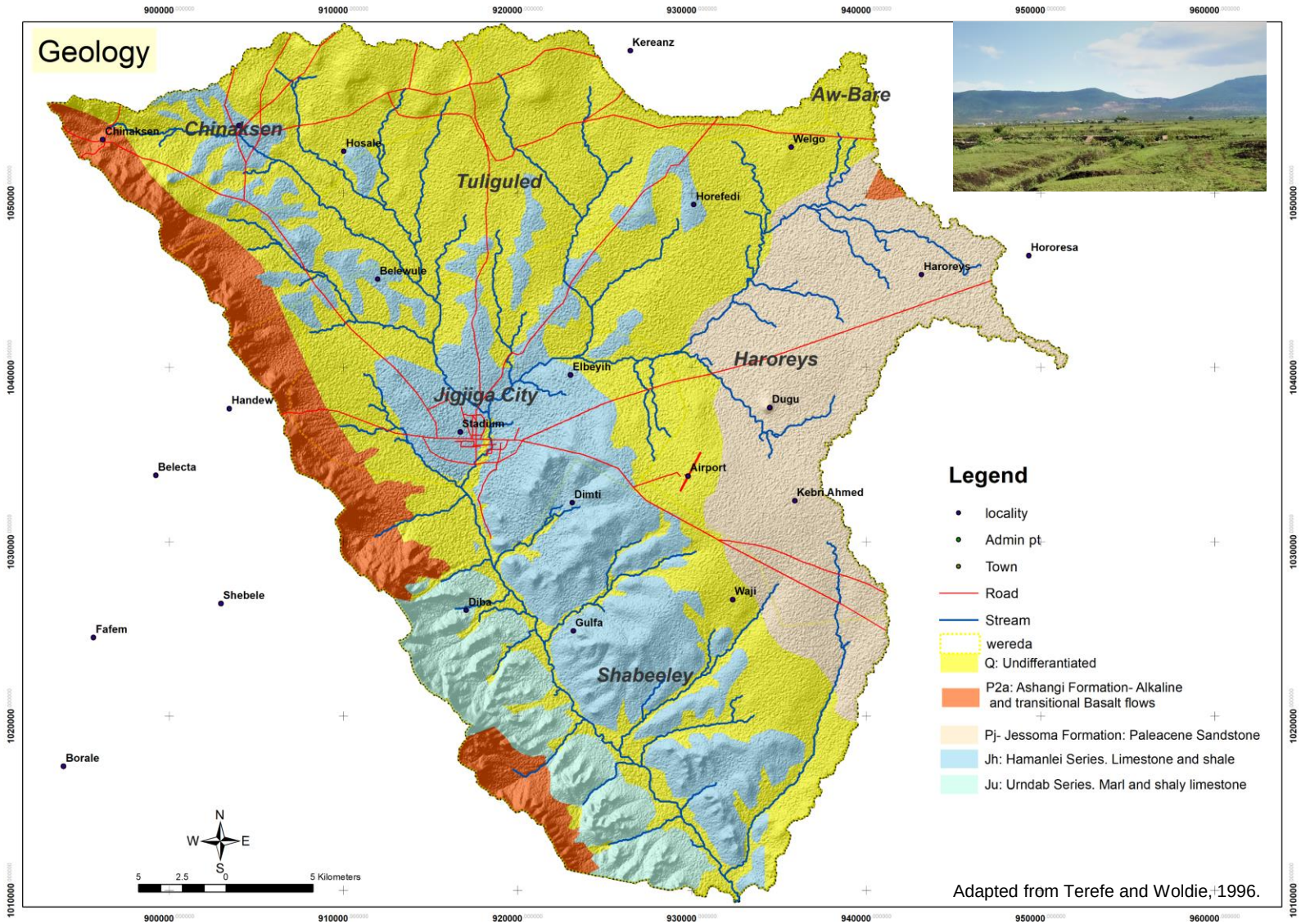
Flood-Based Livelihoods Network Foundation

META

Geology

- The soluble and karstified carbonate rocks underlying the recent sediments are playing big role in accelerated gully development; and failure of WSW and gully protection structures.
- Deep-cut gully opening over such rocks affect the groundwater condition and make the area around gullies drier.
- Opening of the protective cover (the clay horizon) may lead to contamination of the groundwater in the watershed.

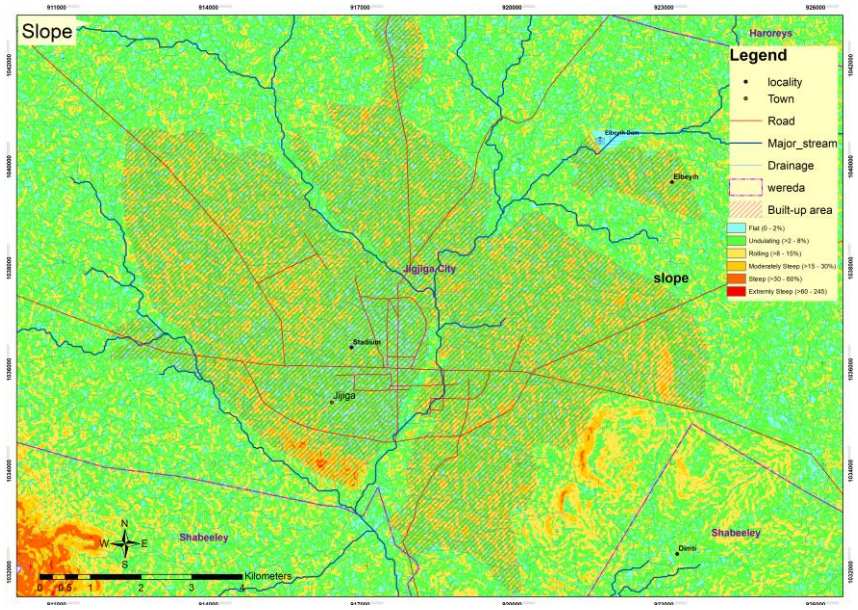
Lithology	Area in Ha	%
Hamanlei Series. Limestone and shale	33177	21.99
Urndab Series. Marl and shaly limestone	9684	6.42
Ashangi Formation- Alkaline and transitional Basalt flows	12289	8.14
Jessoma Formation: Paleacene Sandstone	25938	17.19
Undifferentiated	69798	46.26

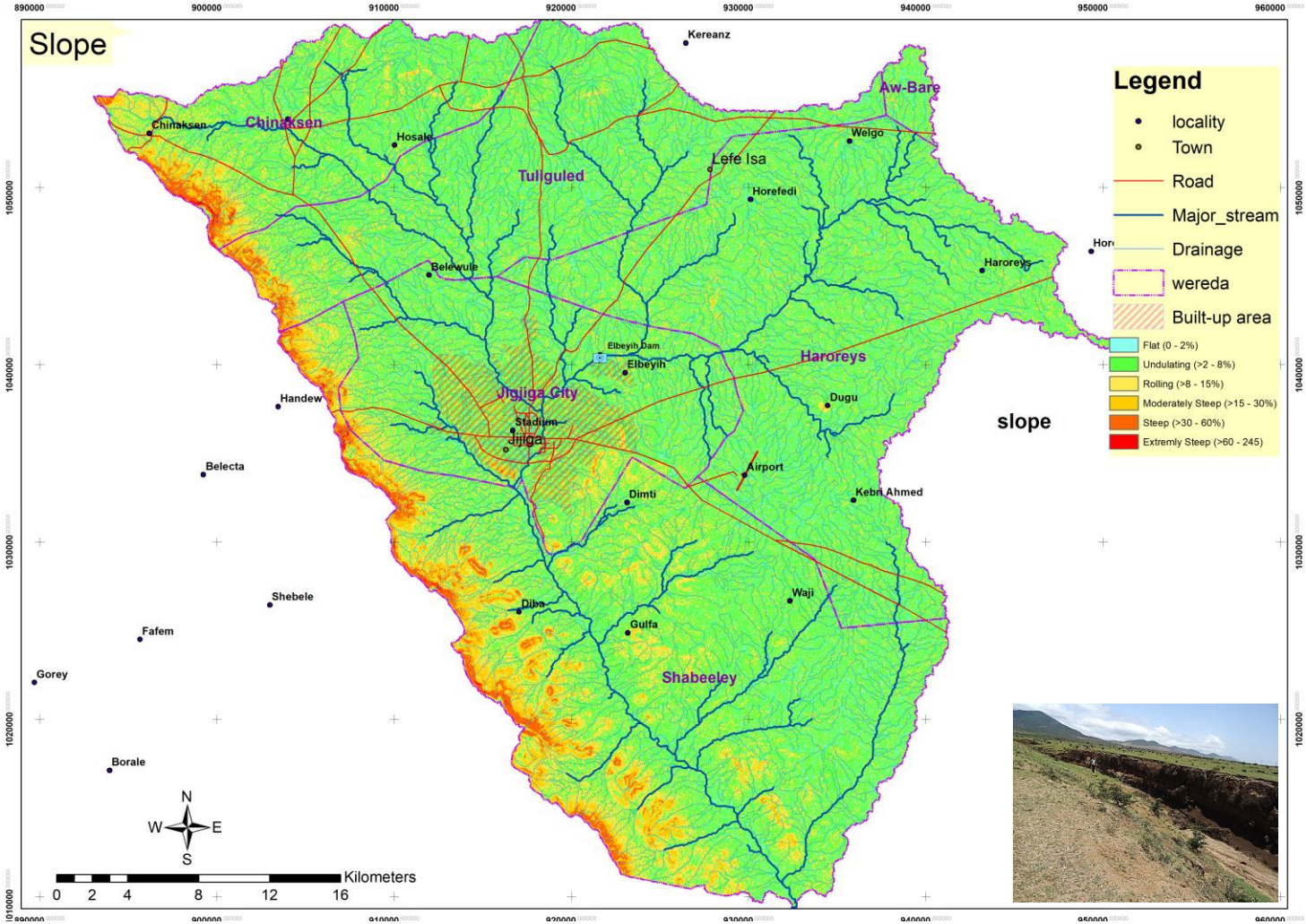


Adapted from Terefe and Woldie, 1996.

Topography

- The high altitude of the western and northeastern part of the watershed, the proximity of Jigjiga city to this slopy areas, the undulating nature of the remaining parts, in combination with other factors mentioned above, leads to enhanced gully development

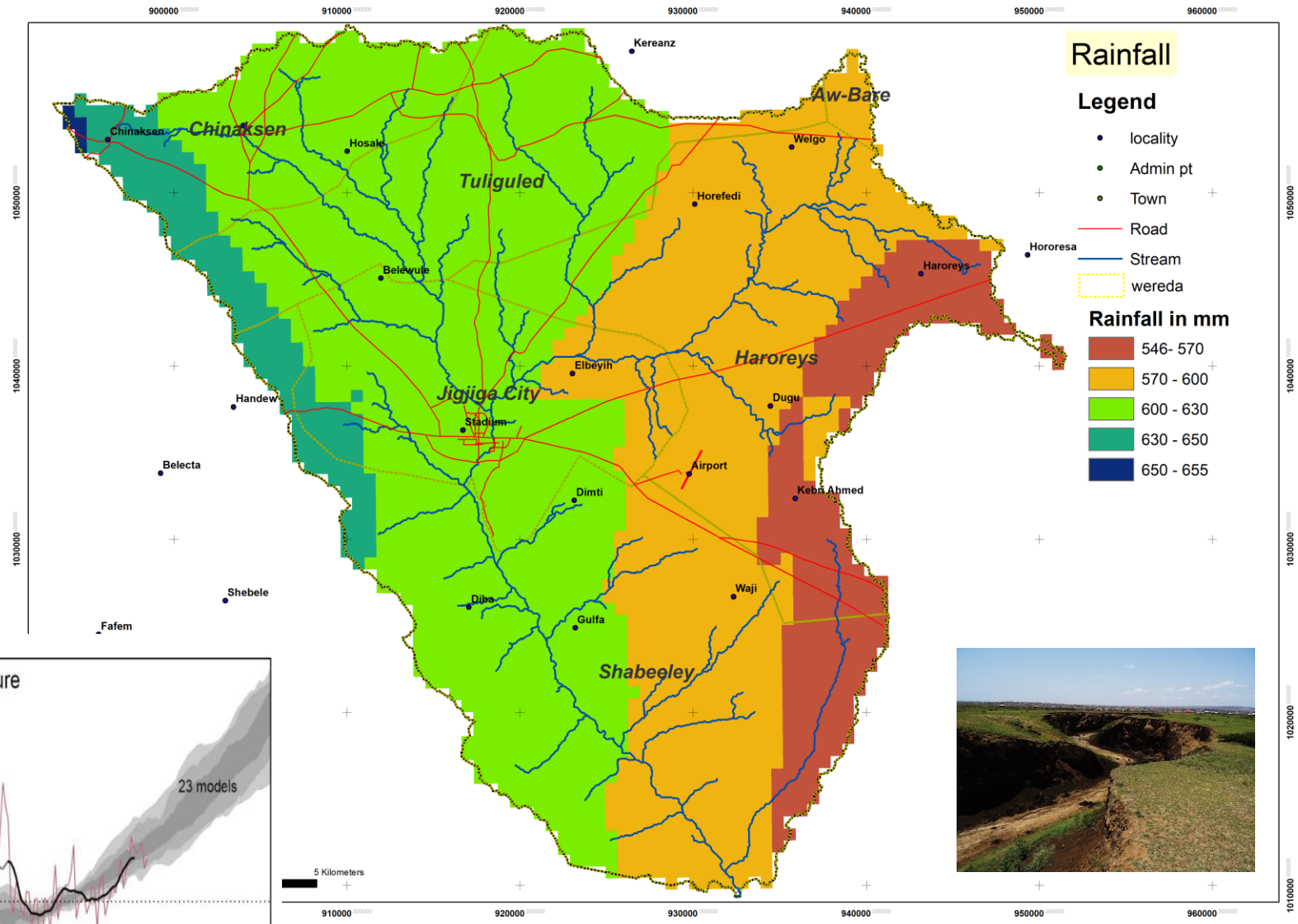


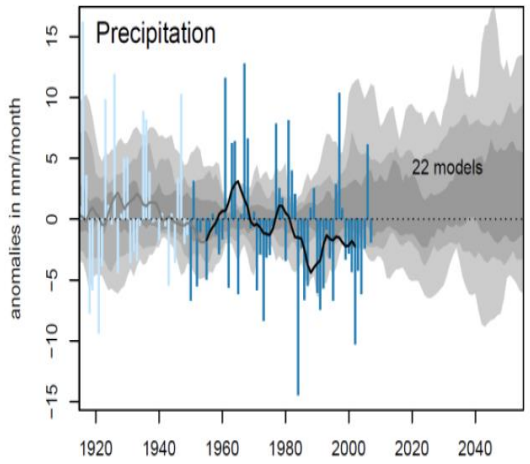


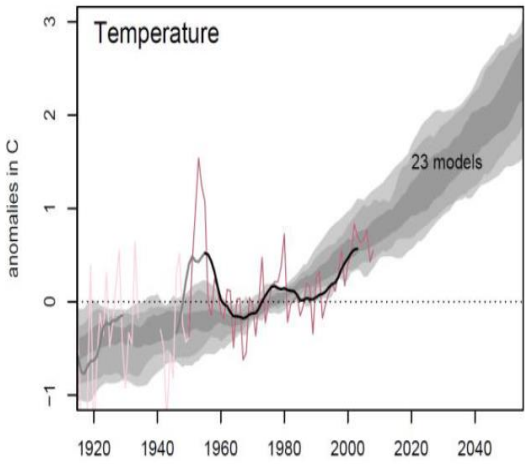
DEM data source: https://search.asf.alaska.edu

Rainfall

- The elevated western and northeastern parts of the watershed are receiving more rainfall to make this part of the watershed more vulnerable.
- The high intensity rainfalls that are frequently occurring in recent years are making all parts of the watershed prone to flood hazard and gully development.



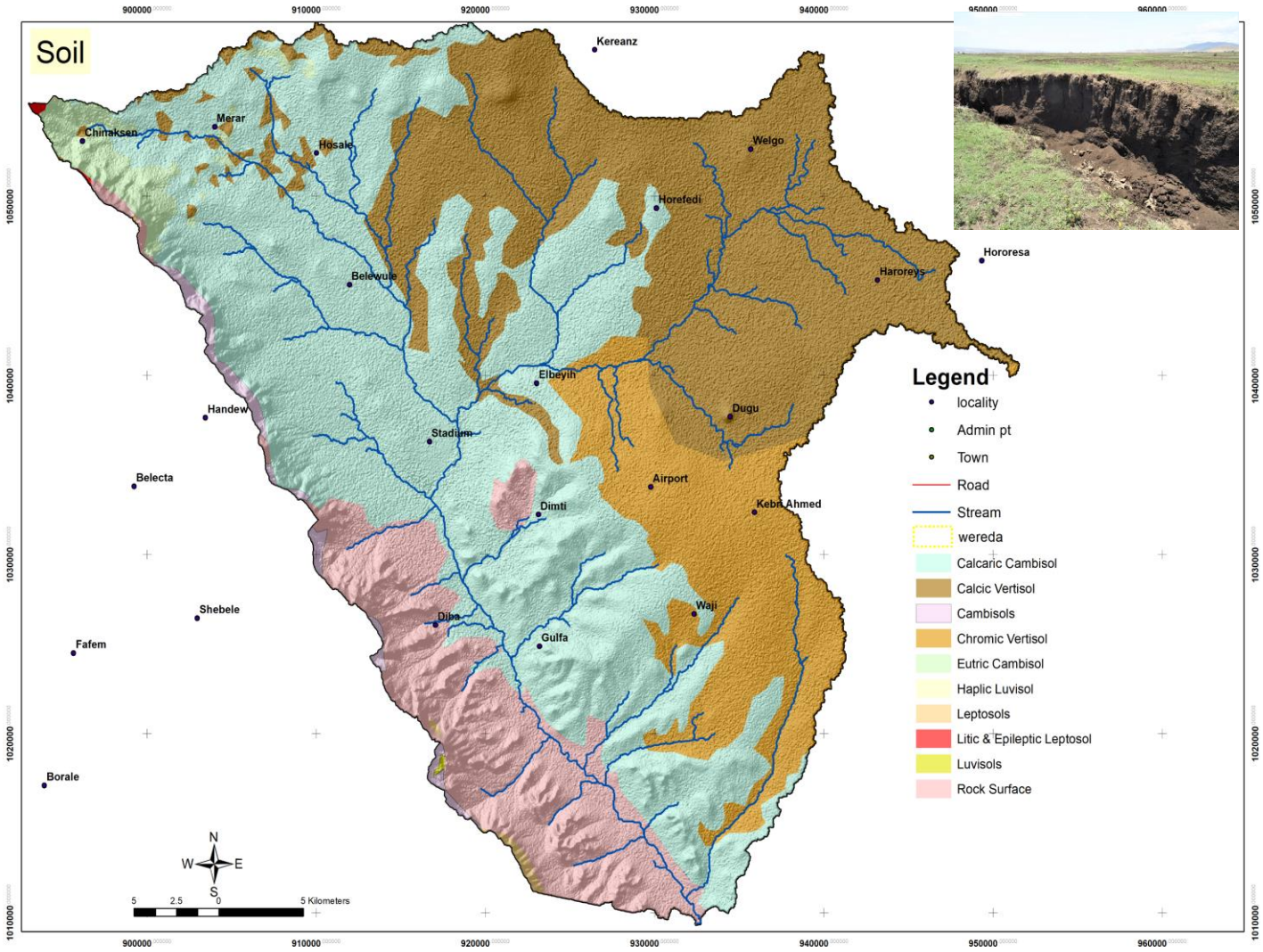




Soils

Soils in the watershed are dominantly sandy on the surface and clayey at depth. The backward agricultural practices, the bed rock conditions and the erosive and dispersive nature the soils are highly contributing to gully development

FAO Class	Texture Class	FAO (Ha)	Percent
Calcaric Cambisol	Loam Sand	65242.05	42.85
Calcic Vertisol	Silty Loam	44728.91	29.38
Cambisols	Silty Clay Loam	1240.52	0.81
Chromic Vertisol	Clay	19022.87	12.50
Eutric Cambisol	Loam	3159.67	2.08
Haplic Luvisol	Sandy Loam	4.74	0.00
Leptosols	Loam	257.27	0.17
Litic & Epileptic Leptosol	Loam	53.76	0.04
Luvisols	Sandy Loam	36.46	0.02
Rock Surface	Rock Surface	18495.08	12.15

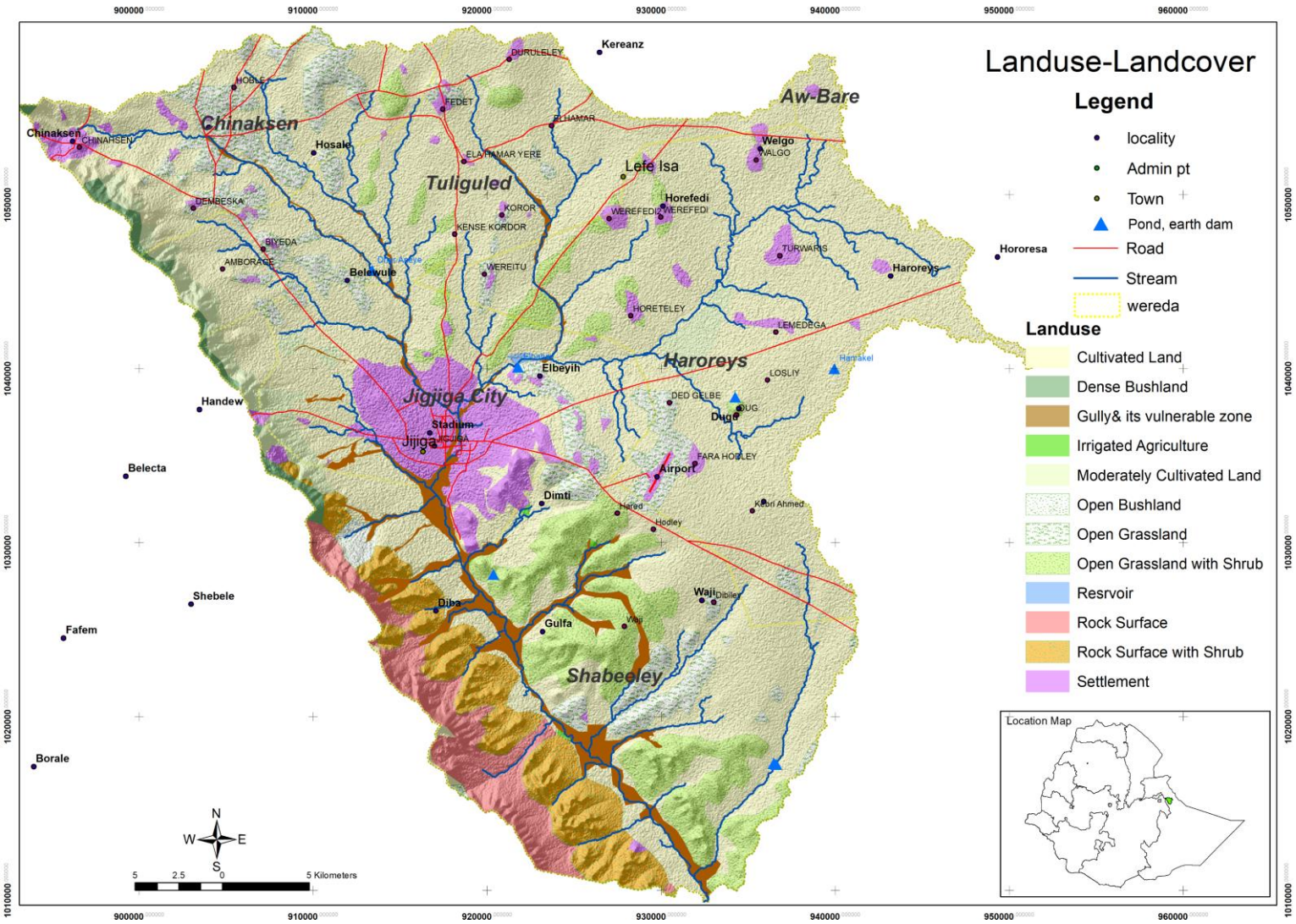


Adopted from :FAO, 1984, Geomorphology and Soils Assistance to Land Use Planning Addis Ababa

Land use-Landcover

- The main land use in the watershed that cover about 67% of the area is cultivation with backward agricultural practice;
- This use is taking more land from the natural covers; which may contribute to aggravation of gully development.

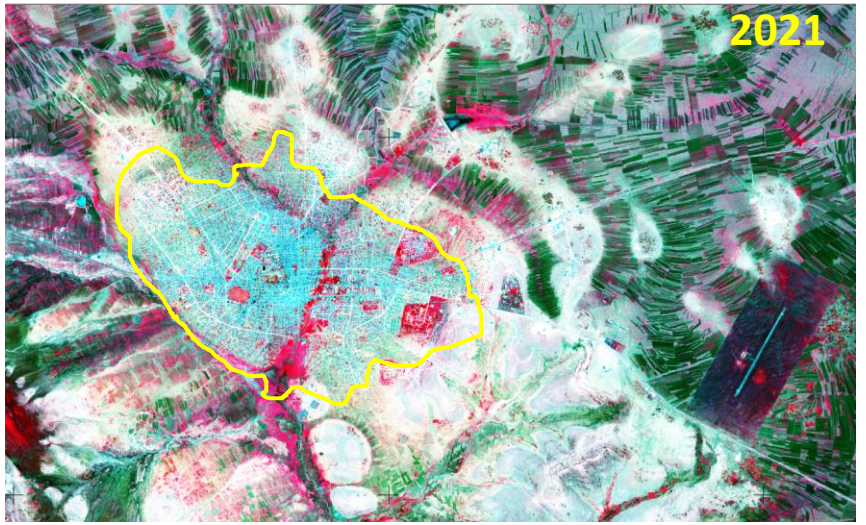
Land use Type	Area in Ha	%
Cultivated Land	92763	60.04
Dense Bushland	1028	0.67
Gully/vulnerable areas	8461	5.48
Irrigated Agriculture	62	0.04
Moderately Cultivated Land	3893	2.52
Open Bushland	418	0.27
Open Grassland	11783	7.63
Open Grassland with Shrub	13473	8.72
Reservoir	59	0.04
Rock Surface	5191	3.36
Rock Surface with Shrub	7477	4.84
Settlement	9888	6.40

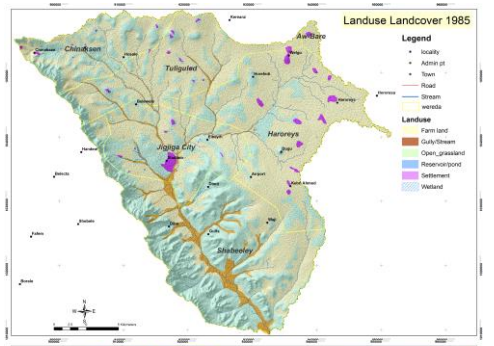


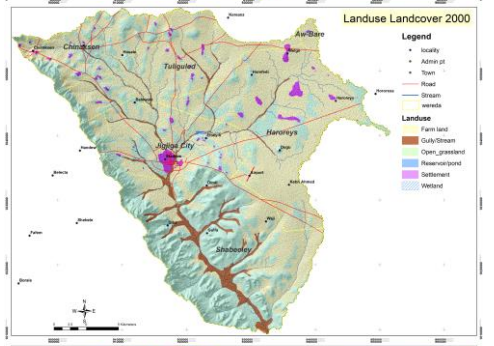
Land use-Landcover Conversion

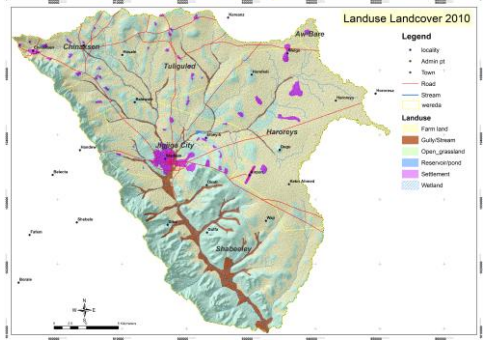
- Half a decade ago, Jigjiga town had had an area of only 150 of ha.
- The biggest leap in its growth is seen during the current decade.
  Other settlements have also grown during this period.
- Most of the landuse conversion is from agriculture to settlement

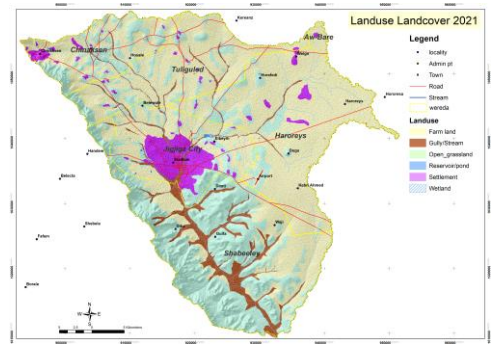
Dominant LULC Type	1985	2000	2010	2021	Change in percent		
					1985-2021	2000- 2021	2010-2021
Farm land	86391	87193	87593	84640	-2.03	-2.93	-3.37
Gully/vulnerable areas	6731	6777	7250	8461	25.70	24.84	16.69
Open, grass and bush land	56899	55128	52407	50101	-11.95	-9.12	-4.40
Reservoir/pond/wetland		83.25	92.7	92.7		11.35	0.00
Settlement	1990	2433	3562	7892	296.64	224.42	121.58







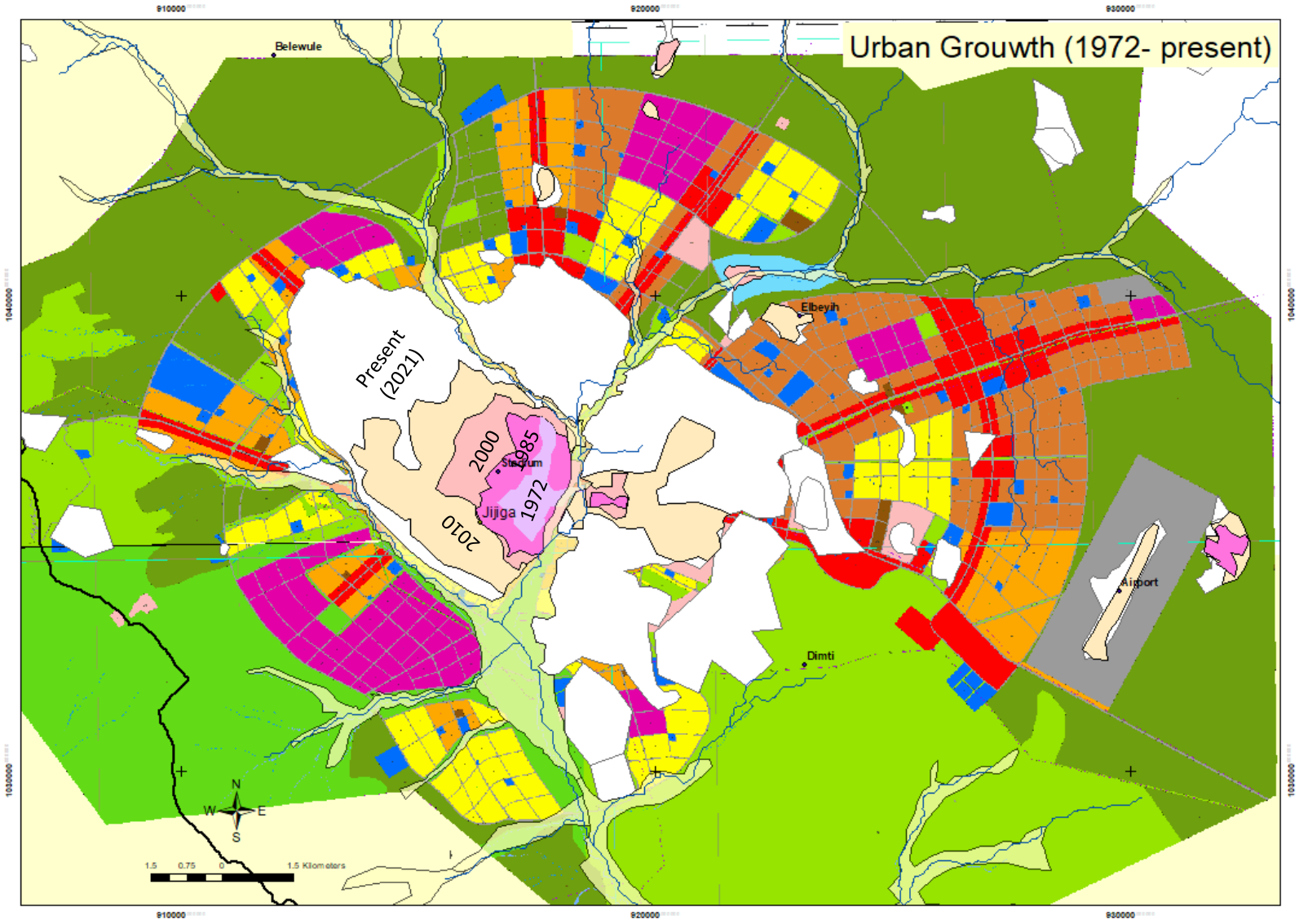




Source: Copernicus Sentinel data 2021, processed by ESA.; Landsat- 4 image courtesy of the U.S. Geological Survey

Rapid Urban Growth

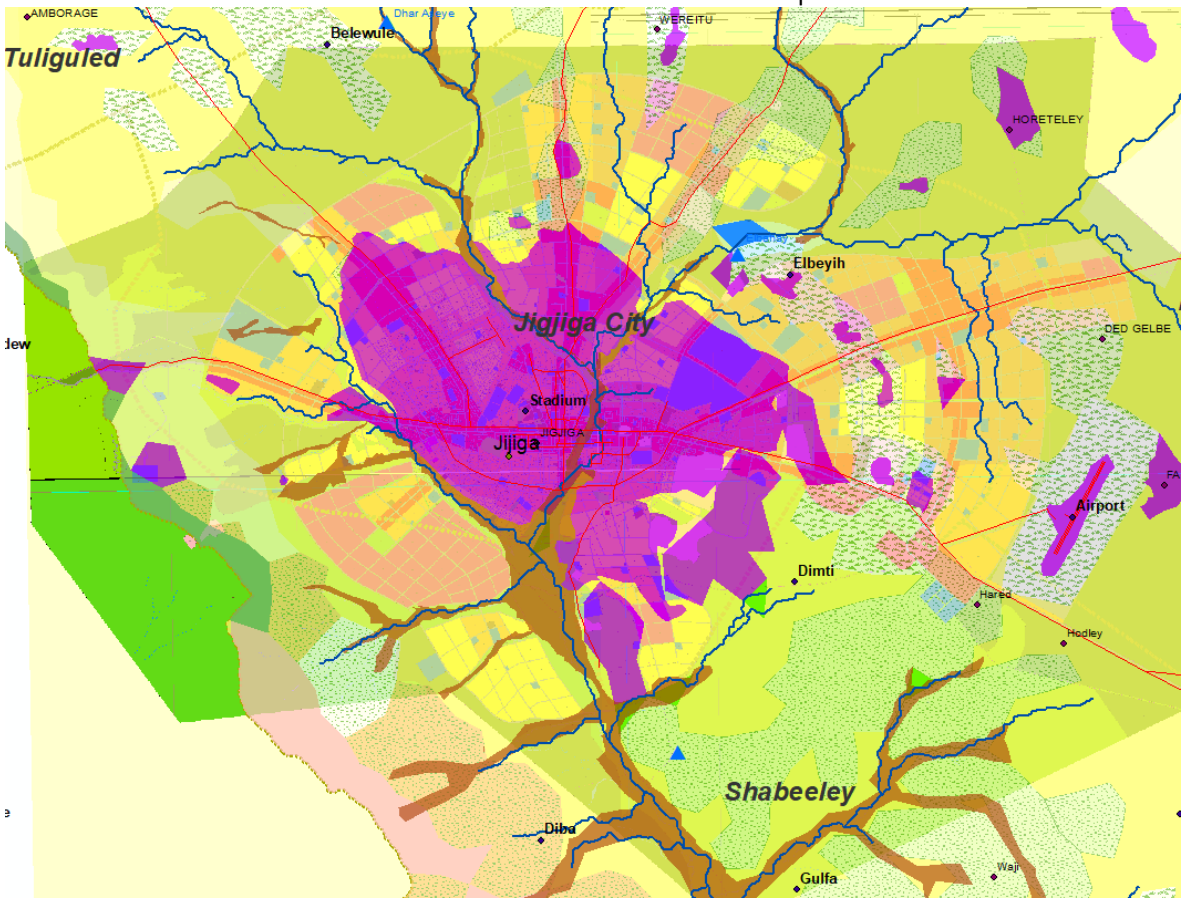
Year	Area in ha	% Growth
1972	148	
1985	1990	1245
2000	2433	22
2010	3562	46
2021	7892	122



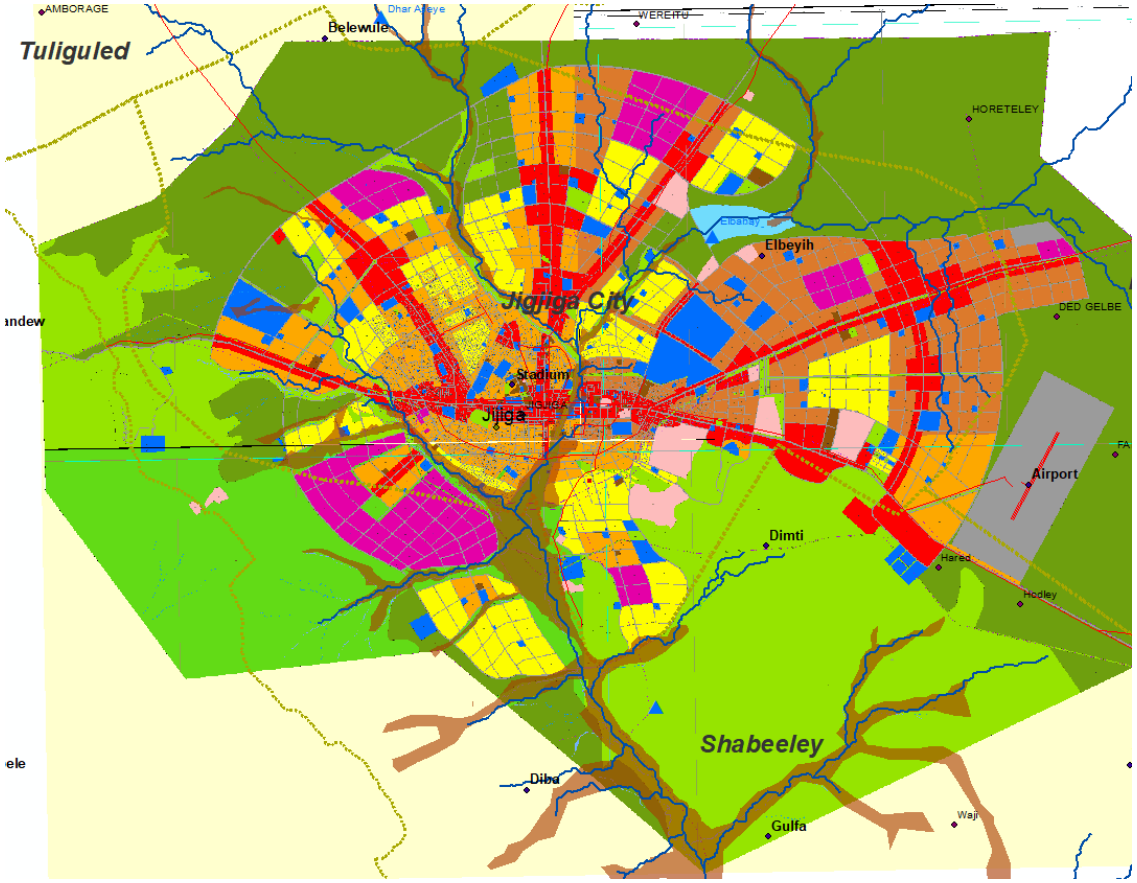
Current vs Future Plan

- The draft land use plan for Jigjiga already allocated 50 to 500 meters environmental buffer along the gullies,
- Controlling further development and the type of planned restoration activities are decisive to enforce the plan
- How to solve the future water demand, which is a challenge already, is not clear.
- The carrying capacity of the watershed

Current extent overlain on the draft plan



Draft Land use proposal 2021-2030)



Yellow, orange - residence; red- business; blue- education; purple- manufacturing & storage; green & blue - environmental recreational; gray – transport; greenish brown- urban agriculture; pink- special function