Leibniz Centre for Agricultural Landscape Research (ZALF)

Identifying drivers of land degradation in Xilingol, China, from 1975–2015

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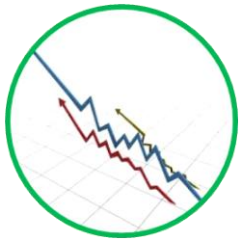
Outlines

Land degradation

Drivers Collection

Partial Order Theory



Results & Discussion

Land degradation

Xilingol, Inner Mongolia, China

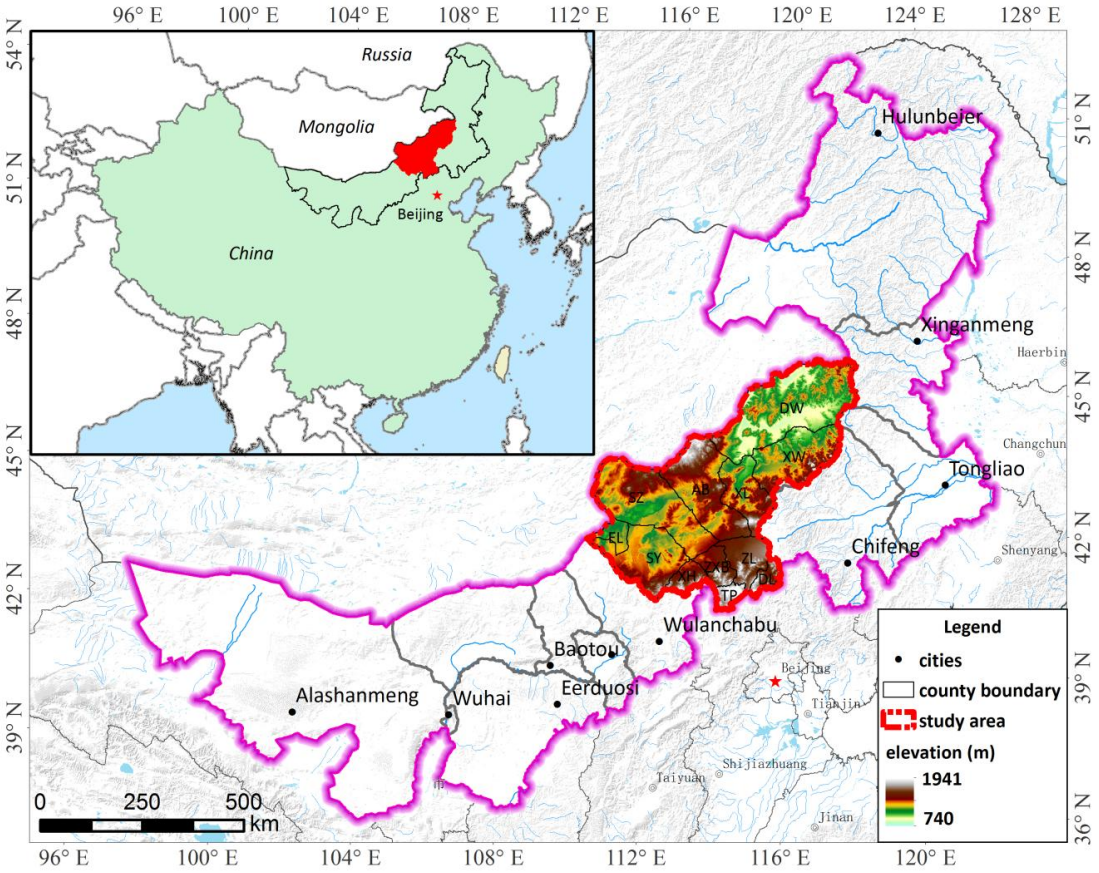
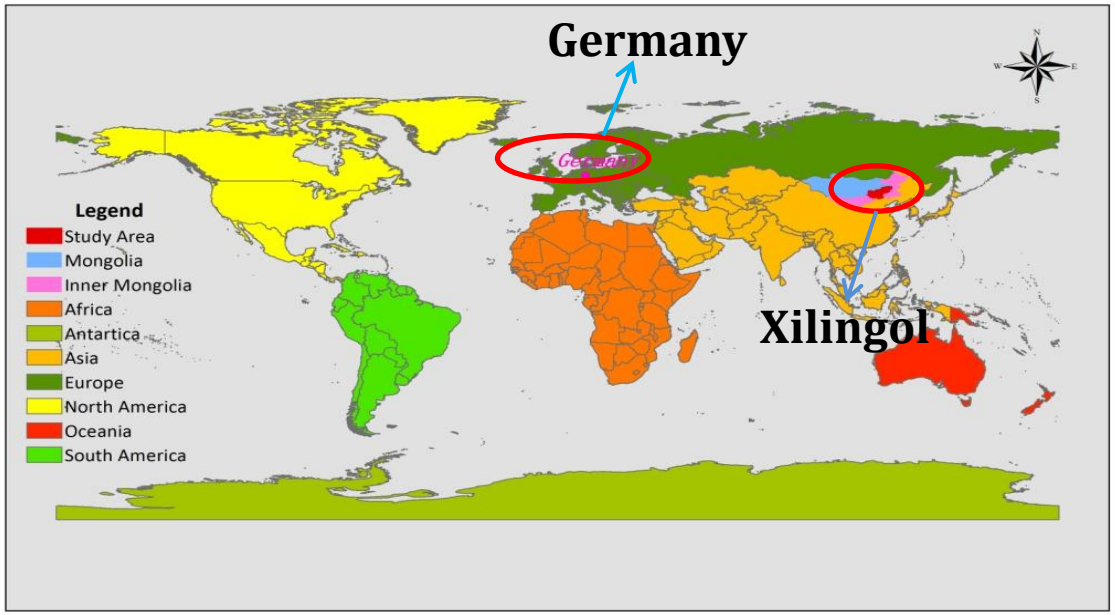


Photo source: Batu, 2015

Xilingol, Inner Mongolia, China



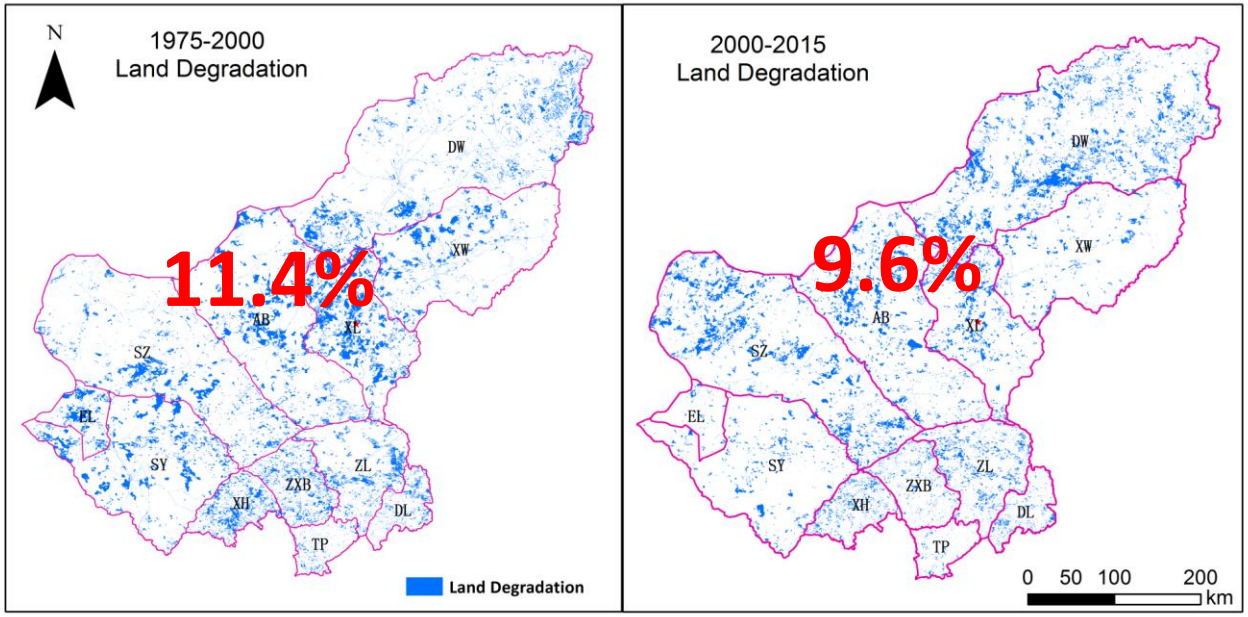
Land degradation

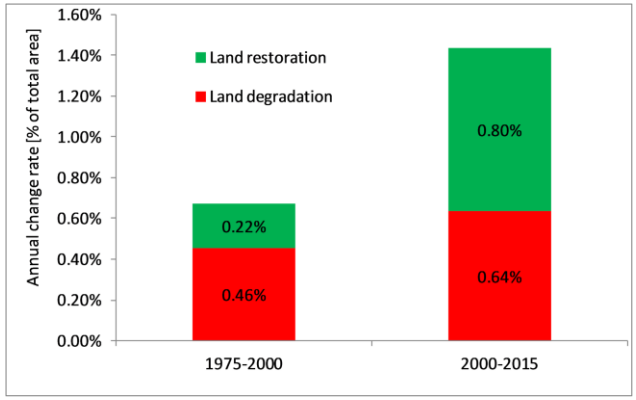
Mining
Livestock
Road
Urban/rural
……..

Degradation
Grassland degradation
Surface water loss
Woodland loss
……..

Land degradation

- Compare and rank the LD drivers at county level in two periods of 1975-2000 and 2000-2015.





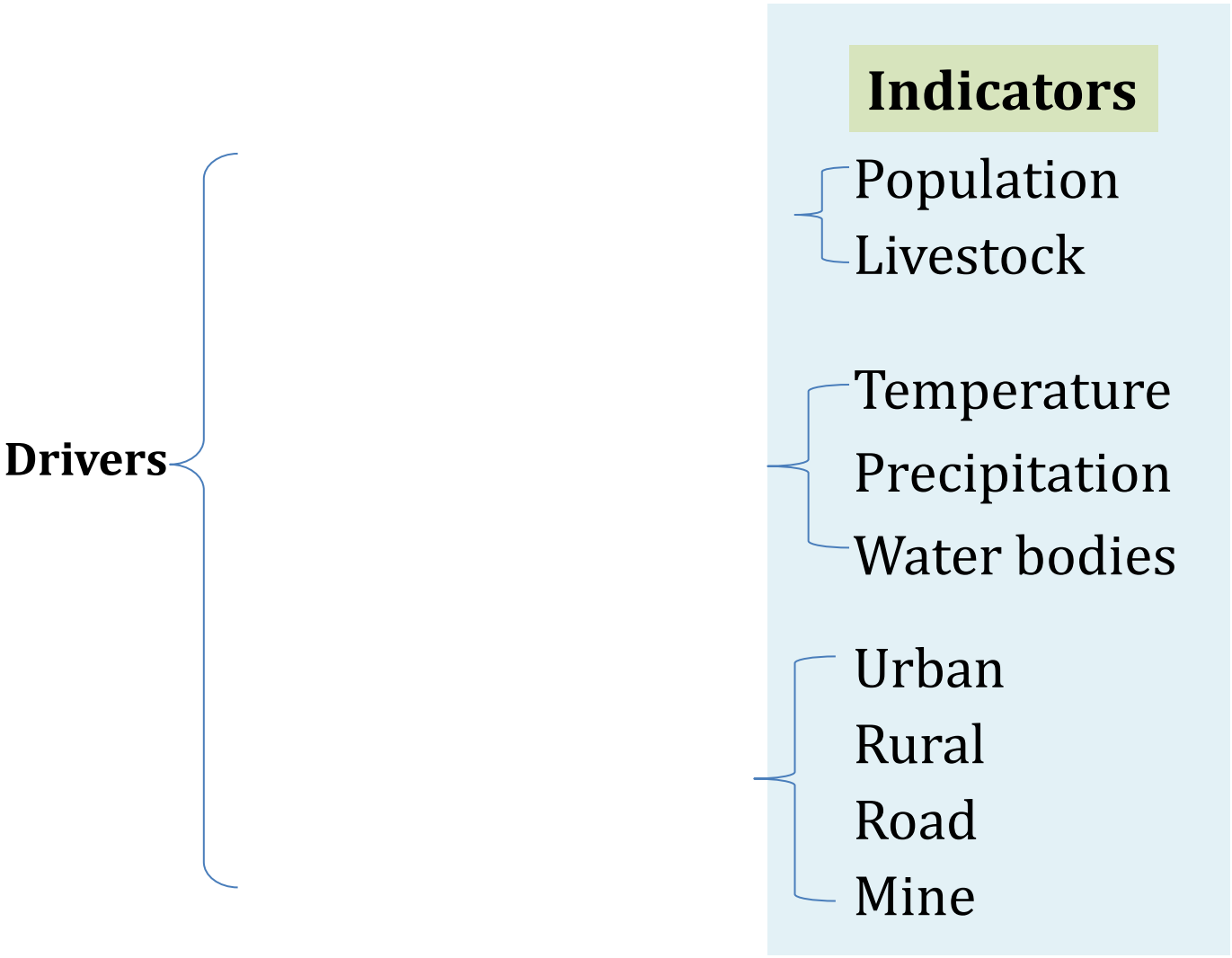
Data sources:
Batunacun, et al. 2018

Land degradation

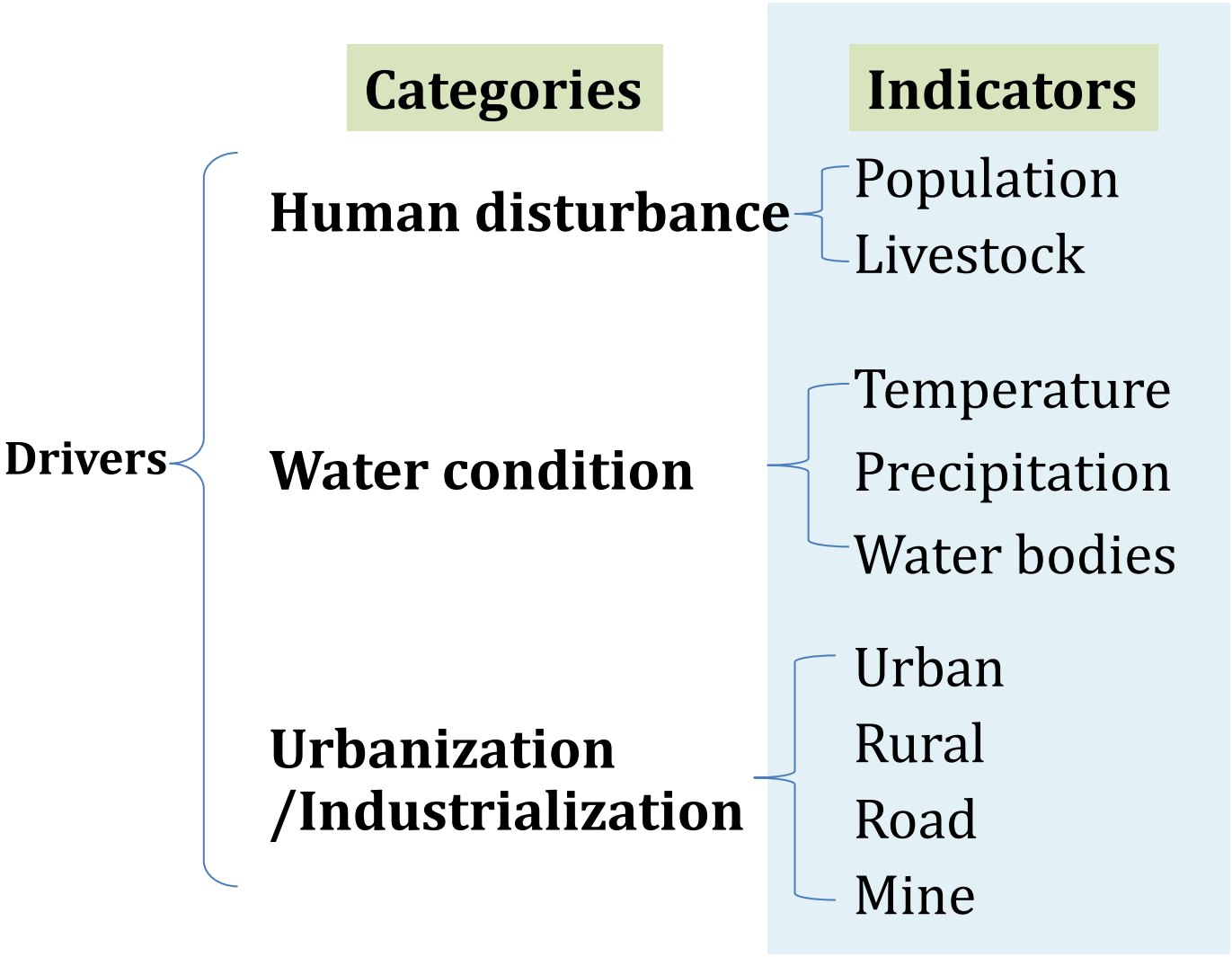
- Analyse temporal and spatial LD drivers dynamic in Xilingol.

- Summarize the ecological policies and discuss possible policy for the future.

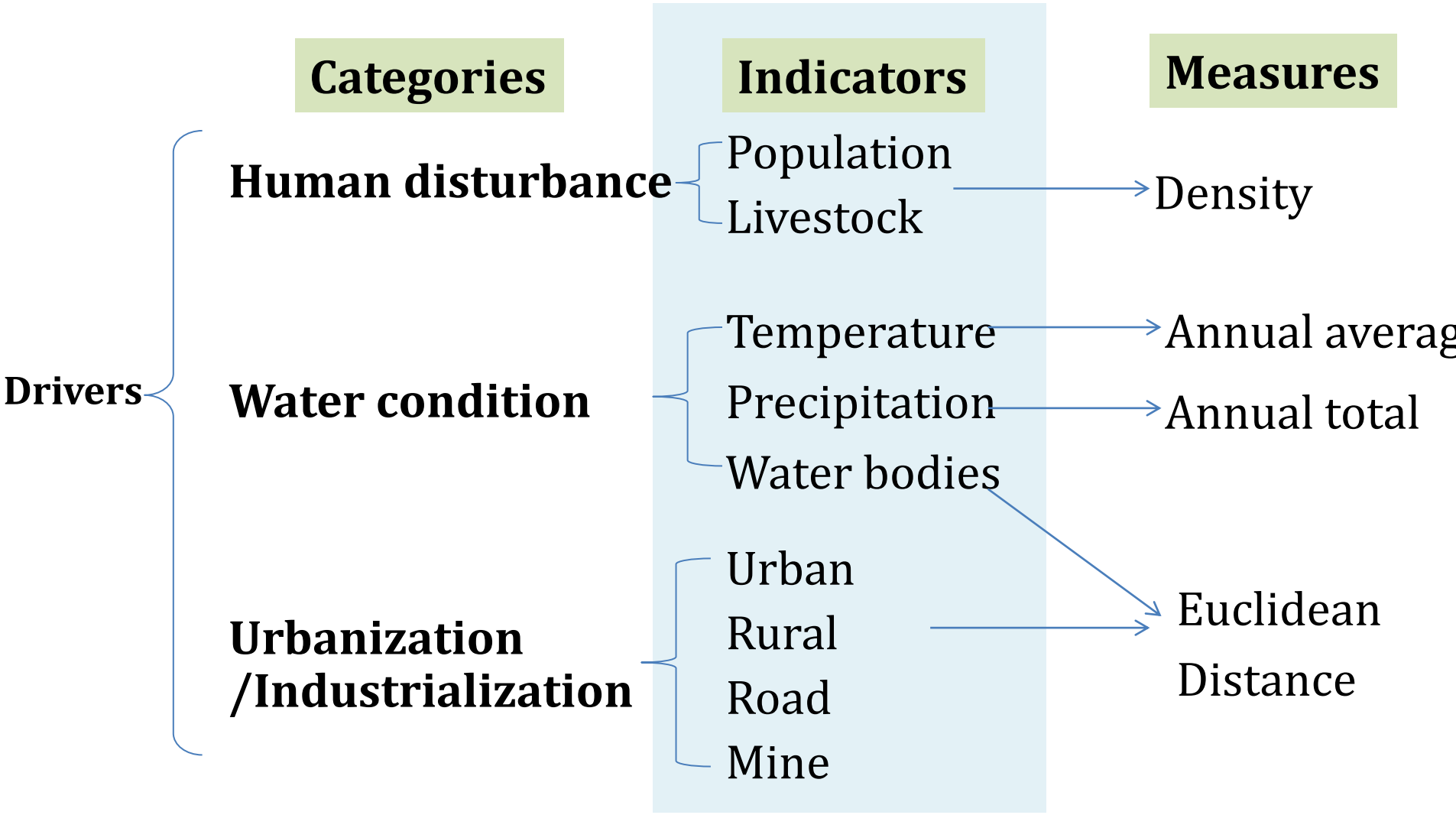
Drivers Collection



Drivers Collection



Drivers Collection



Partial Order Ranking Theory

Features of Partial Order Theory (POR)

- POR conceptualises the comparison of element.
- Possess more than one attribute.
- Rank the drivers of land degradation in Xilingol.

Partial Order Ranking Theory

Features of Hasse Diagram Technique (HDT)

- Visualization of POR .

- Posets: The projects and their indicators.

  Data matrix: Q

$$Q\ (N \times R)$$

Land degradation: Objects **Drivers: Indicators**

Partial Order Ranking Theory

Data organization.

Partial order sets: Posets

Obects/	Urbanization				Water condition			Human disturbance	
Indicators	Urban	Rural	Road	Mining	Water	Temp	Pre	Pop	Livestock
County 1	V11				……				V1n
County 2	V21								V2n
……									
County 12	V121				……				V12n

Partial Order Ranking Theory

Normalization and Orientation.

- **Normalization:**

  Normalized value between [0,1]

- **Orientation:**

  Defined as “Strong” and “Weak”

  Strong: Strong effects on LD process.

  Weak: Small effect on LD process.

Partial Order Ranking Theory

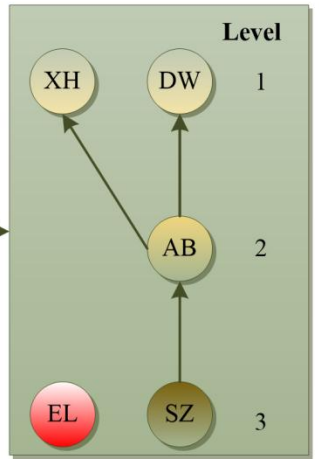
- **Hasse Diagram Technique (HDT)**

➢ HDT, exemplified by urbanisation drivers between 2000 and 2015.

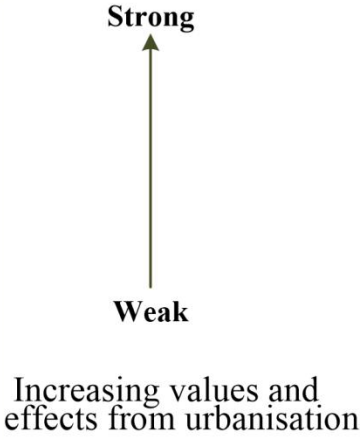
The input data of HDT

	2000-2015 Urbanisation indicators							
County Name	Durban 2000	Drural 2000	Droad 2000	Dmine 2000	Durban 2015	Drural 2015	Droad 2015	Dmine 2015
DW	0.50	0.75	0.80	0.82	0.49	0.70	0.71	0.84
XH	0.83	0.60	0.66	0.86	0.88	0.49	0.65	0.81
AB	0.32	0.56	0.59	0.25	0.26	0.45	0.39	0.35
SZ	0.00	0.22	0.00	0.00	0.00	0.04	0.19	0.00
EL	0.96	0.00	0.87	0.97	1.00	0.46	0.87	1.00

HDT



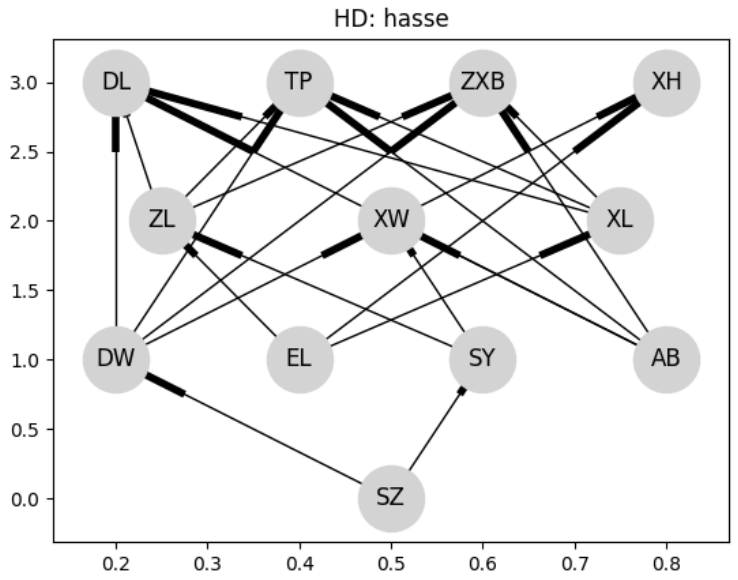
The values and effects



Results & Discussion

- Human disturbance 1975-2000

1975-2000 Human disturbance input data				
county	1975_popD	2000_popD	1978sheepD	2000sheepD
DW	0.01	0.02	0.12	0.40
EL	0.02	0.05	0.00	0.00
DL	0.38	0.44	0.73	0.79
TP	1.00	1.00	1.00	0.53
ZL	0.11	0.11	0.73	0.38
ZXB	0.18	0.18	0.75	0.85
SY	0.03	0.04	0.12	0.24
SZ	0.00	0.00	0.12	0.15
XW	0.04	0.04	0.18	0.87
XL	0.10	0.14	0.01	0.46
XH	0.08	0.08	0.42	1.00
AB	0.01	0.01	0.09	0.44



Notes:
popD: population density
sheepD: livestock density

Results & Discussion

- Human disturbance 1975-2000

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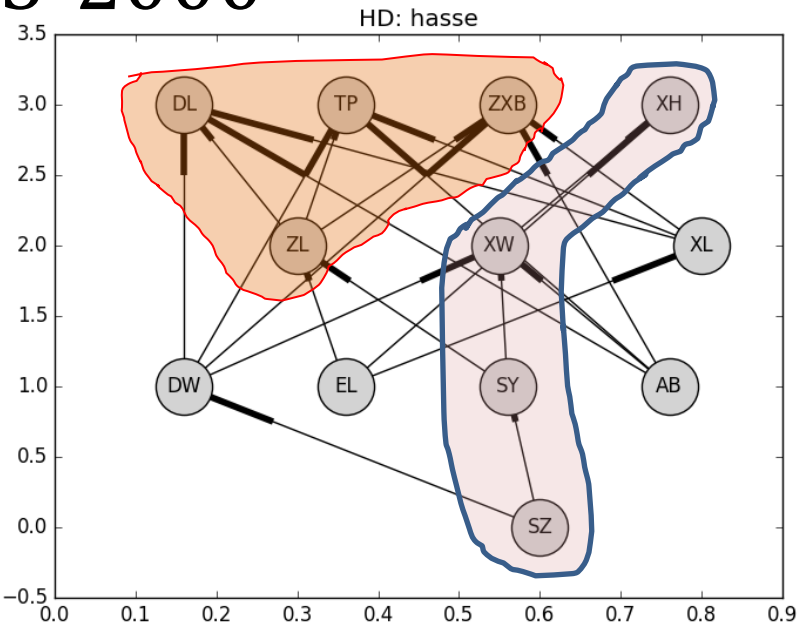


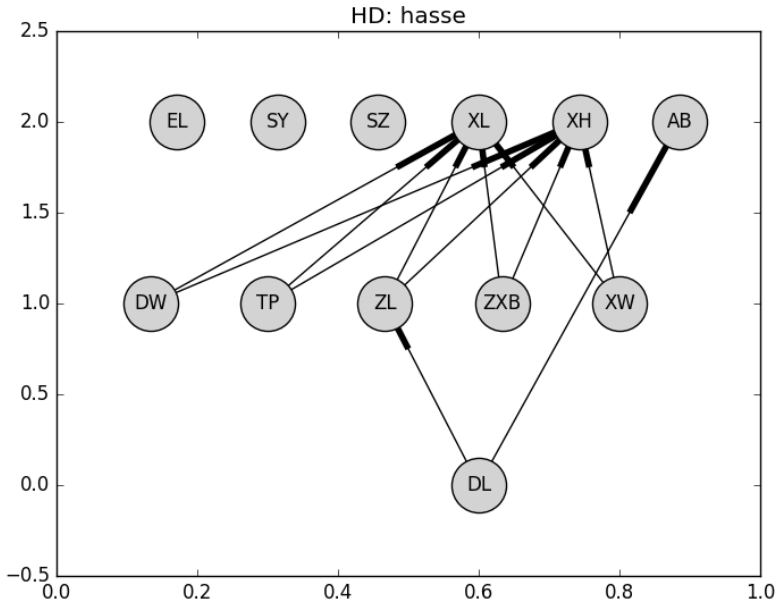
Dominant livestock chain

With both high population and livestock

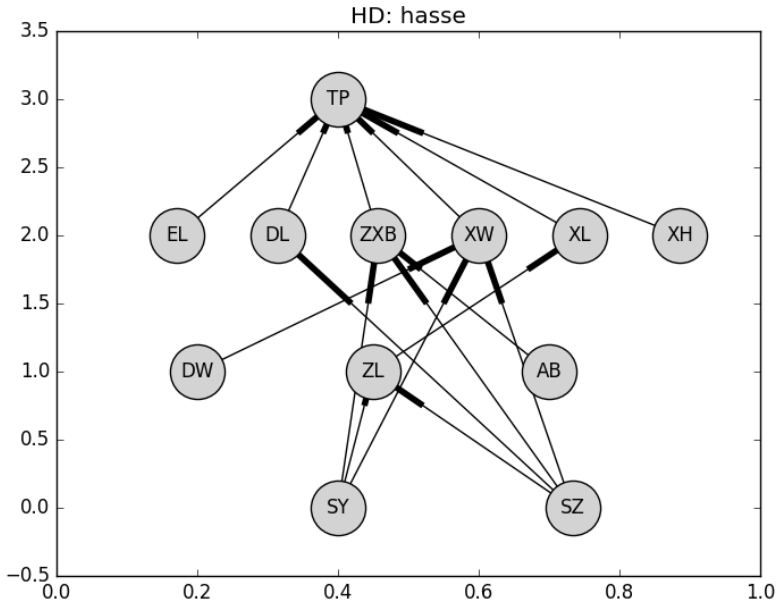
Results & Discussion

1975-2000

Water condition



Urbanization

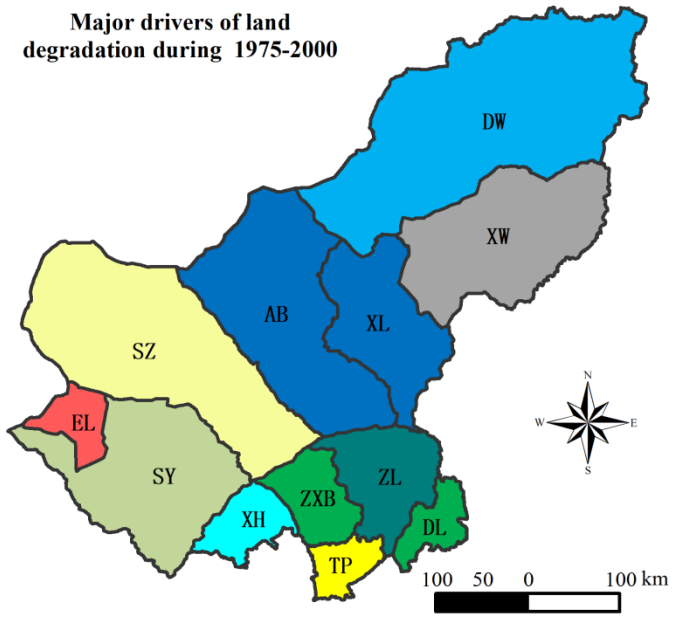


Results & Discussion

Order ranking for all drivers in 1975 and 2000

- Human disturbance: dominant driver in **eight** county.
- Water condition: dominant driver in **six** county.
- Urbanization: dominant driver in **four** county.

Ranking of drivers (1975-2000)				
County	Human disturbance	Water condition	Urbanisation	Dominant drivers
ZXB	1	2	2	Human
DL	1	3	2	Human
XW	2	2	2	Human,water and urban
SY	3	ISO	4	Human
XL	2	1	2	Water
AB	3	1	3	Water
TP	1	2	1	Human and urban
ZL	2	2	3	Human and water
XH	1	1	2	Human and water
DW	3	2	3	Water
SZ	4	ISO	4	Human and Urban
EL	3	ISO	2	Urban

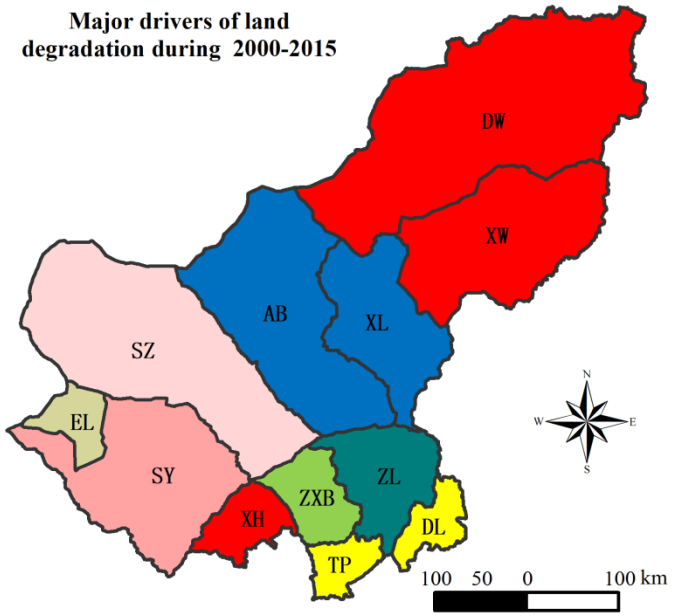


Results & Discussion

Order ranking for all drivers in 2000 and 2015

- Human disturbance: dominant driver in ~~eight~~ **five** county.
- Water condition: dominant driver in ~~six~~ **three** county.
- Urbanization: dominant driver in ~~four~~ **seven** county.

Ranking of drivers (2000-2015)				
County	Human disturbance	Water condition	Urbanisation	Dominant drivers
ZXB	2	ISO	3	Human
DL	1	2	1	Human and Urban
XW	3	2	1	Urban
SY	4	ISO	3	Urban
XL	2	1	2	Water
AB	5	1	2	Water
TP	1	3	1	Human and Urban
ZL	2	2	3	Human and Water
XH	2	2	1	Urban
DW	4	2	1	Urban
SZ	6	ISO	4	Urban
EL	3	ISO	ISO	Human



Results & Discussion

Order ranking for all drivers in 2000 and 2015

- Human disturbance: dominant driver in ~~eight~~ **five** county.
- Water condition: dominant driver in ~~six~~ **three** county.
- Urbanization: dominant driver in ~~four~~ **seven** county.

- Drivers group remained unchanged area: TP and DL.
- No dominant driver area: EL.
- Urbanisation increased and has now become more dominant than human disturbance after 2000.
- Water conditions as a driver causing LD in almost all counties.

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Identifying drivers of land degradation in Xilingol, China, between 1975 and 2015. *Land use policy* (Under review).