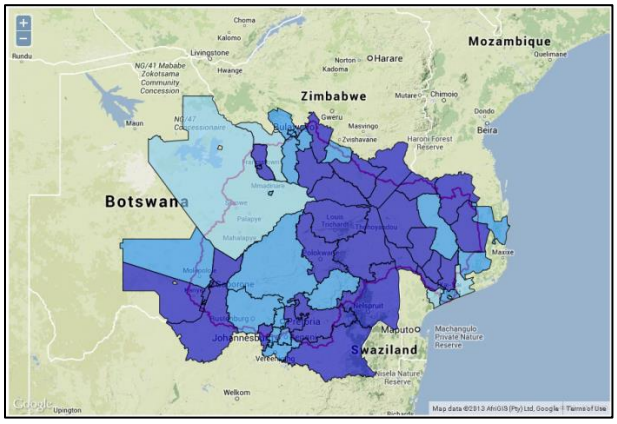
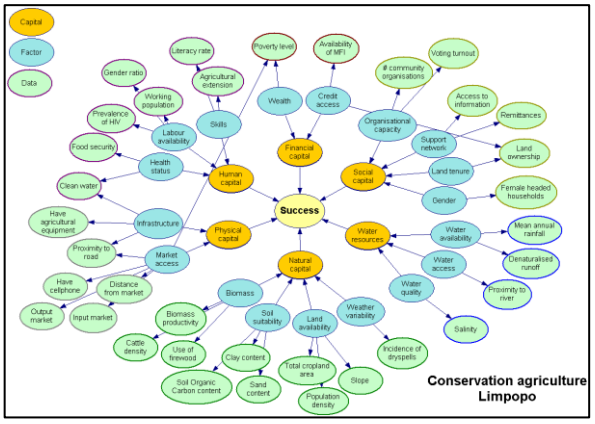
TAGMI Bayes Network Model Result Maps and Network Images for the Limpopo Basin





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Acknowledgements

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Bayesian Network Model in Detail

The Bayesian Model calculates a desired outcome, '**Success'**, which is the likelihood that an AWM technology introduced in a target community will still be in use 2 years after the intervention project has ended. Based on participants' discussions, and using the DFID Sustainable Livelihood Framework (DFID, 1999), 'Success' is conditional on adequate levels of 5 **capitals**: Human, Social, Financial, Physical and Natural. Water resources are included as a separate 6th capital given its centrality to AWM. Each **capital** comprises 2-4 key **factors** (e.g. Human capital is a combination of **Labour availability**, **Skills**, and **Health**). Each **factor** is described by 1-3 **data variables**, which are the foundation of the model (e.g. **Labour availability** is indicated by the relative size of the **working age populatio**n and the **gender ratio** in the population).

The **linking arrows** convey the conditional probabilities of how each node in the network influences the presence of the next node. The model calculates the probability that the **factor** is present given knowledge about the state of its **data variable** (high, medium or low), then the probability that the **capital** is present given the calculated state of its **factors**, then the probability that **success** is present given the calculated state of all capitals. A similar application of Bayesian network modeling to analyse the likelihood of water poverty is explained in detail in Kemp-Benedict et al. (2009).

Interpreting the result

The resulting '**likelihood of success'** is influenced by:

The data itself

- the data distribution is standardised: all data is classified into 3 categories (lowmed-high) of equal numbers of districts
- results therefore show relative differences across districts
- the data quality may skew the distribution: where coarser data is allocated to the district-level, large blocks of districts with similar values are created

The importance of the data

- the conditional probability tables linking the data to the factors reflect both the *type* (positive or negative) and *strength* (very strong - strong -weak) of the relationship between the data and the factor
- a *very strong* relationship has more effect on the value of the factor, and therefore contributes more to the final result, than a weak relationship
- most of the data is set to a very strong relationship with the factor it represents, unless expert input indicated otherwise

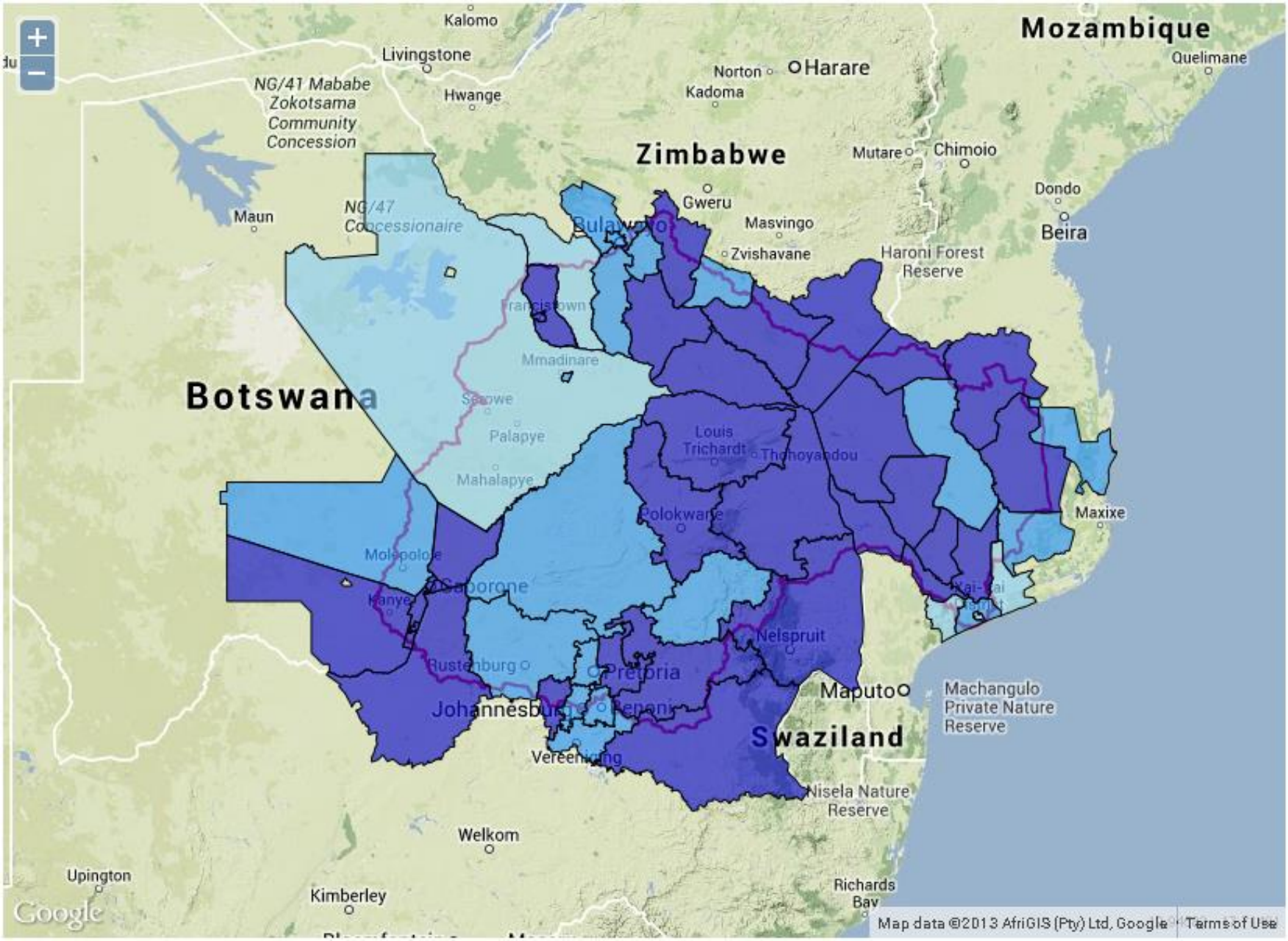
The importance of the factors

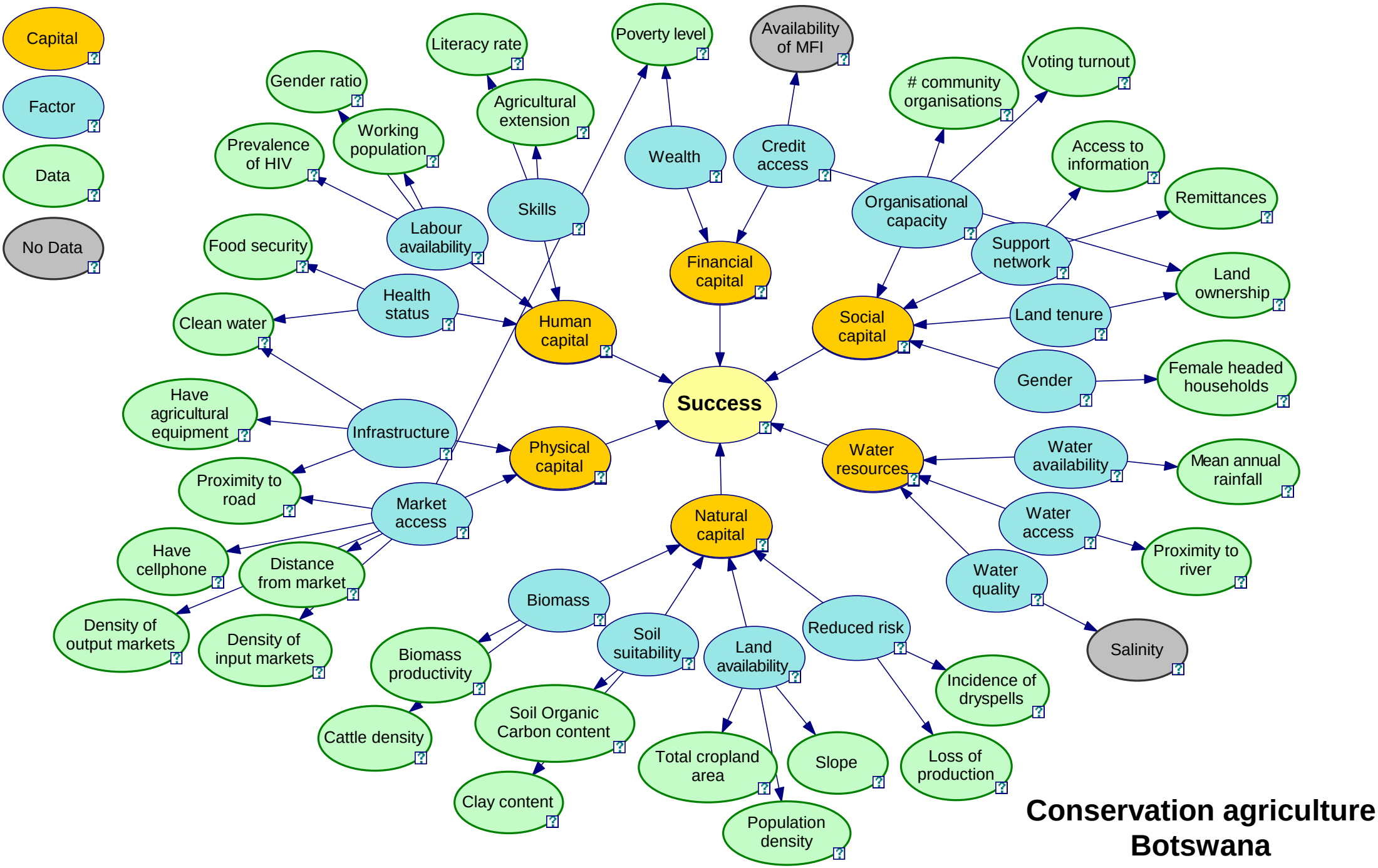
- the calculated value of each factor also carries a weight that reflects how much it contributes to achieving the capital it belongs to - e.g., do **Health status**, **Labour availability** and **Skills** contribute equally to achieving **Human capital** or not?
- a factor with a high weight will have more effect on the value of the capital, and therefore contribute more to the final result, than a factor with a low weight

The importance of the capitals

- the calculated value of each capital also has a weight which reflects how necessary that capital is to achieving long-term success of the project:
    - if a capital that is essential is absent, the likelihood of success will be significantly reduced
    - if the capital is important but not essential, the likelihood of success will not be much affected

Conservation Agriculture

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Data
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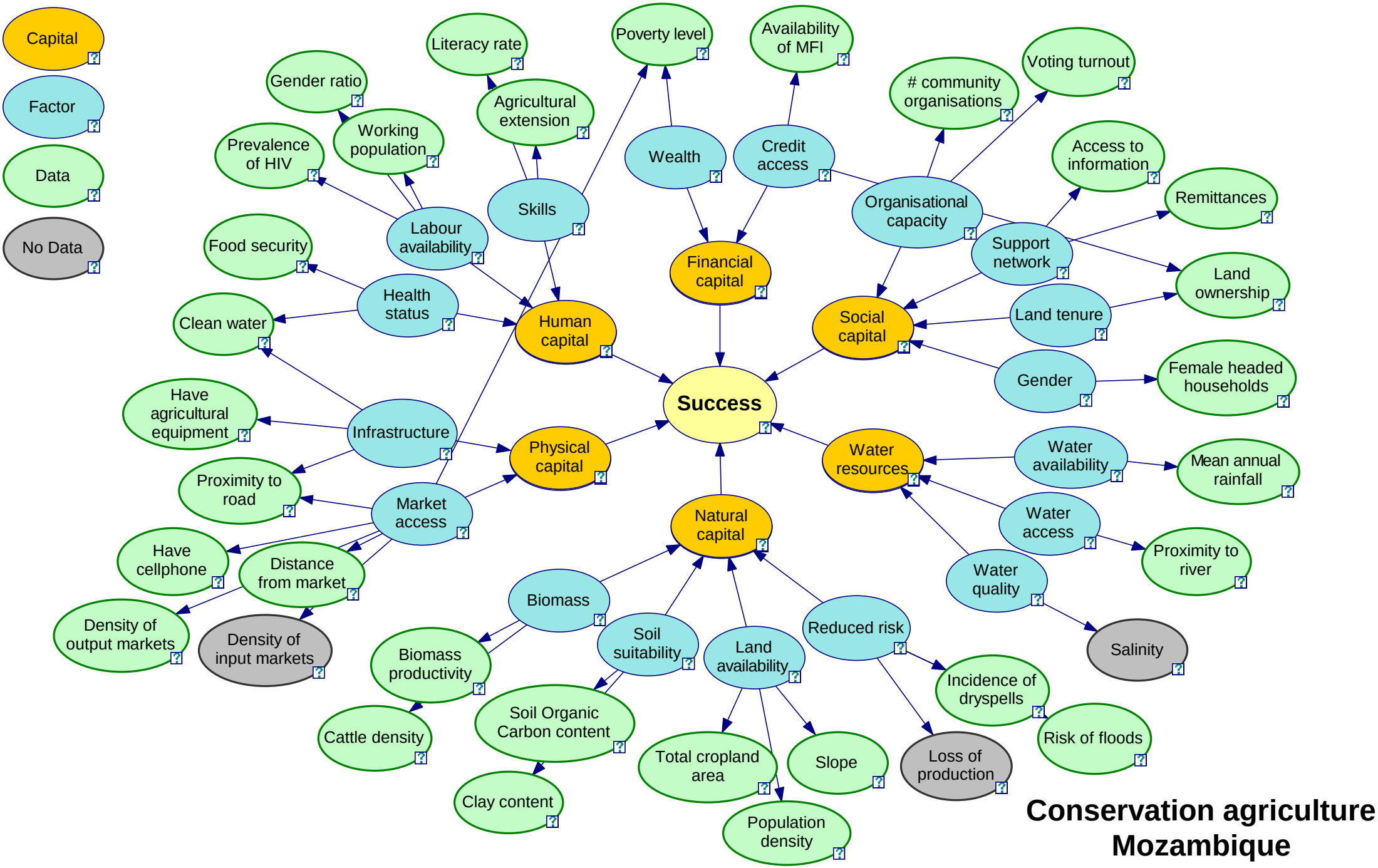
Social capital
Financial capital
Physical capital
Natural capital
Water resources
Infrastructure
Market access
Labour availability
Skills
Health status
Food security
Clean water
Prevalence of HIV
Working population
Gender ratio
Literacy rate
Agricultural extension
Poverty level
Wealth
Credit access
Availability of MFI
Organisational capacity
community organisations
Voting turnout
Access to information
Remittances
Support network
Land ownership
Land tenure
Gender
Female headed households
Have agricultural equipment
Proximity to road
Have cellphone
Distance from market
Density of output markets
Density of input markets
Biomass
Soil suitability
Land availability
Reduced risk
Biomass productivity
Cattle density
Soil Organic Carbon content
Clay content
Total cropland area
Slope
Population density
Loss of production
Incidence of dryspells
Water availability
Mean annual rainfall
Water access
Proximity to river
Water quality
Salinity
Conservation agriculture Botswana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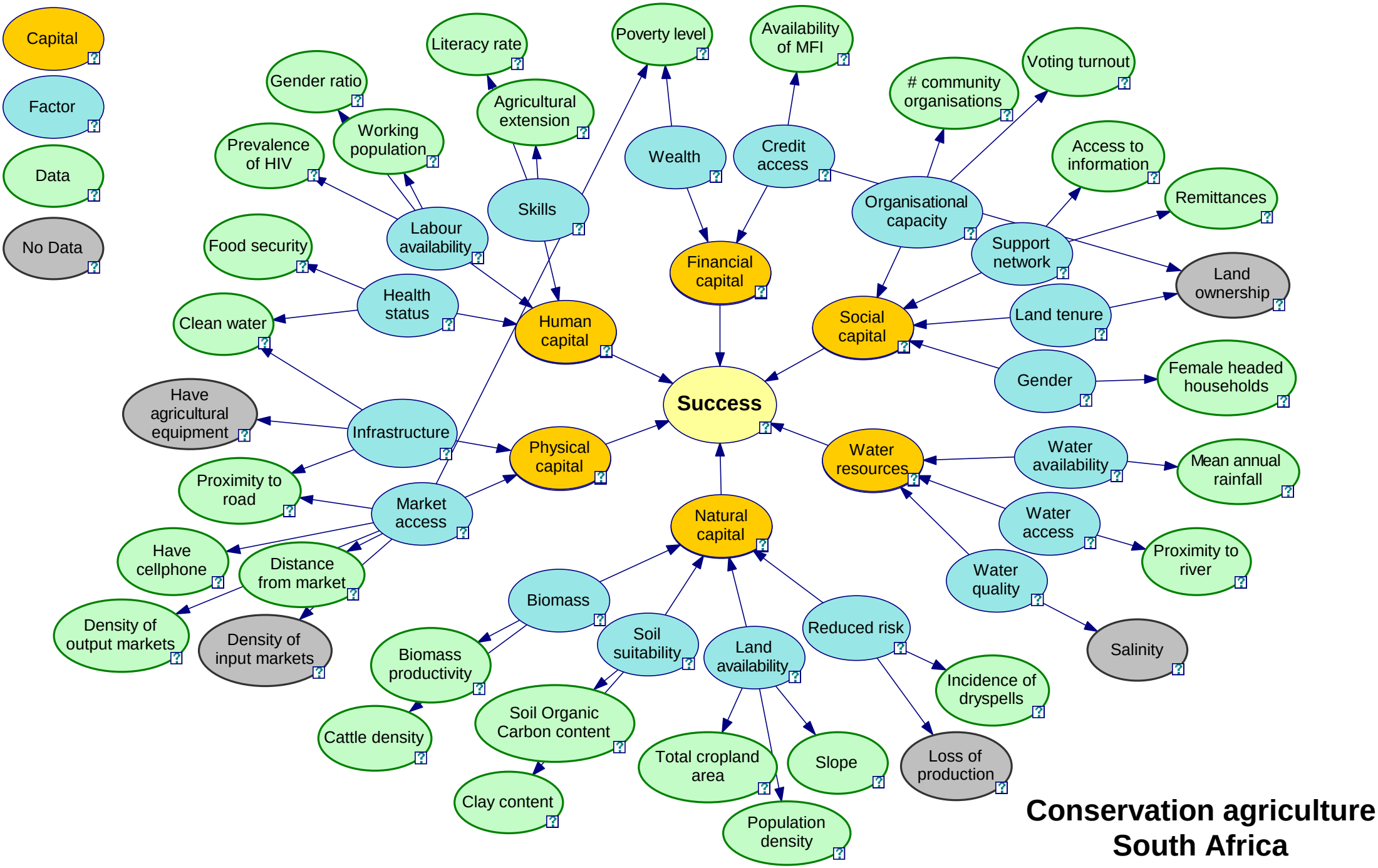
Conservation agriculture
Mozambique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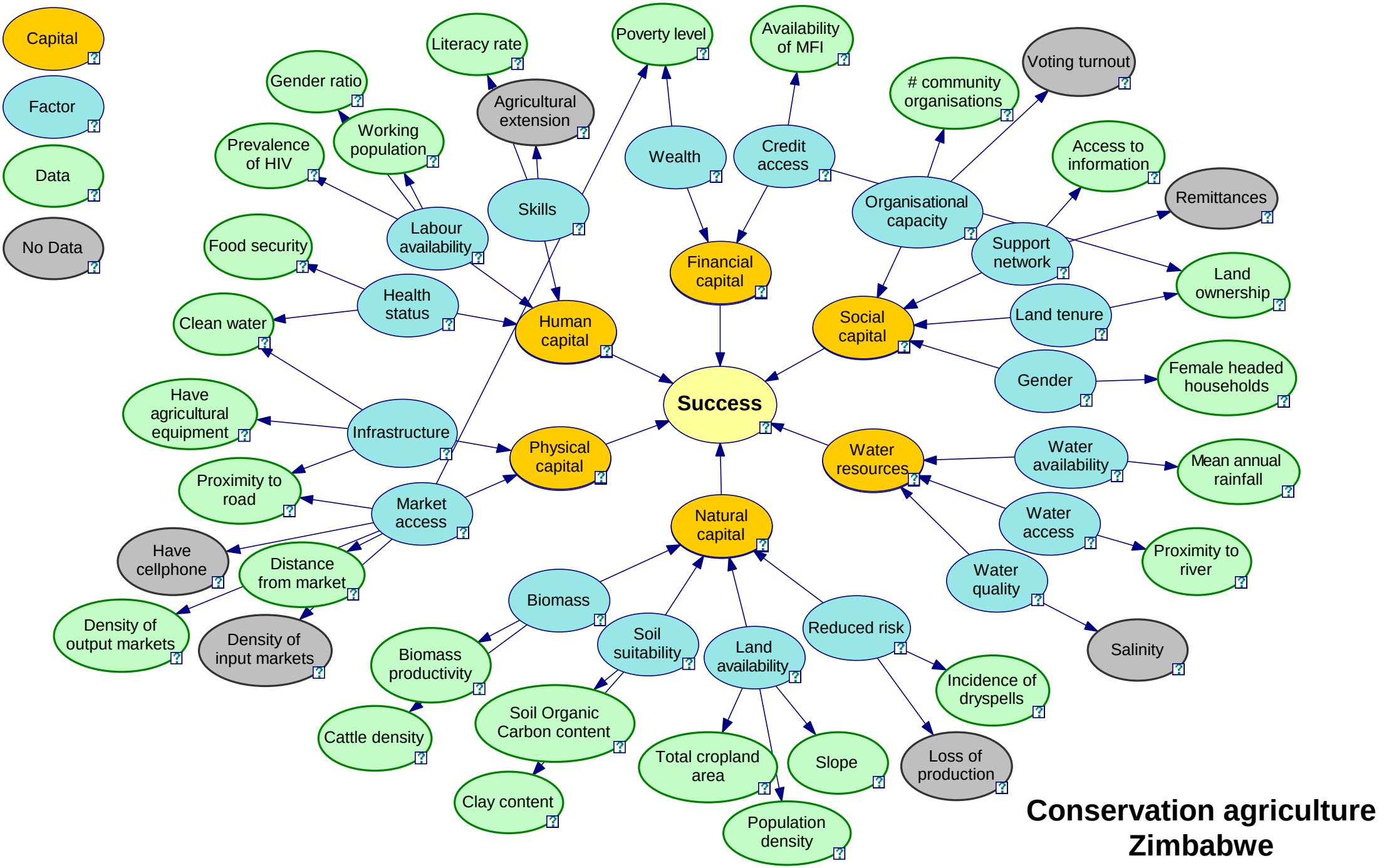
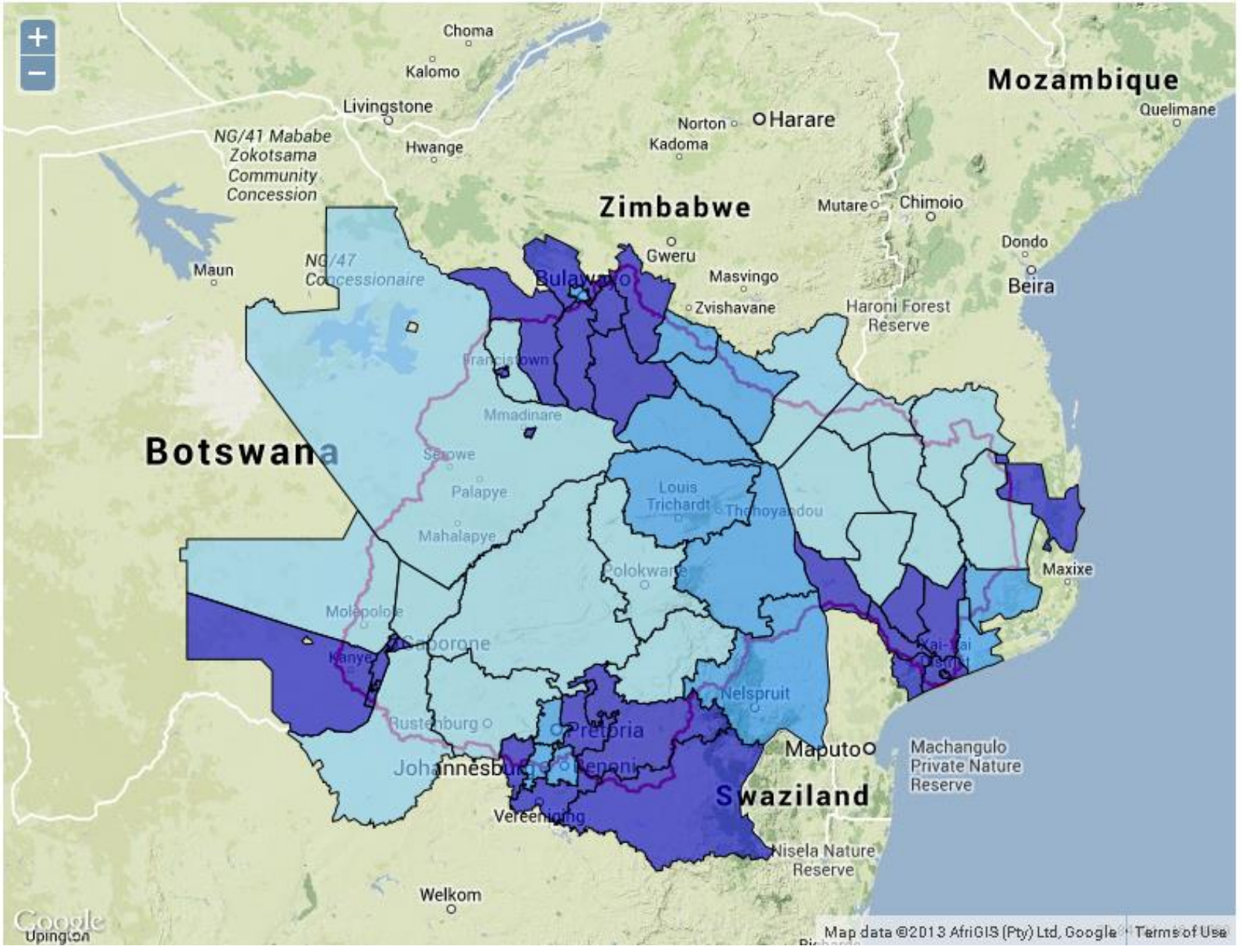
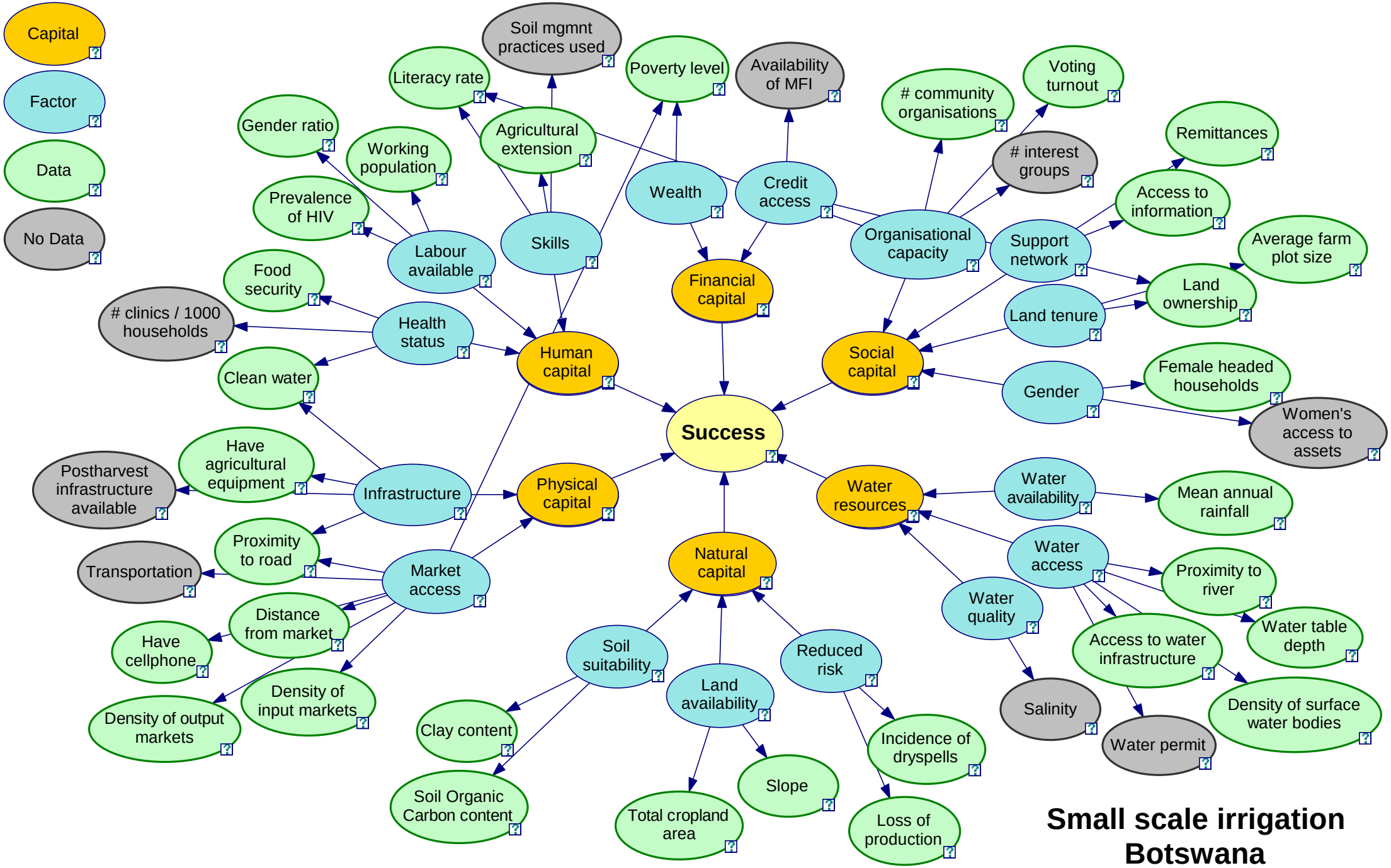


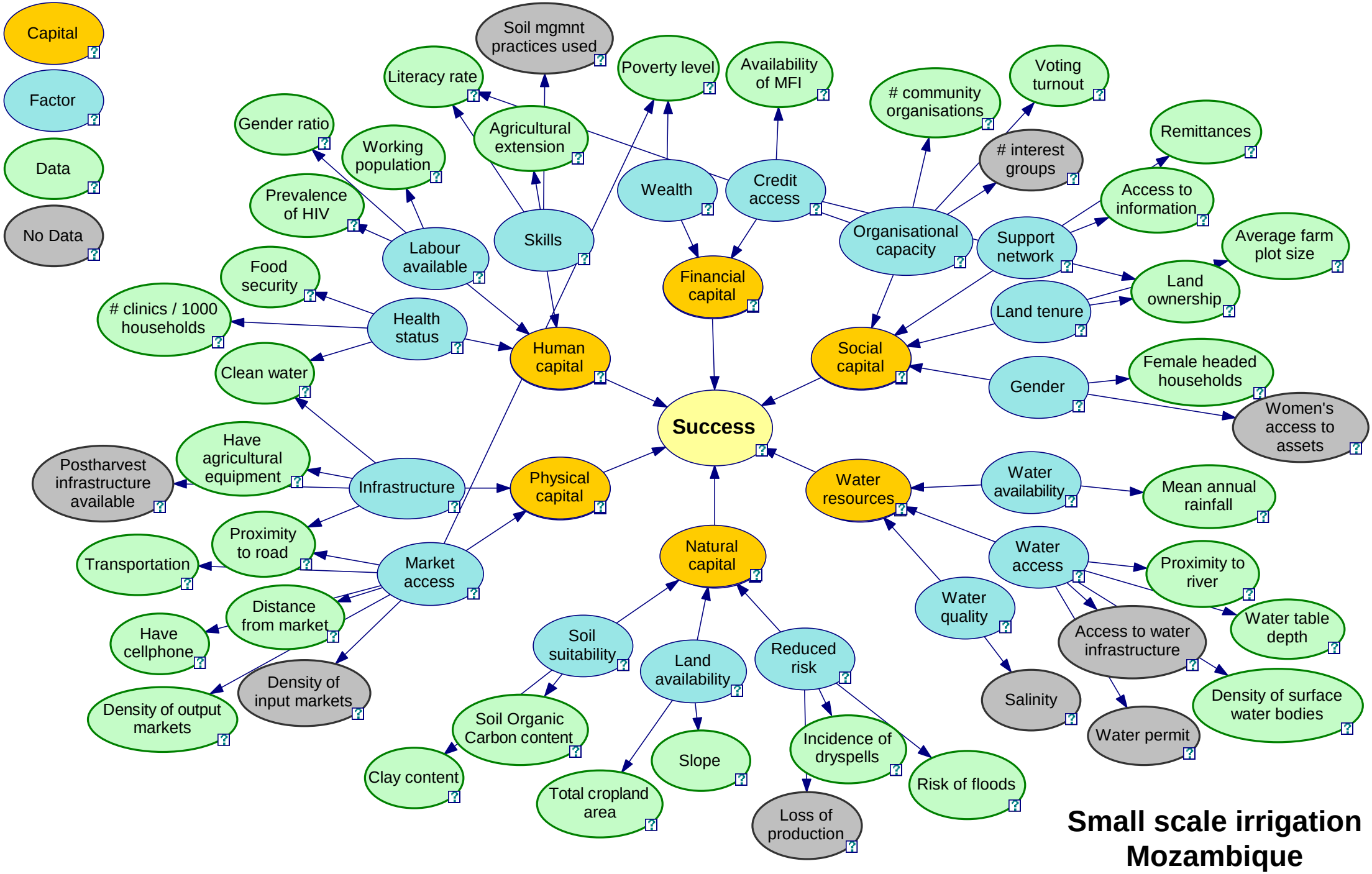
Conservation agriculture Zimbabwe

Small reservoirs





Small scale irrigation Botswana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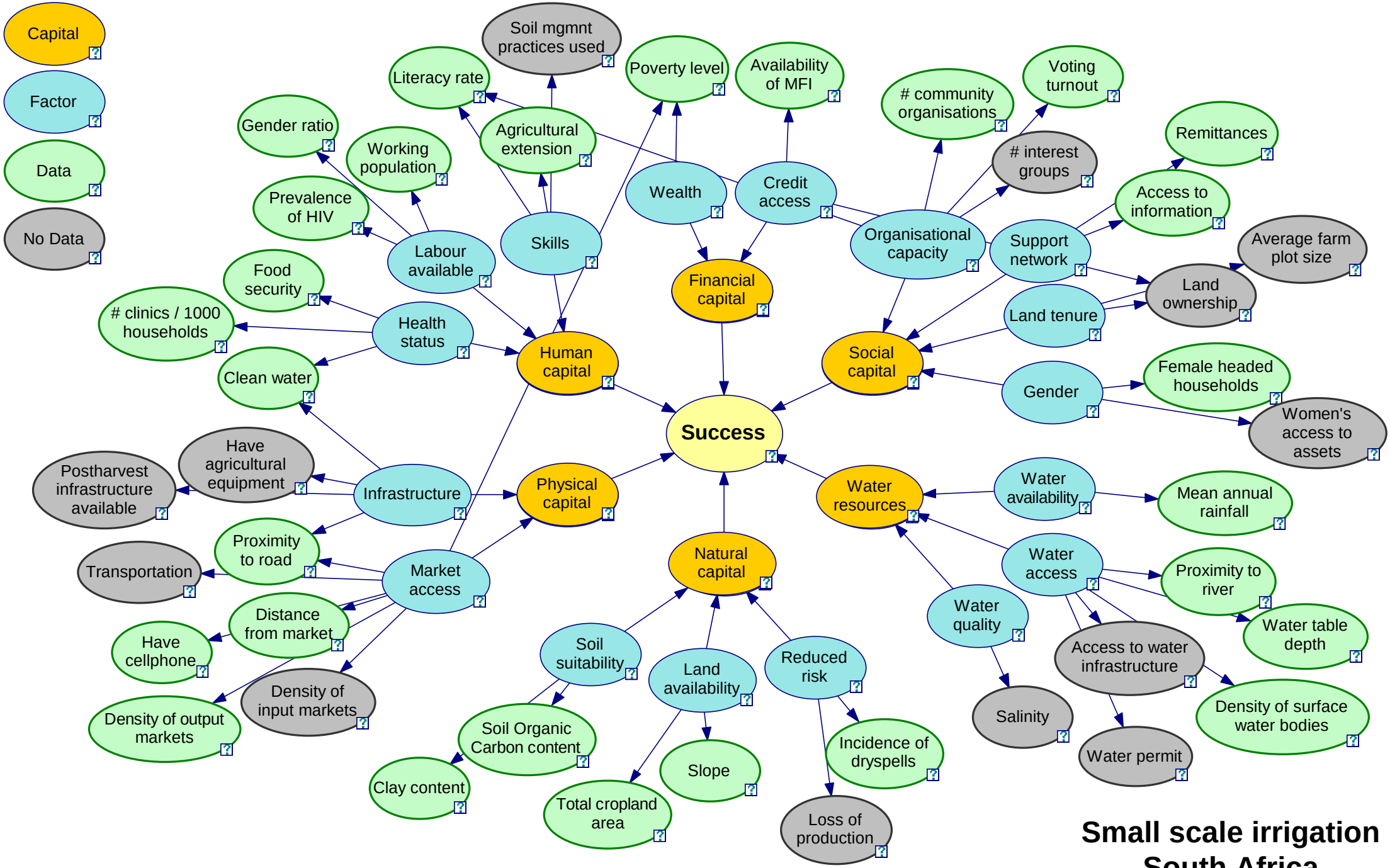
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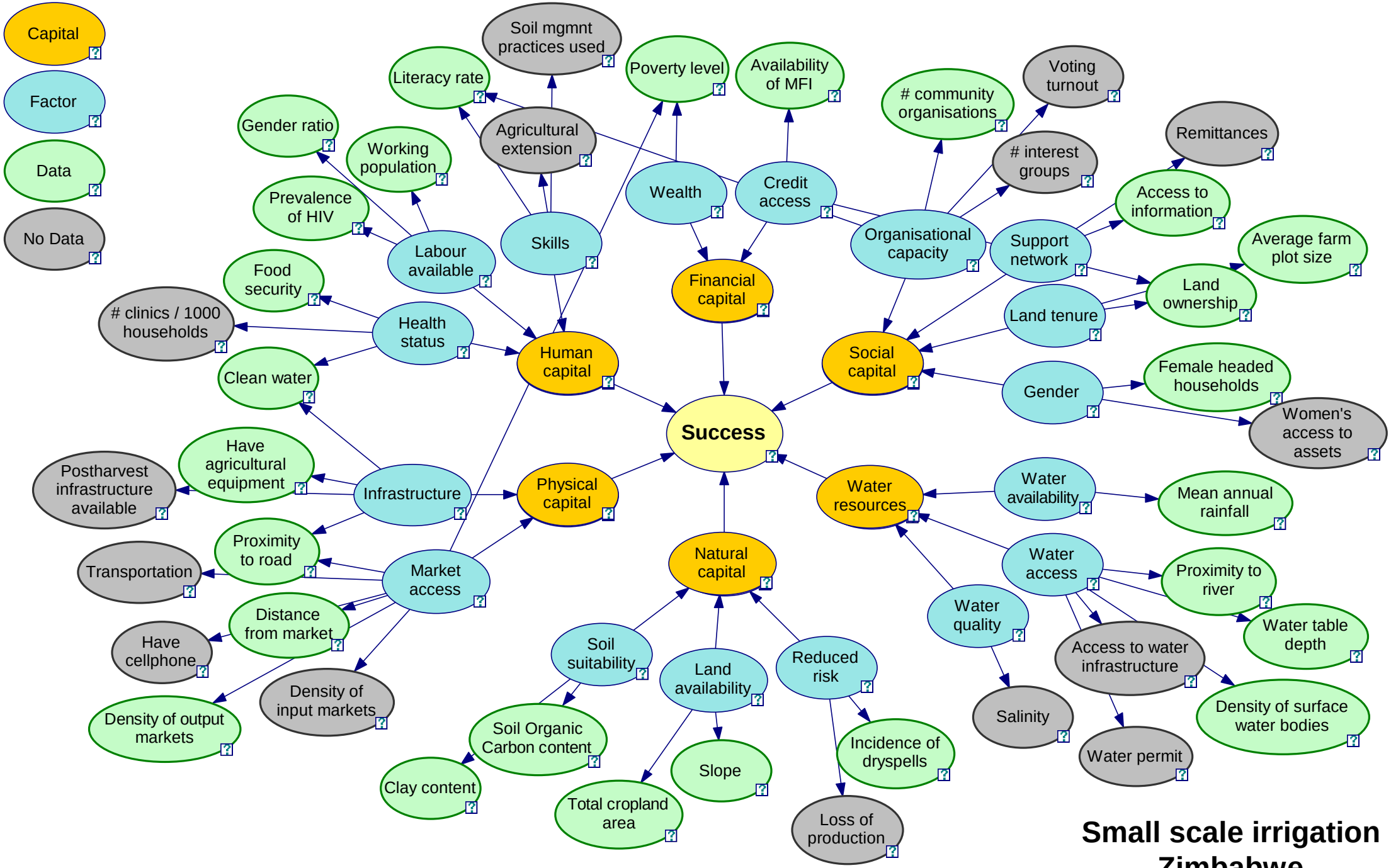
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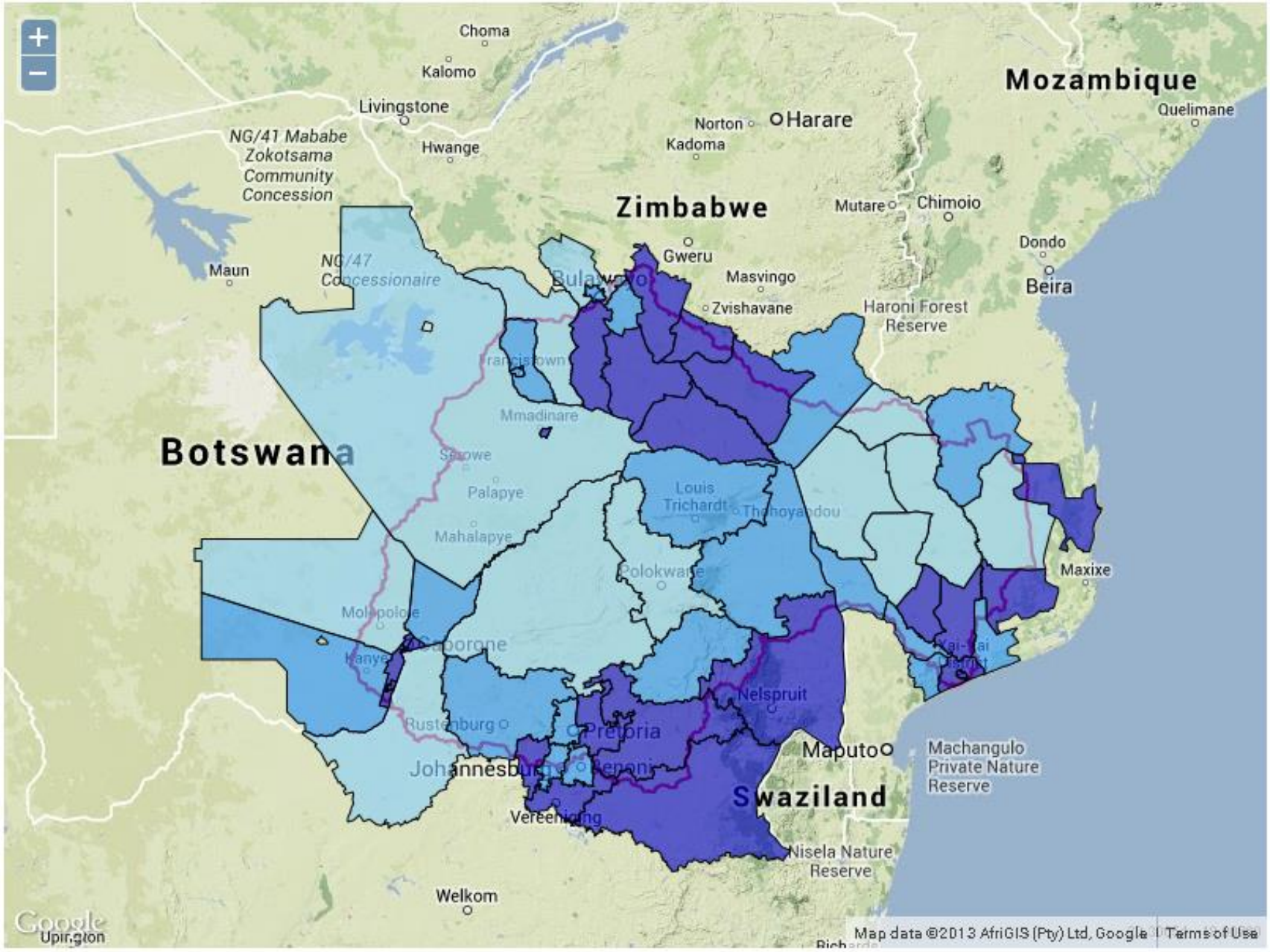

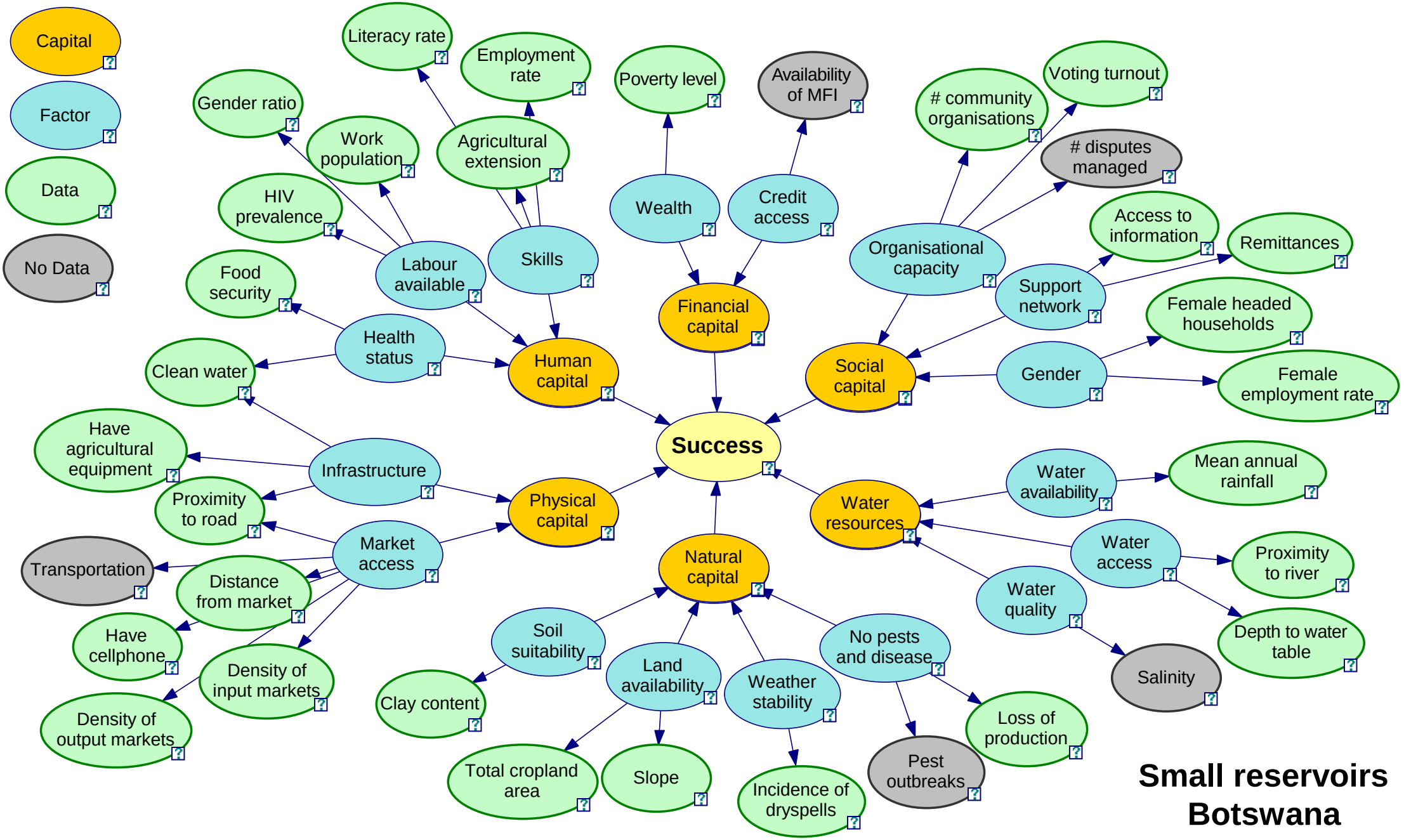
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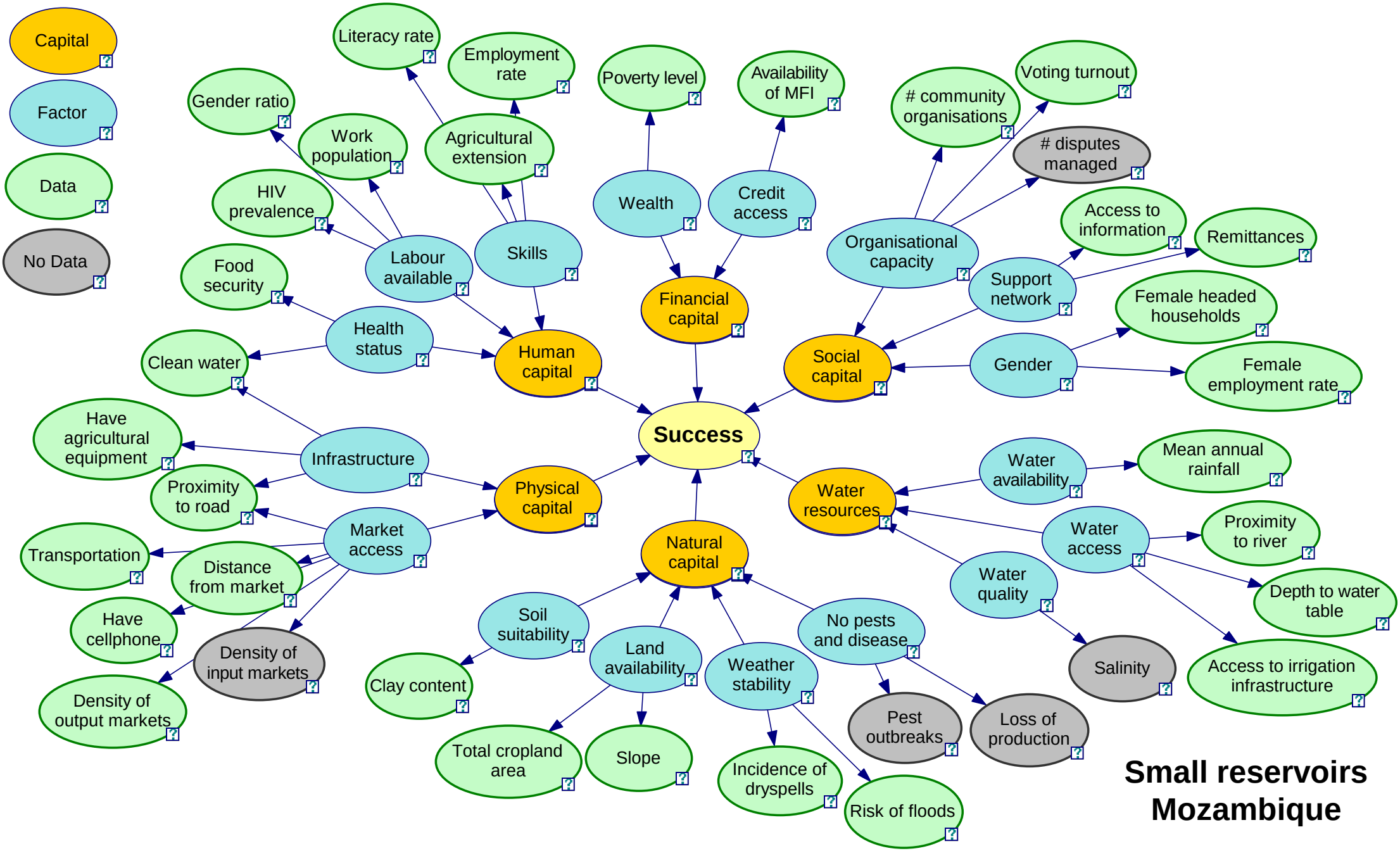
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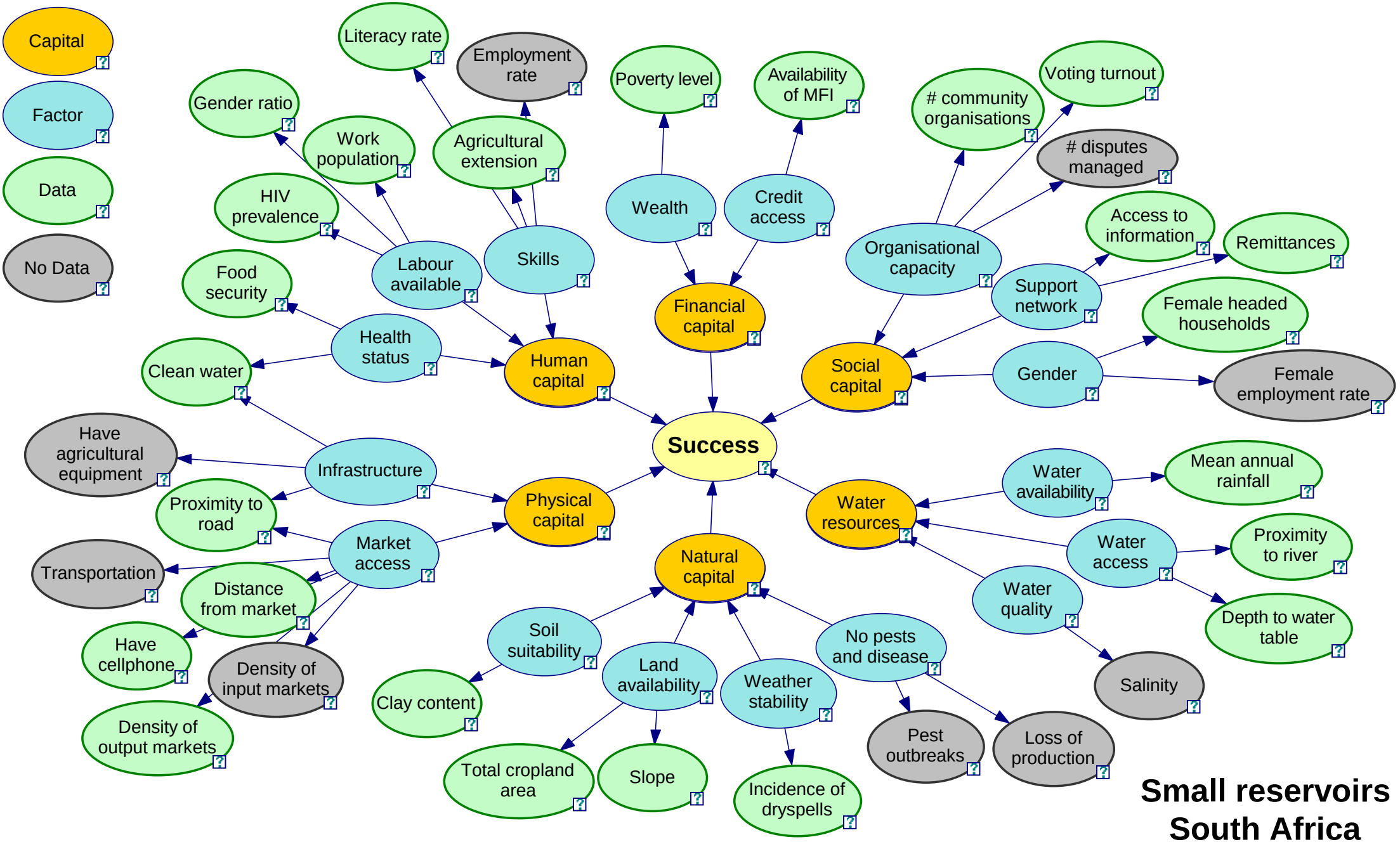
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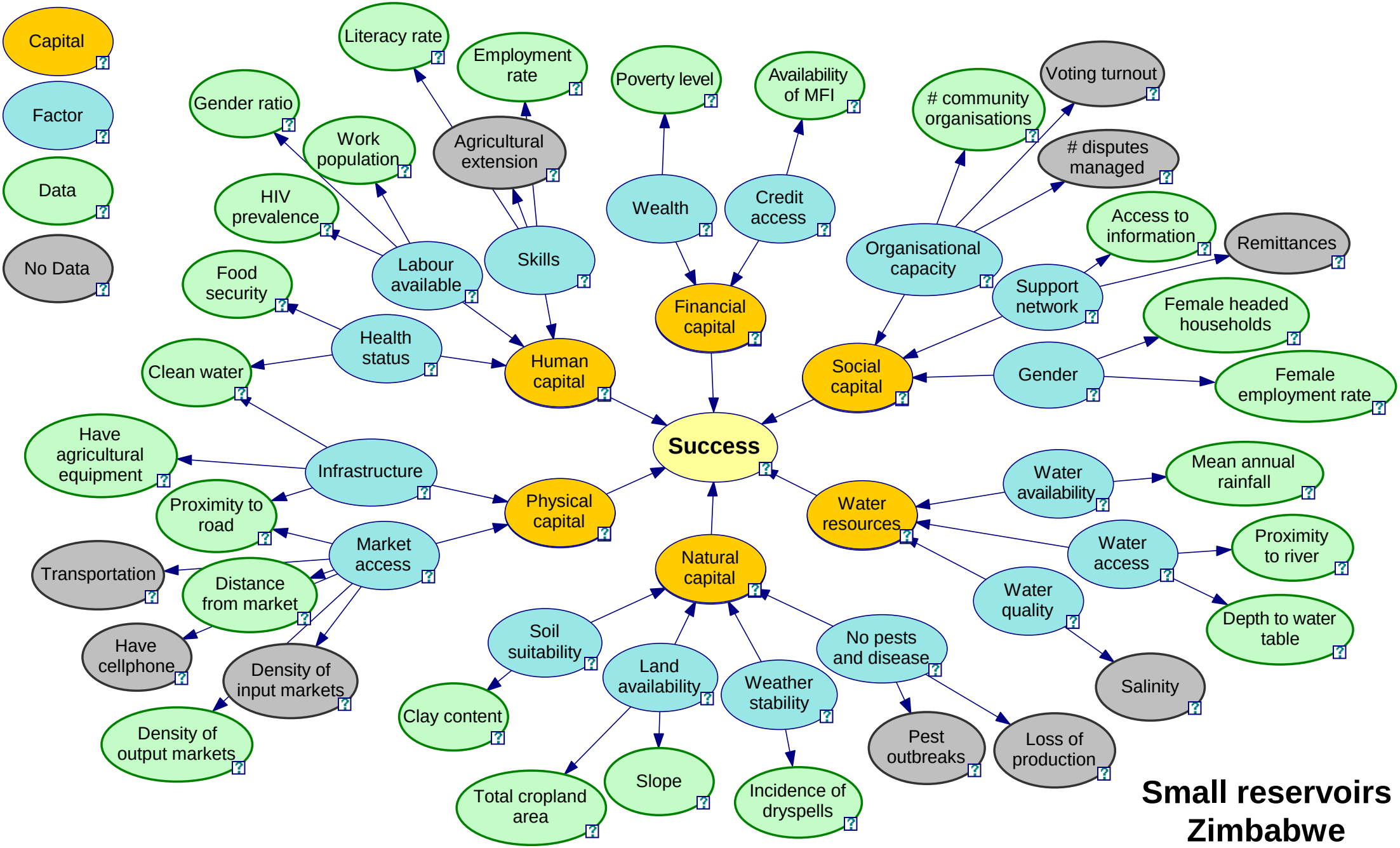
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