Managing With Logic: A Rapid Assessment Using BCN Analysis and the Critical List of Variables for Sustaining the Commons

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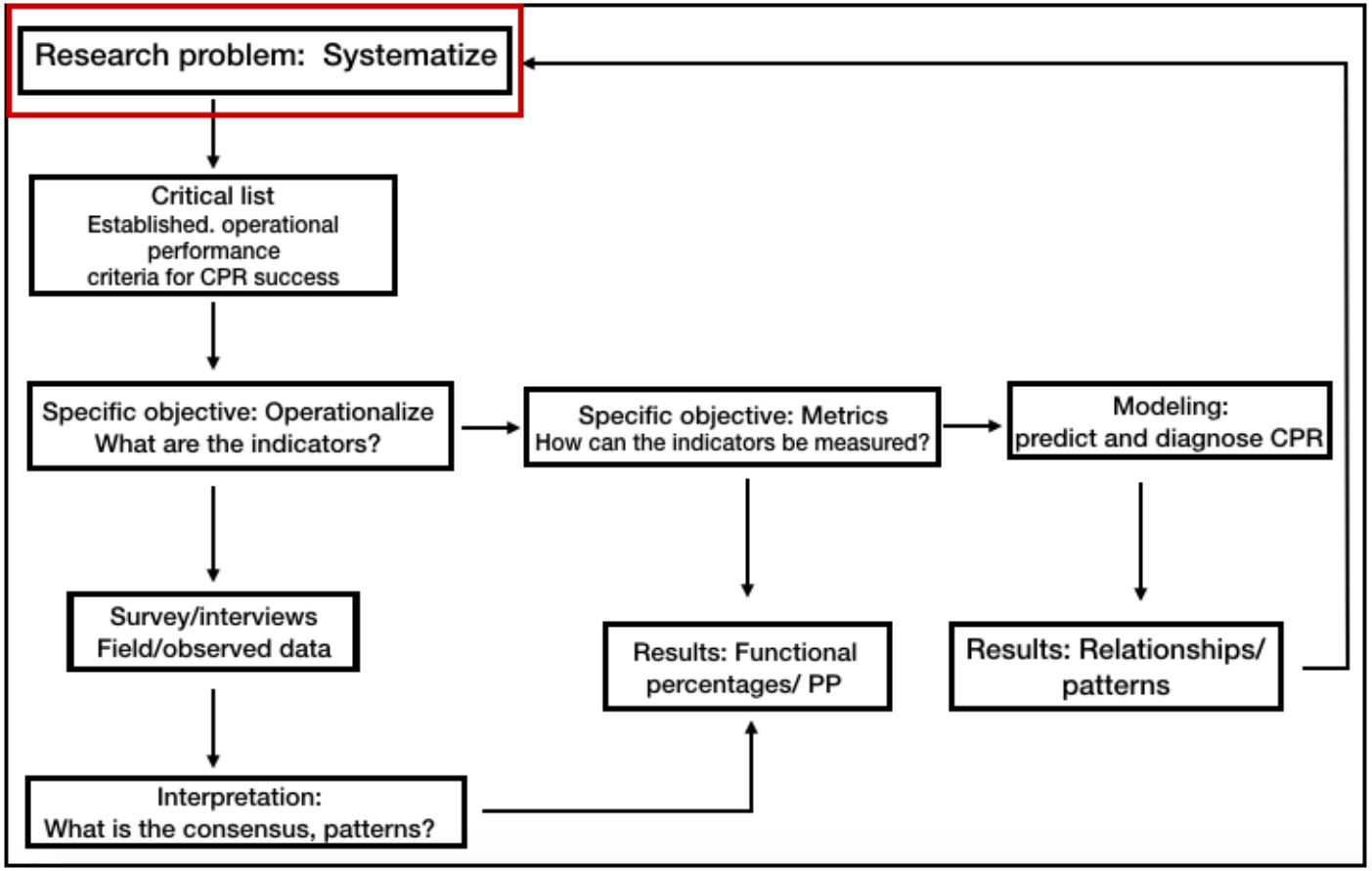
Special thanks to my advisors:
Dr. G. Kiker, Dr. M. Skutsch, Dr. E. Peña-Vega, Dr. S. Barrassa

Problem Statement: Results in CPR system management are mixed and anthropogenic pressures are increasing. We need a method that allows us to systematize analyses, diagnose and predict ex-ante.
Research Question 1: Is there an operational list for performance criteria?
Research Question 2: Is there a systematic/concise way to predict and diagnose multivariate CPR systems?



Methods

- Interviews: semi-structured
  - Use the indicators for each variable
  - Process the results for use in analysis
- Rapid appraisal forest cover assessment
  - Analyze each agrarian nuclei for the periods from 2006-2010 and 2010-2015
- Bayesian causal models or belief networks
- Model the critical list using the real world data collected in interviews
- Sensitivity analysis to model alternative scenarios

The study area:

Indigenous communities:
Carpinteros
San Francisco Curungueo

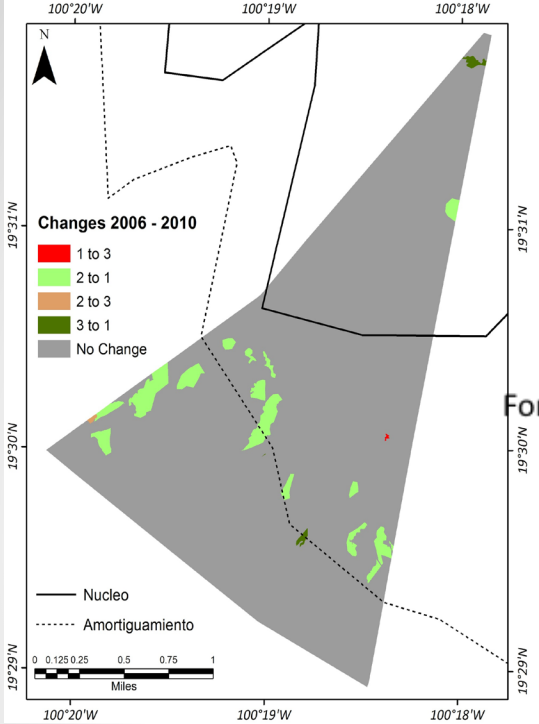
Ejidos:
San Juan Zitácuaro
Nicolás Romero

The critical list of variables for sustaining the commons

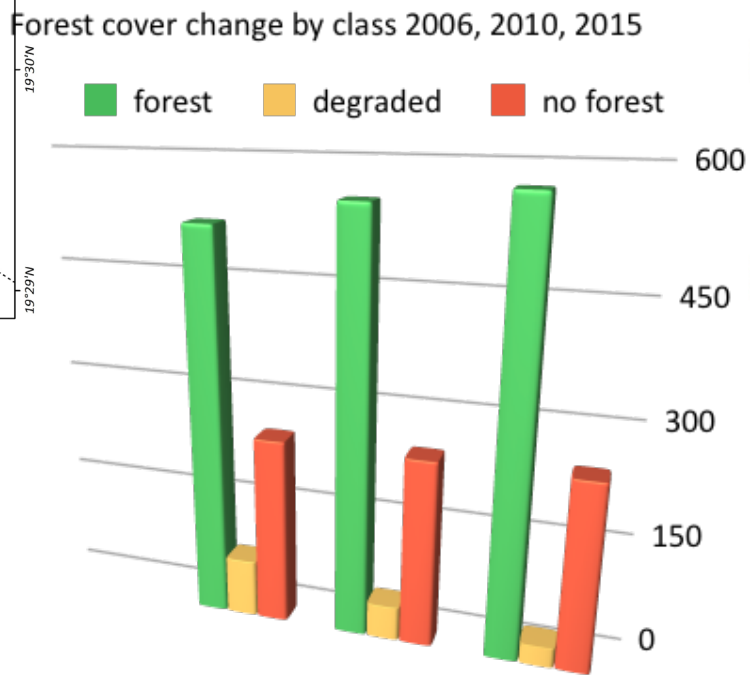
- **Ostrom's (1990) design principles**
- **Wade (1994)**
- **Baland and Plateau (1996)**
- **Agrawal (2003)**

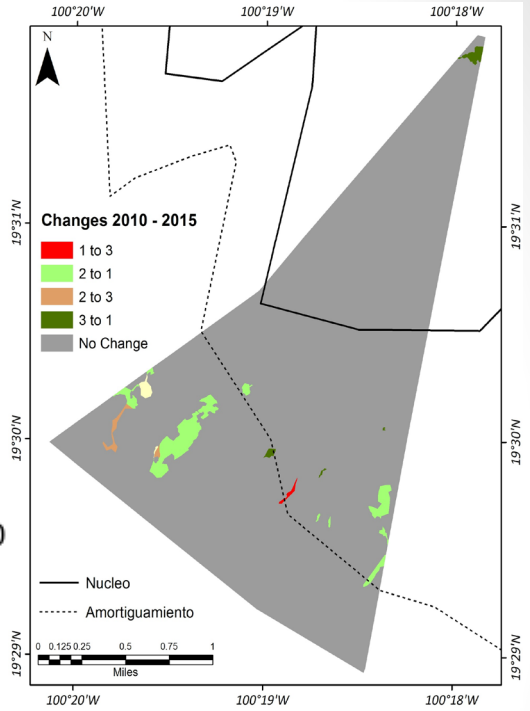
Rapid forest cover change method

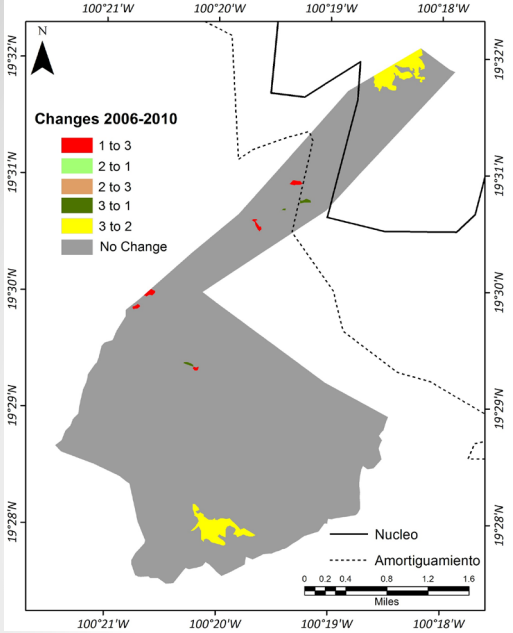
- Created the maps using satellite imaging from Google Earth Pro and ArcGIS with the gracious aid of J.A. Navarrete
- Visual representations of the agrarian nuclei in the study were generated (next slides)
- Matrices on forest cover change from 2006-2015 and general trends— 1-2, 2-3, 1-3, 2-1, 3-1, 3-2
- 2006 was chosen for two reasons: availability of images and due to the large-scale initiative to stop illegal logging in 2007 so as to give a prior point of reference as compared to 2010 when it was claimed to have been halted (Vidal et al. 2014) and the research year, 2015.



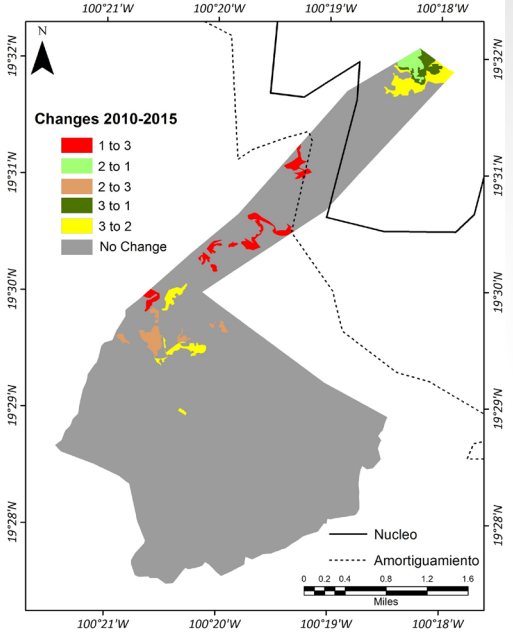
Forest cover increases, non-forest remains consistent and degraded forest declines.



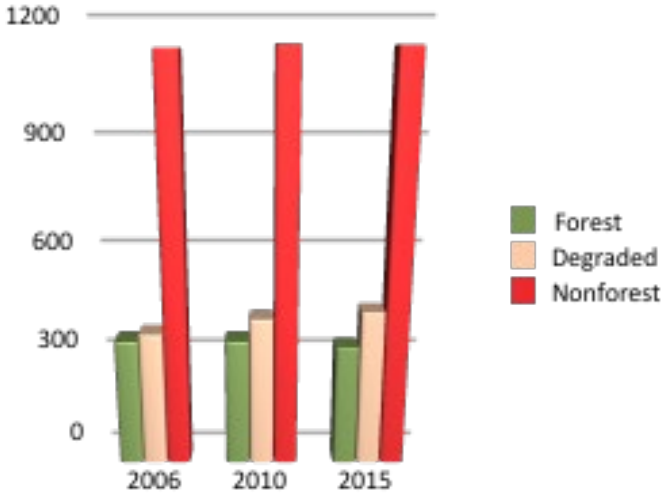


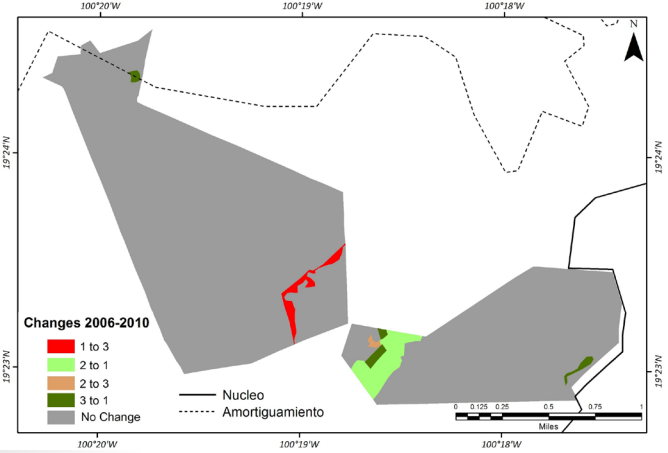


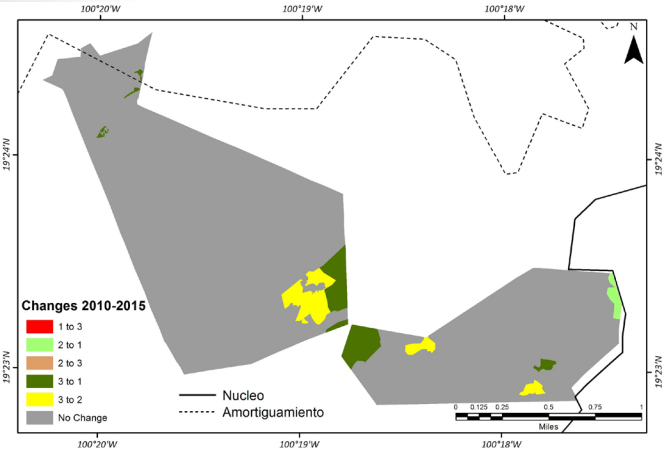
Forest cover rises slightly, non-forest slightly increases and degraded forest increases

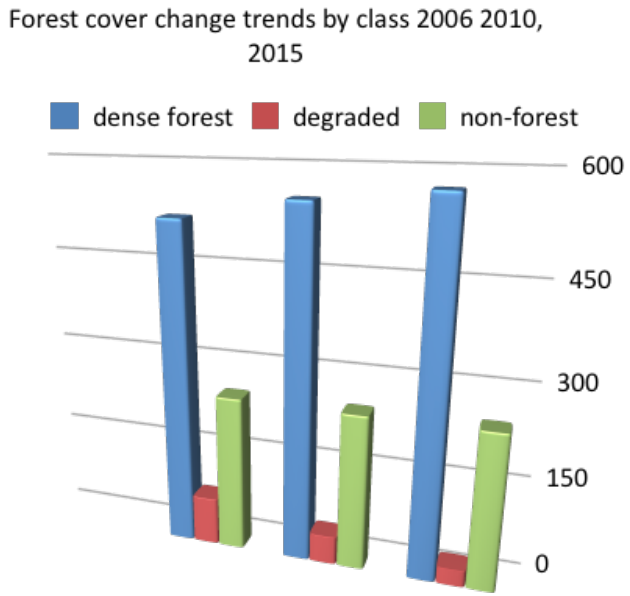


Forest cover by class 2006, 2010, 2015

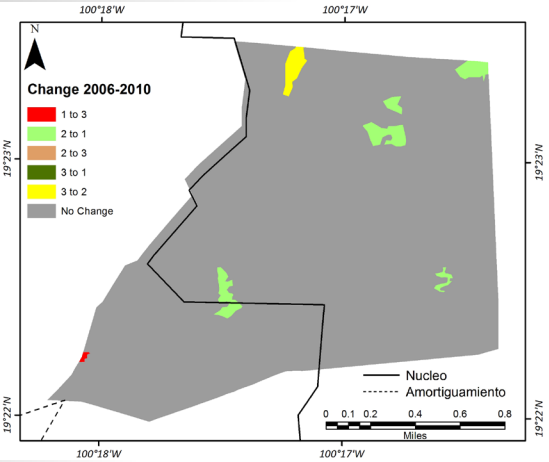


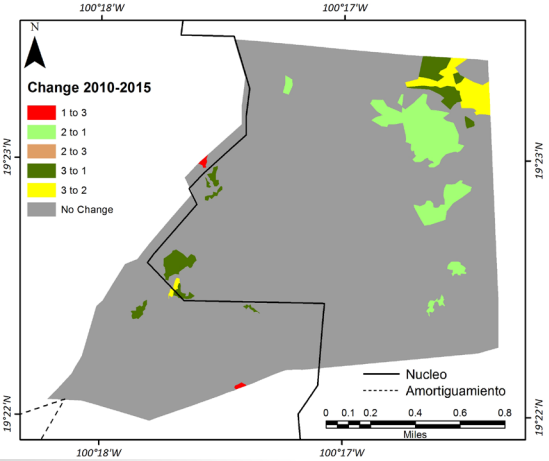


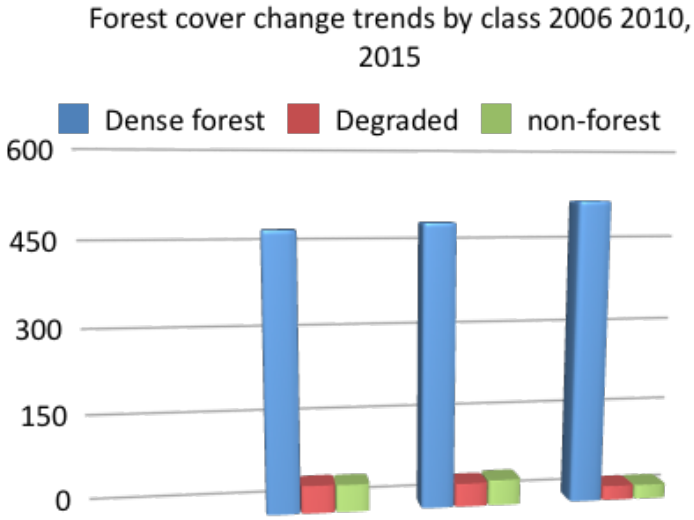




Forest cover increases, non-forest slightly decreases and then plateaus and degraded forest decreases.







Forest cover increases, non-forest decreases and degraded forest decreases.

Bayesian causal networks:

- Exploratory/ diagnostic/predictive tool
- Easily integrates both qualitative and quantitative data
- Prior knowledge (prior probability)
- Gather data
- Combine knowledge with data in a model
- Results are called a *posterior*
- Easily modified with new information

Reverend Thomas Bayes (1702-1761)

Law of probability

For any two events, A and B

$$P(BIA) = \frac{P(A|B) \times P(B)}{P(A)}$$

Where:

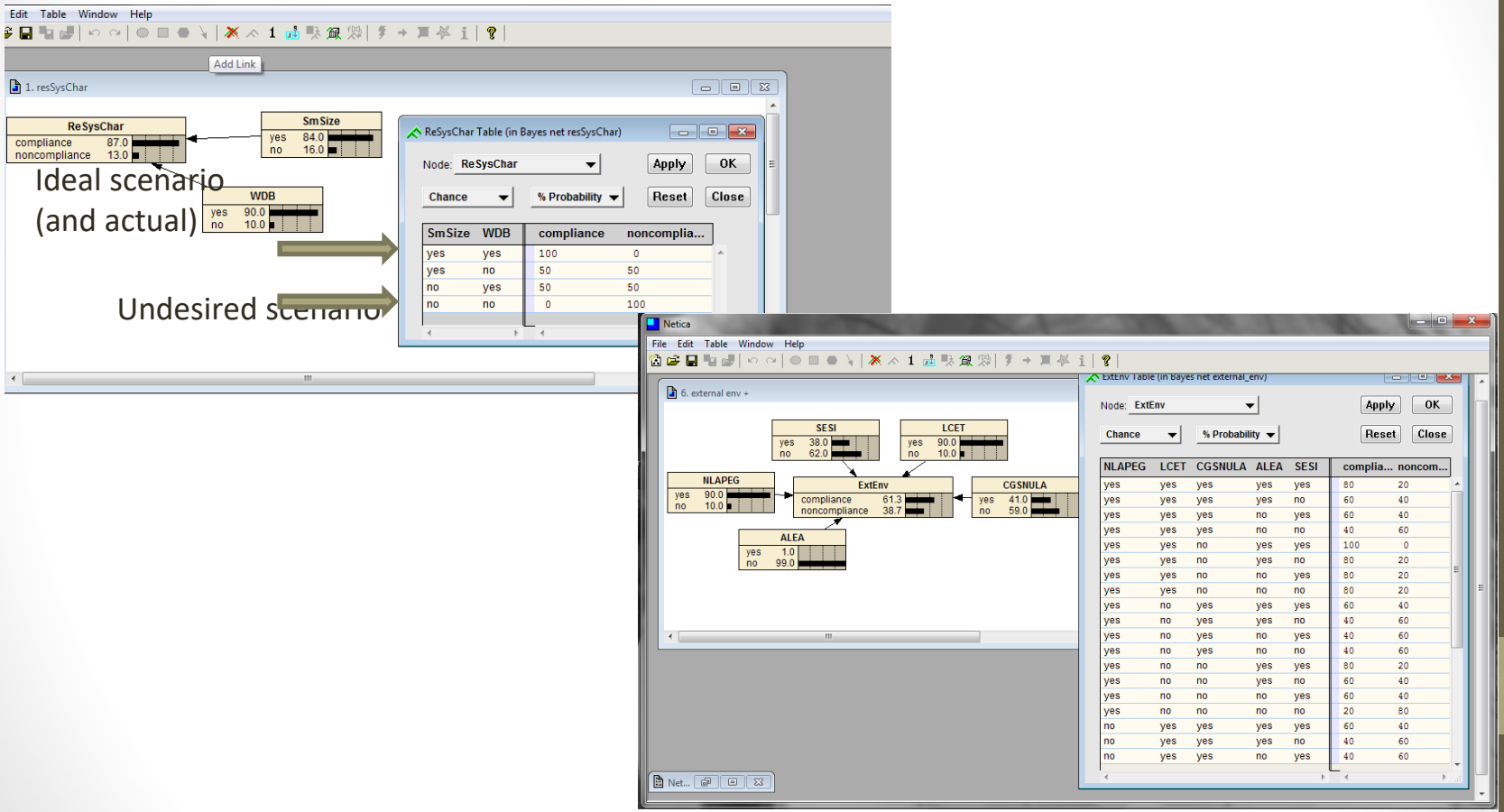
P(B|A) is the conditional probability of event B given event A

P(A|B) is the conditional probability of A given B

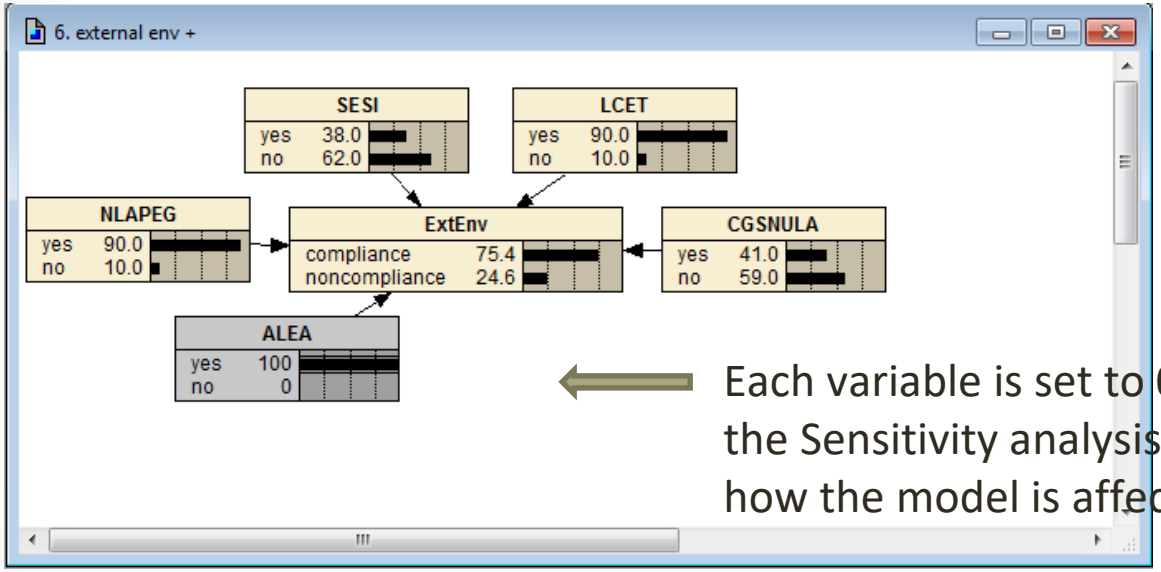
P(B) is the prior probability of B (not dependent on A)

P(A) is the prior probability of A (not dependent on B)

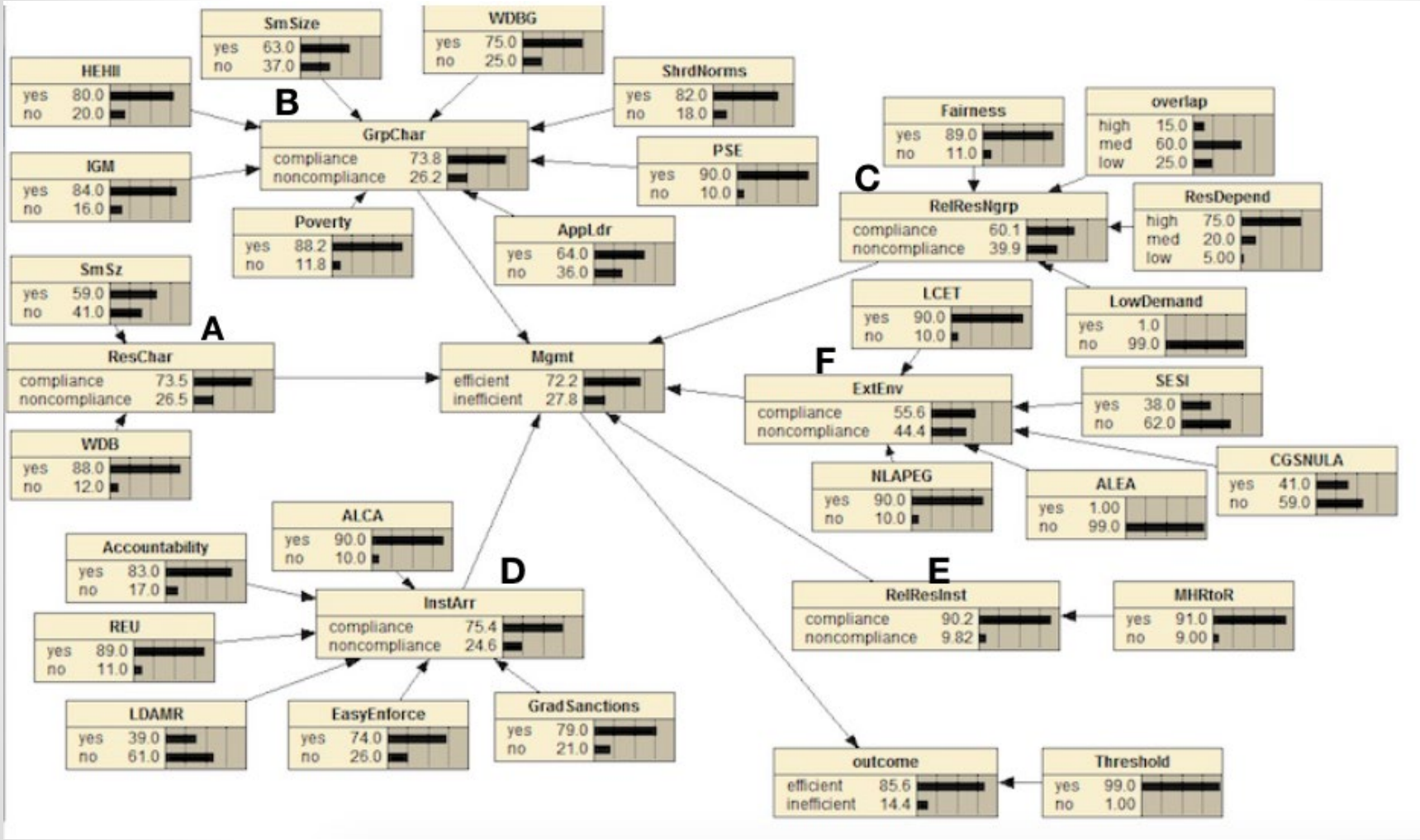
Examples of BCN



Exploring different scenarios



Each variable is set to 0 or 100 for the Sensitivity analysis to determined how the model is affected


SmSize
yes 63.0
no 37.0
WDBG
yes 75.0
no 25.0
HEHI
yes 80.0
no 20.0
ShrdNorms
yes 82.0
no 18.0
B
GrpChar
compliance 73.8
noncompliance 26.2
IGM
yes 84.0
no 16.0
PSE
yes 90.0
no 10.0
Poverty
yes 88.2
no 11.8
AppLdr
yes 64.0
no 36.0
Fairness
yes 89.0
no 11.0
overlap
high 15.0
med 60.0
low 25.0
C
RelResNgrp
compliance 60.1
noncompliance 39.9
ResDepend
high 75.0
med 20.0
low 5.00
SmSz
yes 59.0
no 41.0
LCET
yes 90.0
no 10.0
LowDemand
yes 1.0
no 99.0
A
ResChar
compliance 73.5
noncompliance 26.5
Mgmt
efficient 72.2
inefficient 27.8
F
ExtEnv
compliance 55.6
noncompliance 44.4
SESI
yes 38.0
no 62.0
WDB
yes 88.0
no 12.0
CGSNULA
yes 41.0
no 59.0
NLAPEG
yes 90.0
no 10.0
ALEA
yes 1.00
no 99.0
ALCA
yes 90.0
no 10.0
Accountability
yes 83.0
no 17.0
D
E
RelResInst
compliance 90.2
noncompliance 9.82
MHRtoR
yes 91.0
no 9.00
InstArr
compliance 75.4
noncompliance 24.6
REU
yes 89.0
no 11.0
LDAMR
yes 39.0
no 61.0
EasyEnforce
yes 74.0
no 26.0
GradSanctions
yes 79.0
no 21.0
outcome
efficient 85.6
inefficient 14.4
Threshold
yes 99.0
no 1.00

Results

- Small size and Well defined boundaries
- PSE/IGM (Cu)
- Fairness/Dependence
- REU/Accountability-- ALCA (Ca)
- LCET/NLAPEG

Conclusions

- Success is more informative
- Compliance or not?
- Goal achievement
- Agrawal 2003, Baggio et. al 2016 and Barnet et al. 2016
- Durability and monitoring
- Useful dialogue and direction for strategizing
- Descriptive, diagnostic and predictive

Any Questions?