URAdapt

Managing Water at the Urban-Rural Interface: The key to climate change resilient

Dynamics of urban-rural interaction in relation to water and waste water

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Theoretical framework

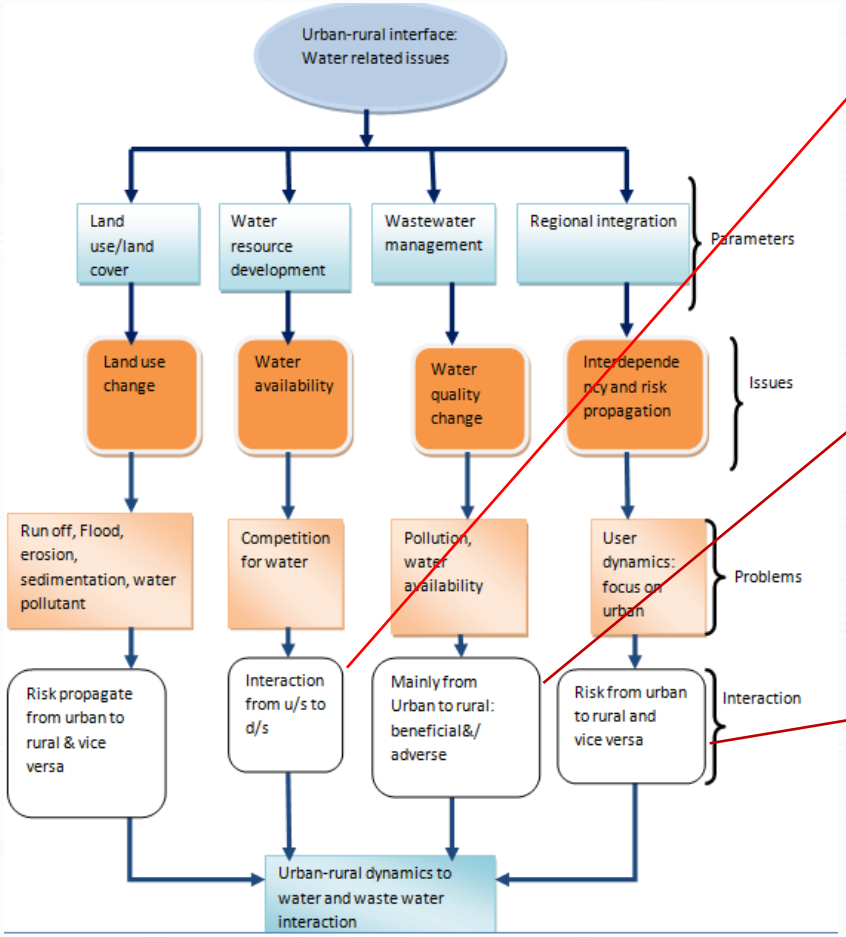
- Urban-rural: geographically interconnected areas
- Economic, social and political interaction
- Urban-surrounding rural areas

Rural	Urban	Interaction
Livelihood: Agriculture	Labour market, trade	Migration Informal settlement Urban encroachment Competition for water
Natural capital: Key asset	Housing: key economical resource	
Favourable environment	Reliance on cash	

Theoretical framework

- Hydrological linkage is a main feature in neighbourhood
- Regional cooperation: sustainability->regional planning based on wider perspective
- Issue: Managing the water resource with out regional cooperation

Theoretical framework

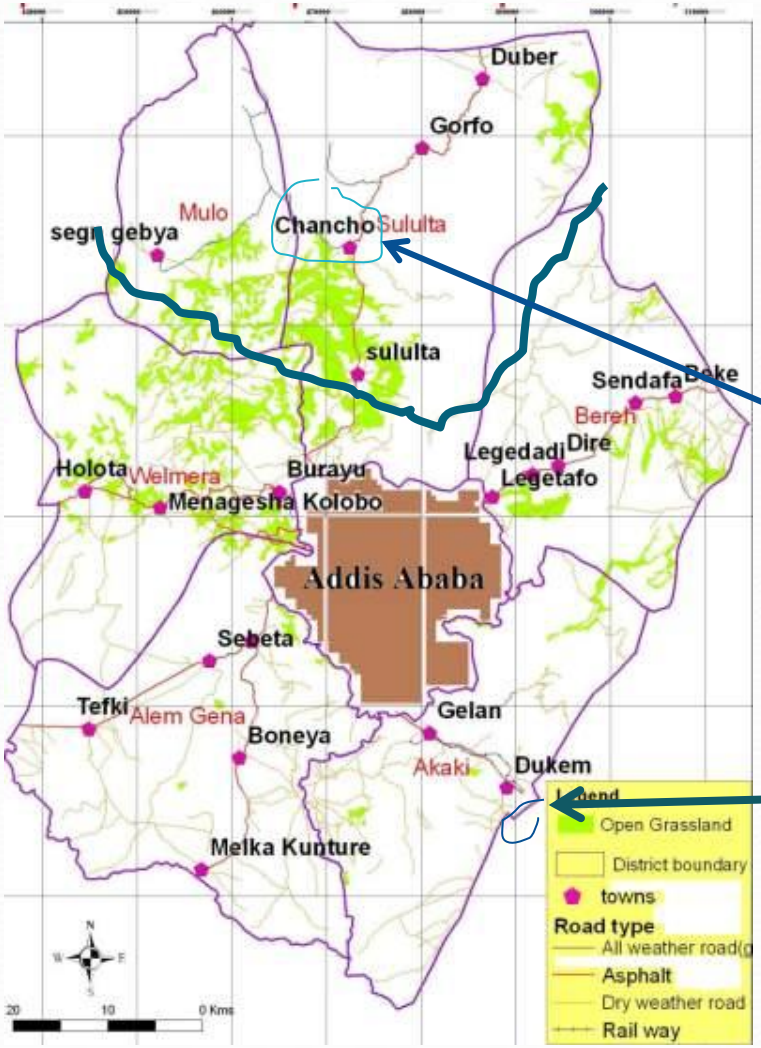


- U/s abstractions rise->decrease flow to D/s users
- Depends on urban location

- Urban waste->peri urban & rural Agricultural waste->urban
- Beneficial or harmful interaction

- Interdependency on natural resource
- Common interests->competitive

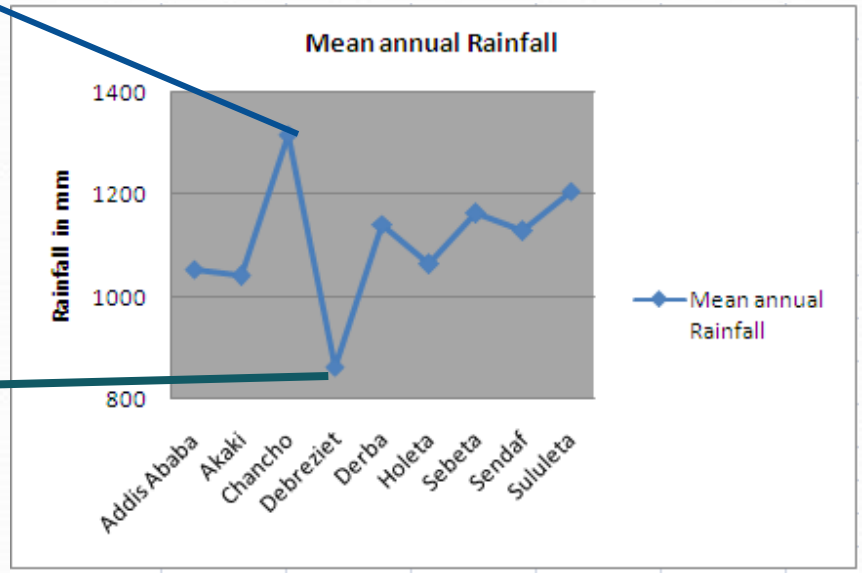
Study area



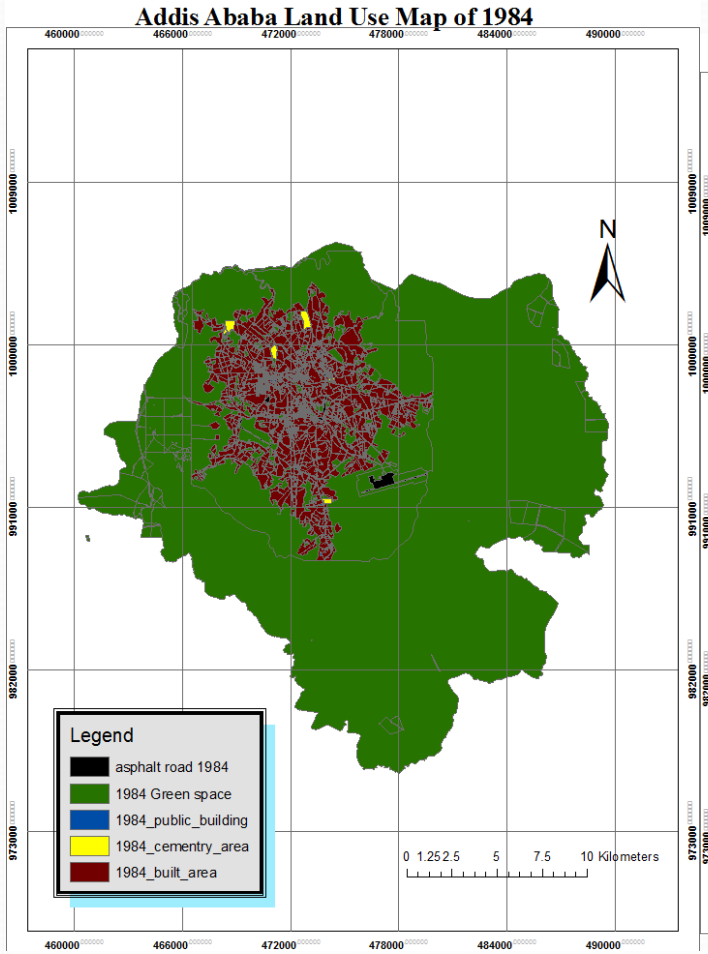
Population:

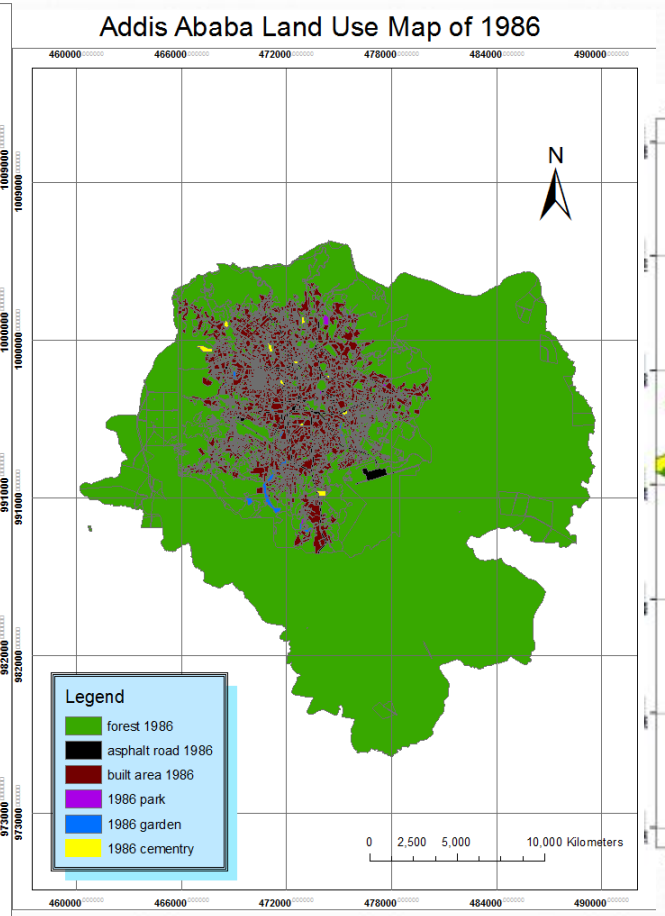
AA: above 3 million

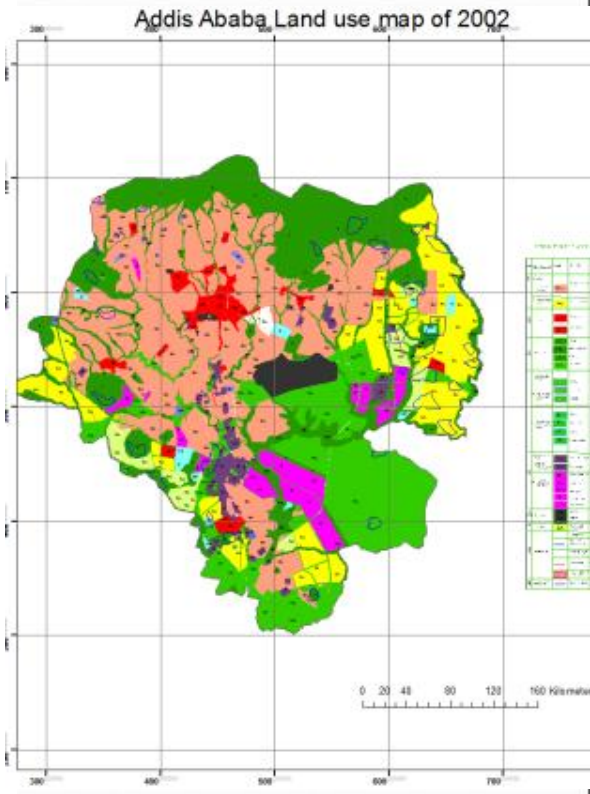
Special zone: 1 million



A. Land use changes: Addis Ababa

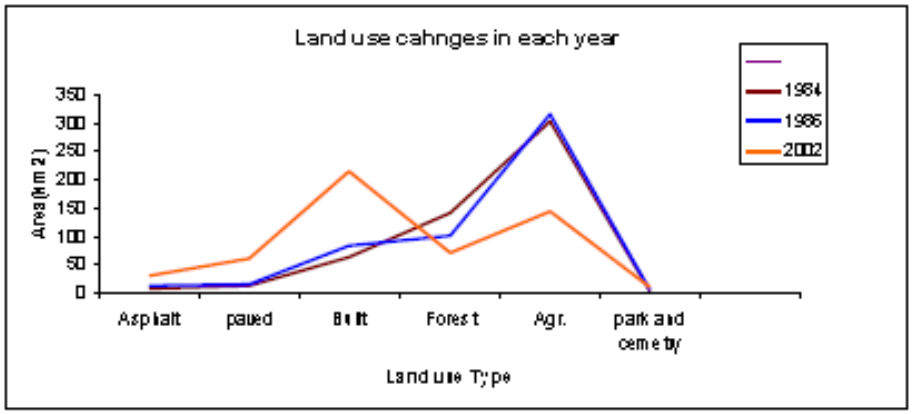




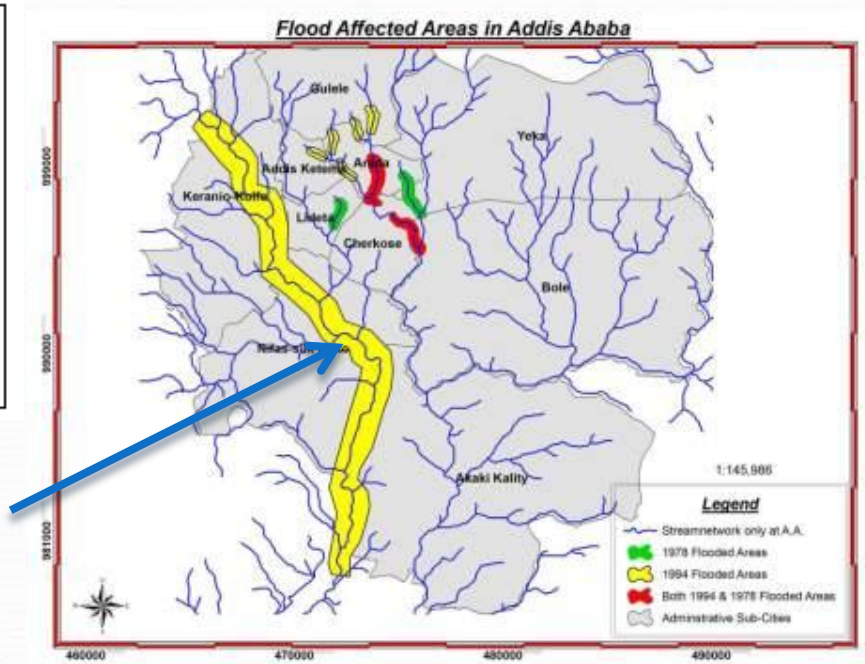


Land use change of AA

Year	Total Area (km^2)	Land use Type					
		Impervious Area			Pervious Area		
		Asphalt (km^2)	Paved (km^2)	Built (km^2)	Forest (km^2)	Agriculture (km^2)	Cemetery and park (km^2)
1984	517.87	4.72	11.16	60.15	139.023	301.7	1.09
1986	517.87	10.734	12.864	80.173	98.062	314.67	1.38
2002	517.87	27.704	57.358	212.733	68.717	142.87	8.43



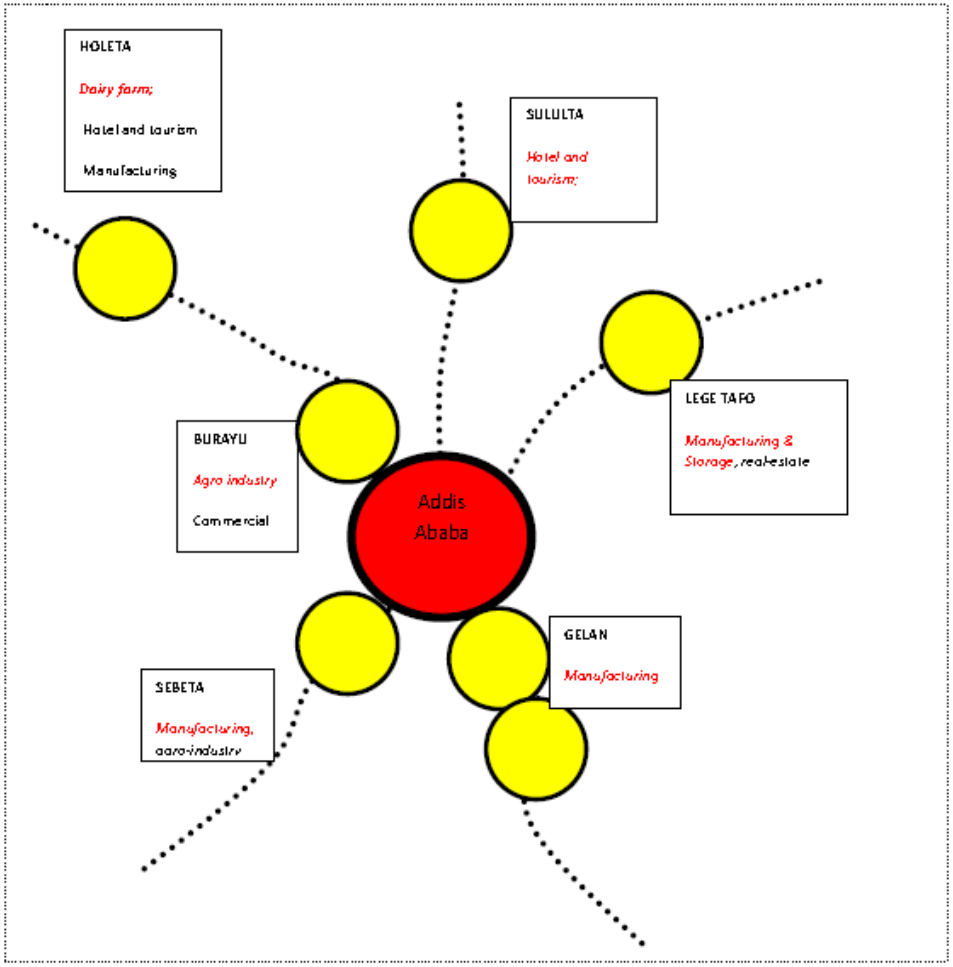
- Run off potential increased 1984: 0.28 2002: 0.45
- 50 % agricultural land is urbanized



Increased downstream flooding and inundation area

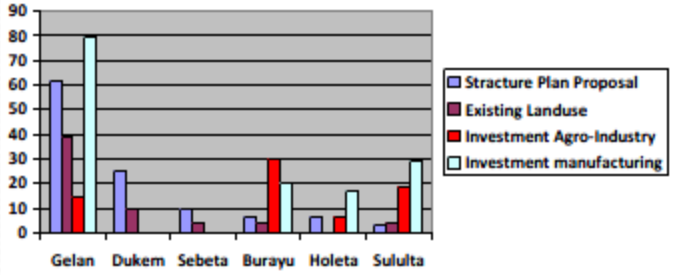
Land use changes: Special zone

Urbanization

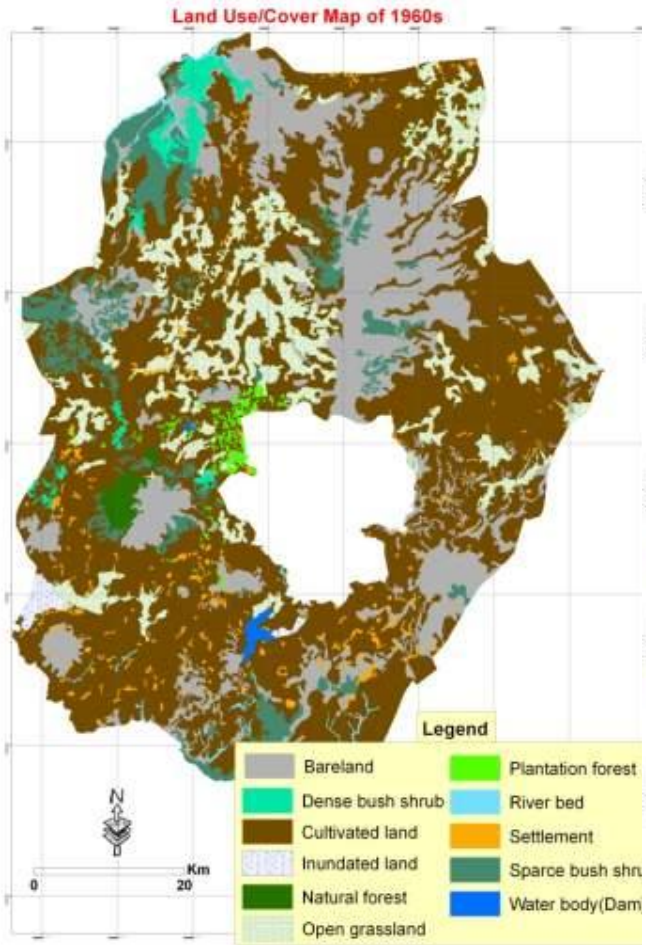


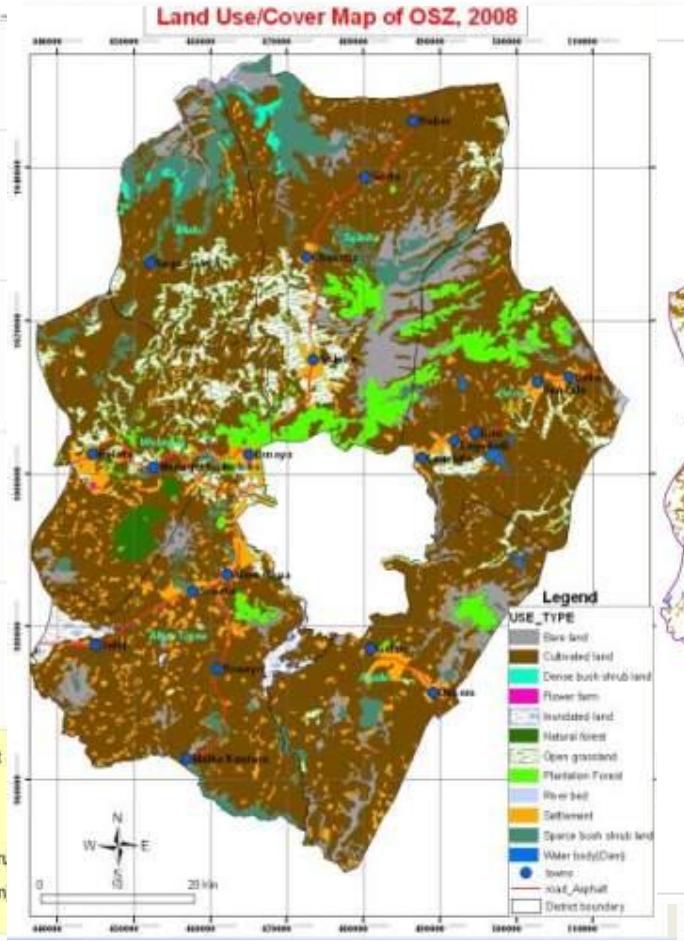
Land use types

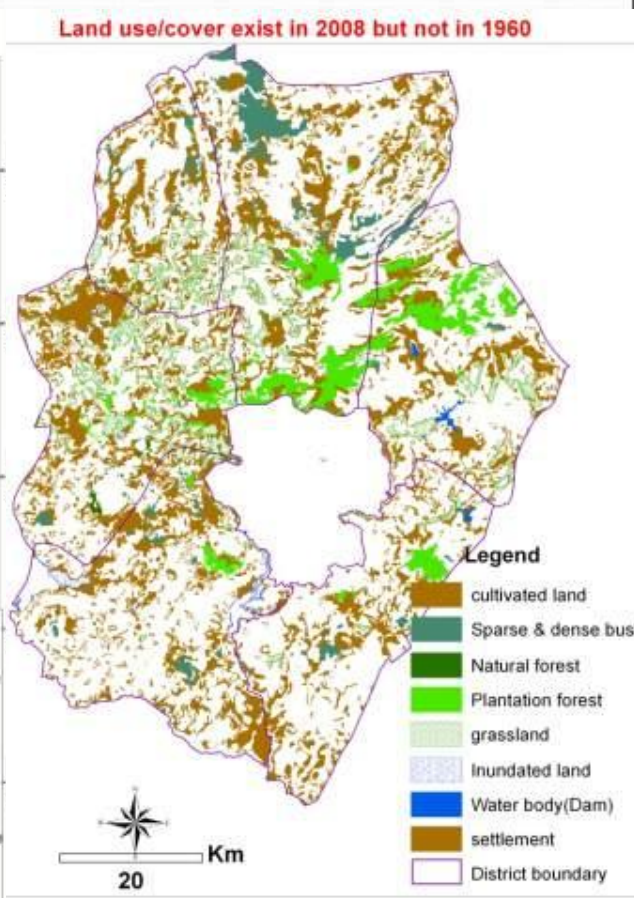
- Southern towns: Heavy industrial growth
- Northern :Agro industries and recreation



Land use changes: special zone







Land use changes: special zone

Land use/cover type		Year Area_ha		Gross change in ha			Change in percentage		
	1960	1980	2008	1980s-1960s	2008-1980s	2008-1960s	1980s to 1960s	2008 to 1980s	2008 to 1960s
Cultivated land	275644	296987	315557	21343	18570	39913	7.74	6.25	14.47
Grass land	53130	50200	34311	-2930	-15889	-18819	-5.83	-31.65	-54.84
water reservoir	1387	1919	937	532	-982	-450	38.35	-104.8	-48
Inundated land	2482	2570	4862	88	2292	2380	3.54	89.18	48.95
Dense bush and shrub	8576	7495	1905	-1081	-5590	-6671	-14.42	-293.43	-350.18
Sparse bush and shrub	32329	28125	29415	-4204	1290	-2914	-14.94	4.58	-9.9
Settlement	10160	12631	40842	2471	28211	30682	24.32	223.34	301.98
Natural forest	3293	3333	3648	40	315	355	1.21	9.45	10.78
Plantation forest	3801	10294	23629	6493	13335	19828	170.82	129.54	521.65
Bareland	103144	83687	41323	-19457	-42364	-61821	-23.24	-102.51	-149.6
River bed	3867	547	1152	-3320	605	-2715	-606.94	110.6	-235.67
Flower farm	NA	NA	283	NA	NA	283	NA	NA	NA

In a nutshell, the dynamics of interaction due to land use change

- AA urbanization-> increased frequency and extent of downstream floods (Akaki Wereda)
- Consequence in :
  - Loss of property & life
  - Cost of Adaption
- Increase land use change from the special zone intensive cultivation->Hydrological regime change
  - Sedimentation to Gefersa, Legedadi and Dire
  - Water qualitfy from pesticides, fertilizers , etc

B. Water resource development

Major water users & abstractions

Addis Ababa ->

Commercial, domestic, industrial

Existing supply: 280,000 m3/day

Required->479,000 m3/day

40% deficit->

- Legedadi reservoir->165,000 m^3/day
- Gefersa reservoir->30,000 m^3/day
- Akaki well field & intercity wells->85,358 m^3 /day

Water resource development

Surrounding areas

Drinking water supply

Population: 1 million

Rural coverage: 60%

Urban coverage: 56%

- Deep wells
- Shallow wells
- Springs

Yield varies from 5 to 25 l/s

Type of scheme	Total
Deep well	75
Shallow well	83
Spring gravity	12
Pumped spring	6
Spring on spor	96
Pumped spring	288
Surface(Legedadi)	1
Total	561

Water resource development

Water supply coverage

No	Name of Wereda	2011 population	2011 WS pop	% coverage
1	Mullo	47,217	27,858	59
2	Sululta	137,637	92,079	67
3	Bereke	115,270	78,776	68
4	Akaki	82,138	43,533	53
5	Sebeta Awas	142,344	62,631	44
6	Welmara	94,417	64,676	69
	Total	**619,023**	**369,553**	**60**

No	Name of Town	2011 population	2011 WS pop	% coverage
1	Chancho	18,730	10,670	57
2	Sululta	29,727	20,400	68
3	Legetafo legedadi	18,892	5,800	30
4	Sandafa Bereke	25,901	17,300	66
5	Galan	20,687	15,500	74
6	Dukum	28,917	15,200	52
7	**Sabata**	102,791	50,951	49
8	Holeta	40,097	26,310	65
9	Burayu	103,090	47,110	45
	Total	**388,832**	**209,241**	**56**

Extraction

- PCD based on national standard
- Rural 15 l/day
- Towns 20 l/day

Total extraction= 17000 m3/day

Private industries and commercial centres?????

Water resource development

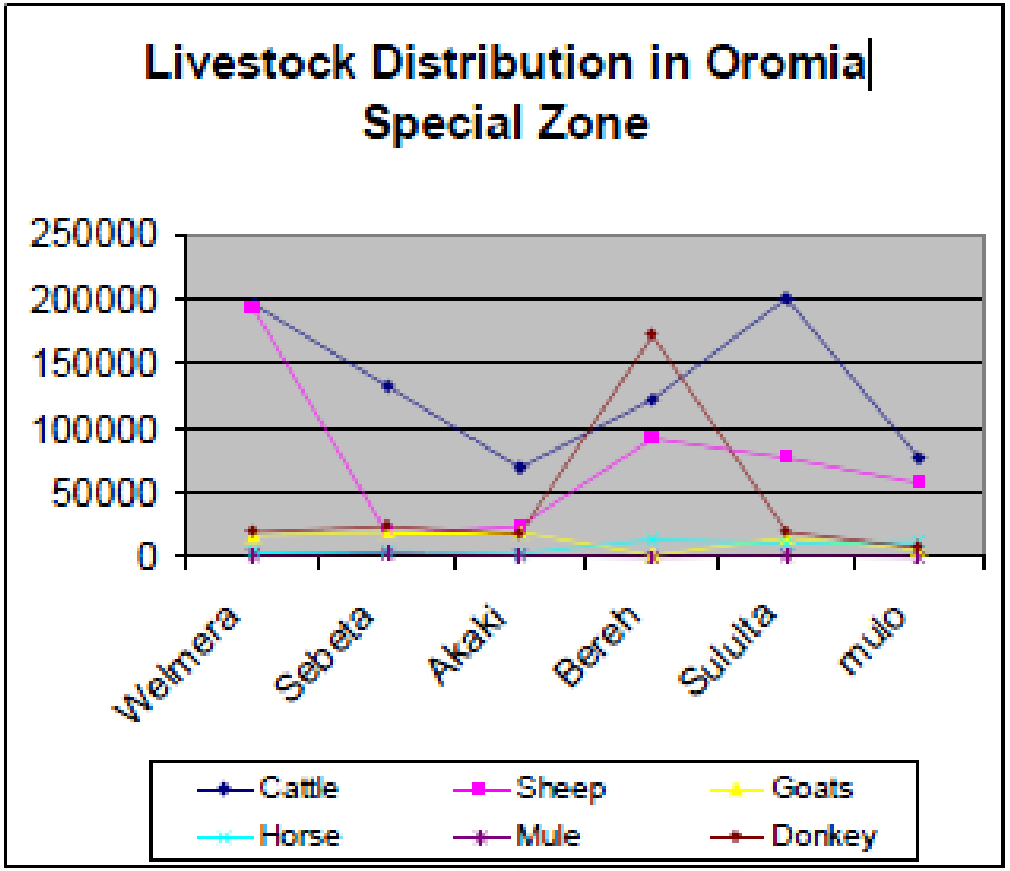
Agricultural water use: smallholders, private investors

- 315,517 ha cultivated land
- 95% smallholder farmers subsistence
- Traditional agricultural systems
- Most use their own farm seed: lower water productivity
- Fertilizer->blanket application->with out soil fertility test, extent of yield, crop & climate specific
- 312ha flower farm

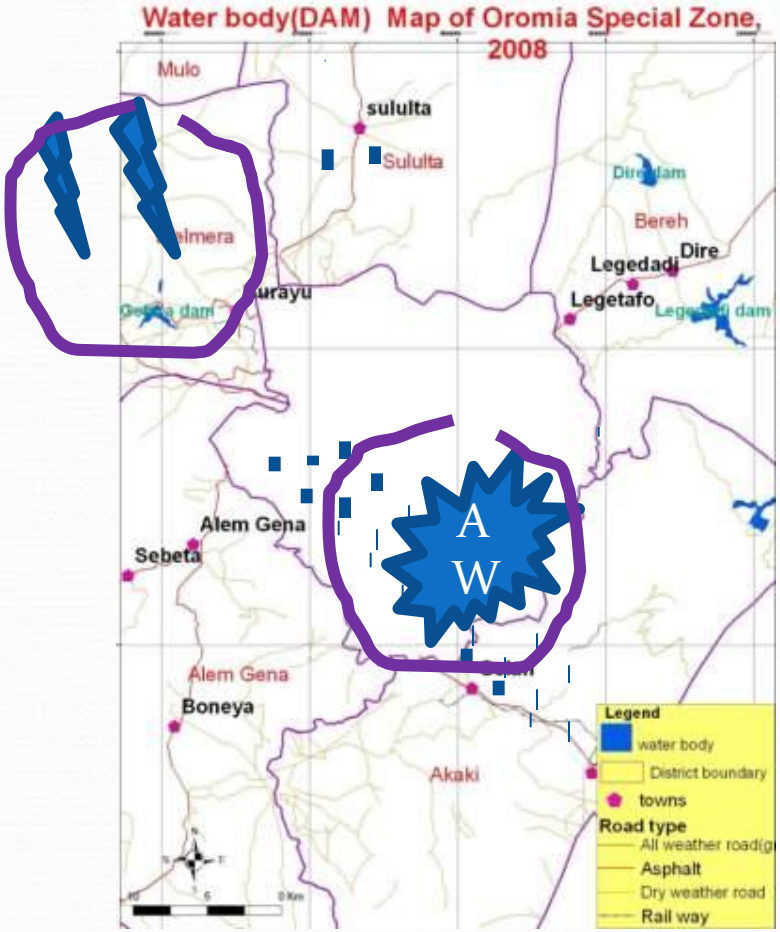
Water resource development

Livestock Watering

- Abundant livestock population
- estimated 792087
- Source of drinking: rivers, springs, ponds and swamps
- Intermittent rivers/ponds: dry season shortage



Water use maps



- Growing Industrial and commercial water demand in Akaki compet with Akaki well field
- Ground water based interaction

Different Sources of Water for Different Purposes – Rural and Urban (Percentage)

Source of water	Drinking		Cooking		Cleaning		Livestock	
	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban
River	29.1	15.1	30.9	14.9	45.2	24.5	59.4	22.3
Pond/Lake	12.4	3	12.3	3.2	14	4.1	16	4.6
Hand dug well	17.6	9	17.6	10.1	15.7	11.4	12.6	2.9
Developed spring	22	2.7	22	2.6	14.2	2.4	6.2	2.9
Piped water	18.8	70.2	17.4	69.2	10.9	57.6	6.2	2
Not using	0	0	0	0	0	0	0.5	57.7
Open surface	41.5	18.1	43.2	18.1	59.2	28.6	74.4	26.9

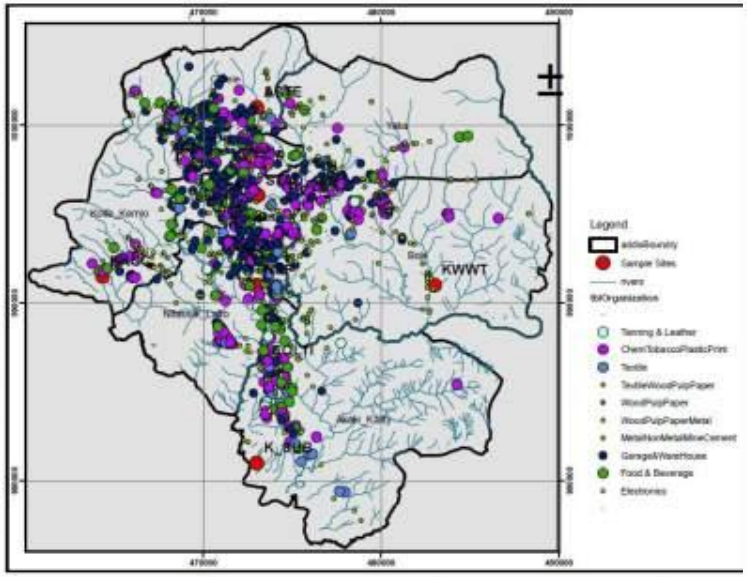
In summary

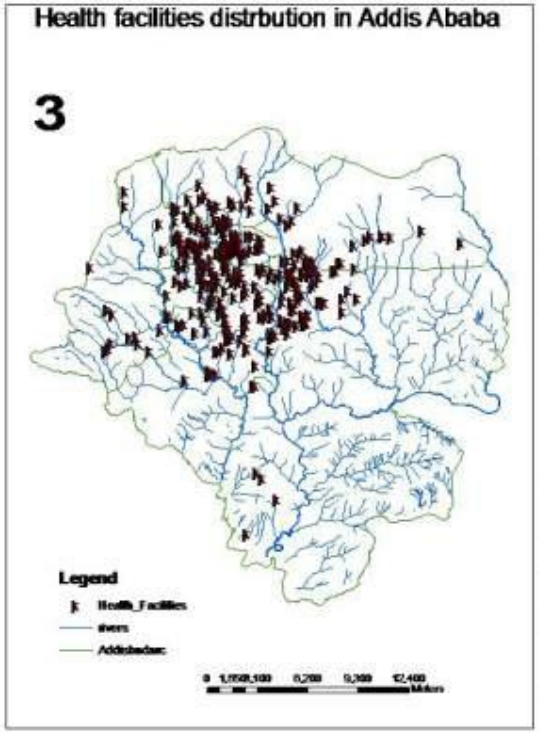
- Increased water demand for common water resources
- Increased water development from the same water sources
- Increasing water consumption by the communing people from the surrounding and vice versa interaction

Likely competition for the common resources will rise

C. Waste water management

- Domestic, industrial, commercial and agricultural wastes





•Open space disposal Addis: 7% sewage collection and disposal
•90 % industries with out treatment plant
•BOD and total coliform examination results exceeds the WHO environmental standards

Waste water management

- Agricultural wastes: Fertilizer and pesticides

Nitrates->health risk->sometimes cancer

- Pesticides: can contaminate water by volatilization,

leaking, and runoff.

- Floriculture activities ->different types of waste ->dangerous to health

Waste

Risk

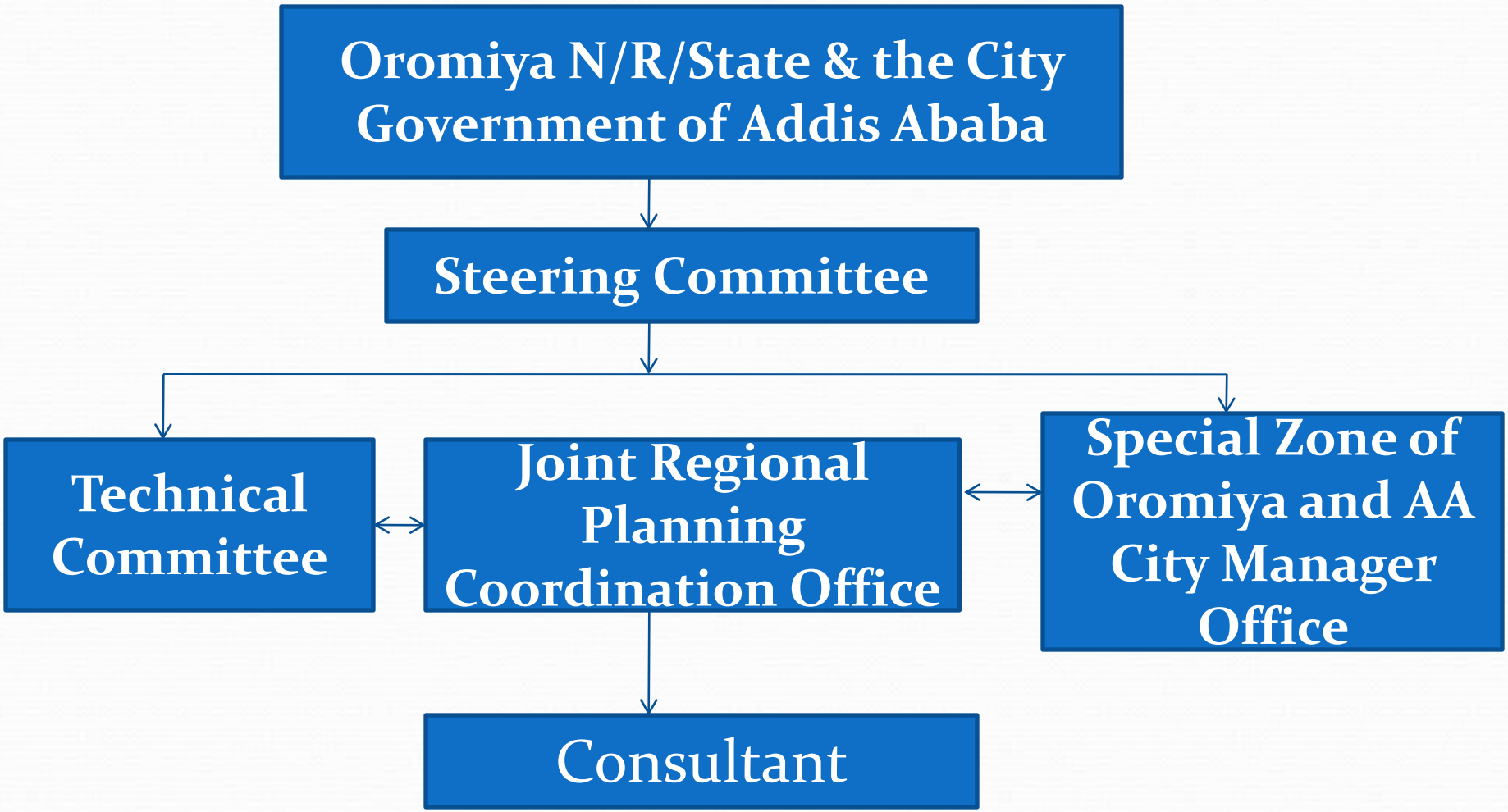
- Irrigation practiced with out ensuring the suitability of water for crop and health
- Flood spread pollutant to farm land and grazing land->livestock health risk

Opportunities

- Water demand rise->reallocate to urban->limit water for agriculture
- Waste water->Readily available water ->Reduce fertilizer cost

D. Regional integration

- Regional planning focused on administrative boundary, not hydrological boundaries
- Undesirable effect from urban to rural and vice versa as stated above
- Addis entirely depend on Special zone on water resources
- The water resource is a common source
- Formal agreement not established between AA & SZ
- Some instances: AAWSA and Gerefersa forest plantation


Oromiya N/R/State & the City Government of Addis Ababa
Steering Committee
Technical Committee
Joint Regional Planning Coordination Office
Special Zone of Oromiya and AA City Manager Office
Consultant

Conclusion

- AA->Rapid urbanization->Flood risk propagation
- SZ-Cultivation increased severely->sedimentation to AA Reservoirs
- Dependency of SZ domestic Ground on ground water->little interaction with AA supplies.
- Akaki well field vs Akaki Wereda Ground water competition
- Welmera Wereda flora farms vs Gefersa resevoir
- Poor urban and aricultural waste Collection & diposal

Recommendations

- Promoting positive two-way interactions reciprocal relations between rural and urban areas
- promote a more balanced use of natural resources such as water
- Recycling urban wastewater for rural agriculture, after ensuring that its quality is suitable for crops and human health

❖***Act on the governance mechanisms***