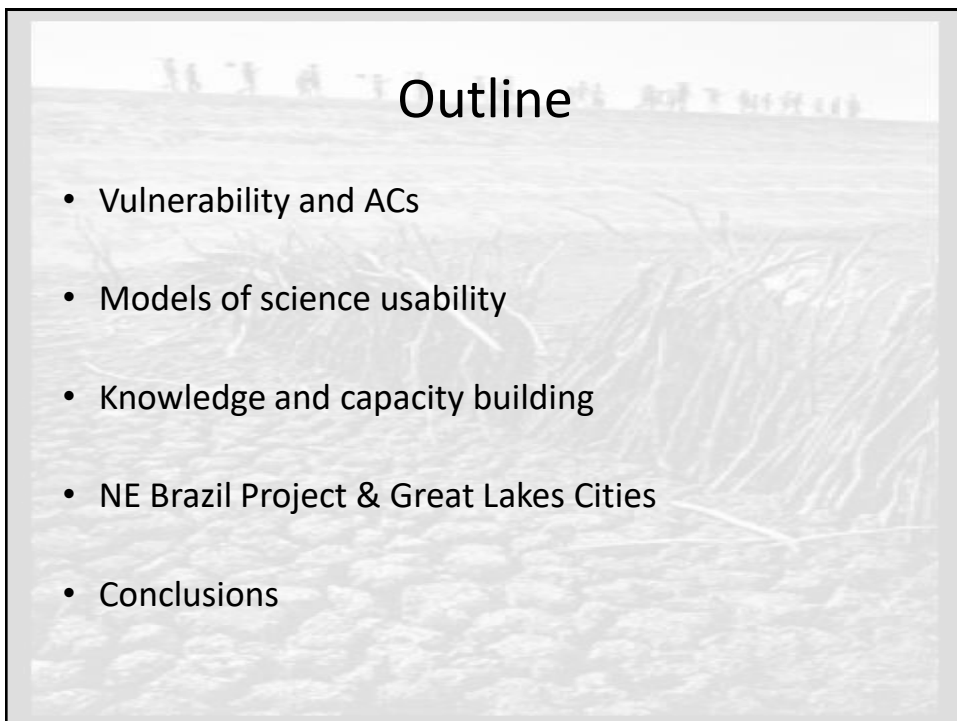


1



2

Climate Vulnerability

The propensity or predisposition to be adversely affected.

Vulnerability is a function of exposure (E), sensitivity (S) and adaptive capacity (AC)



$$V = V(E, S, AC)$$

Source IPCC

3

Definitions (IPCC-AR5)

Exposure: The presence of people, livelihoods, species or ecosystems, environmental services and resources, infrastructure, or economic, social, or cultural assets in places that could be adversely affected (e.g., climate variability and change).

Sensitivity: the degree to which a system is affected, either adversely or beneficially.

Adaptive Capacity: The ability of systems, institutions, humans, and other organisms to adjust to potential damage, to take advantage of opportunities, or to respond.

4

Generic & Specific Capacity

Generic Adaptive Capacity: Capitals or assets available to a system at risk (e.g. household, city, watershed)

Example: Universal access to education and health, political and social capital, natural capital and institutions.

Specific Capacity: Assets and capital that a system can deploy to manage specific risk.

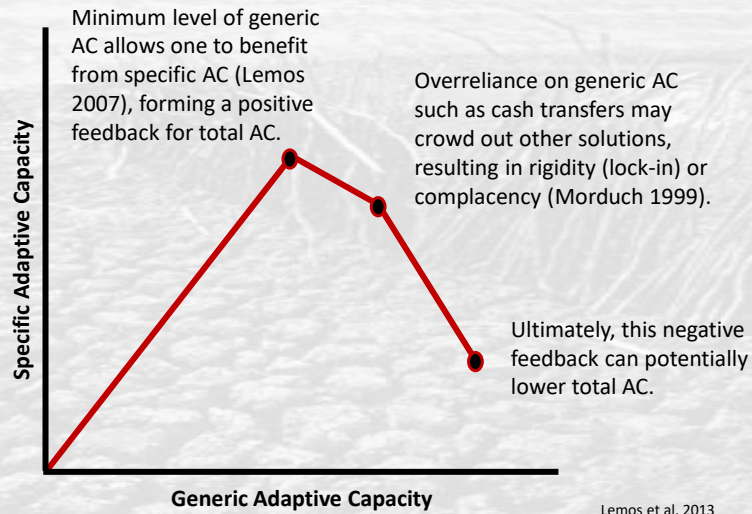
Example: Adaptation technology, climate knowledge, social innovation and specific interventions that mitigate sensitivity to a particular climate threat (e.g. early warnings, climate scenarios, disaster, insurance, irrigation).

5

**But how do these capacities
relate to each other?**

6

Positive and negative feedbacks between generic and specific adaptive capacity



7

How do we increase capacities?

The role of climate Knowledge

Lemos, Kirchoff & Ramparasad 2012
Lemos et al. 2014

8



9



10

How does social reform (Bolsa Familia) influence AC?

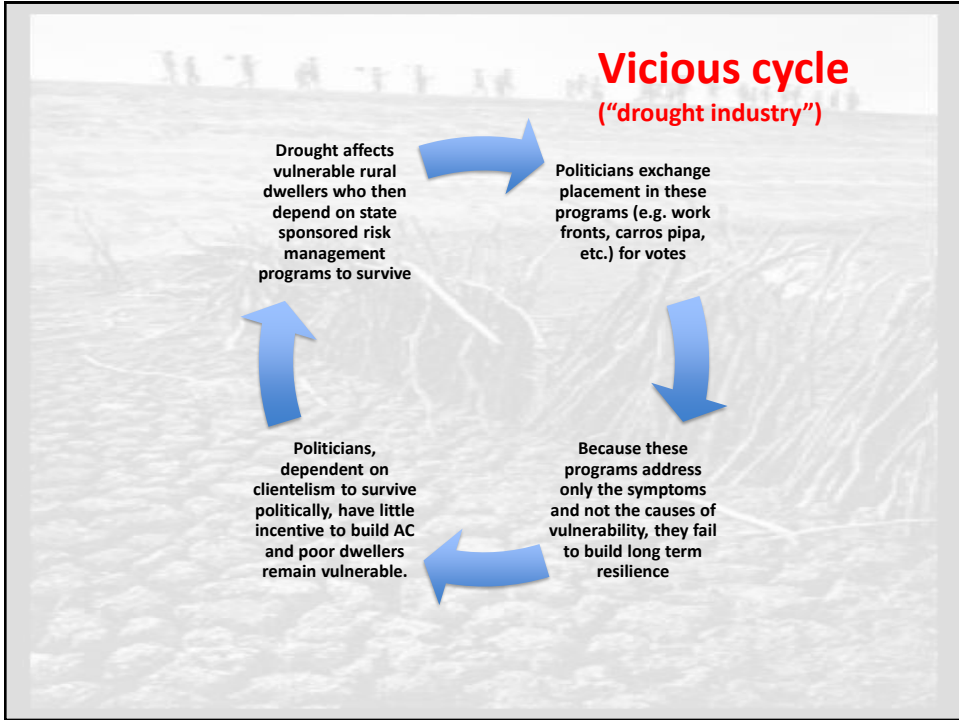
- **Relationship between poverty and vulnerability**
- Conditional cash transfer program (income, health, education)
- **Relationship between social reform and risk management** (specific drought emergency programs)

11

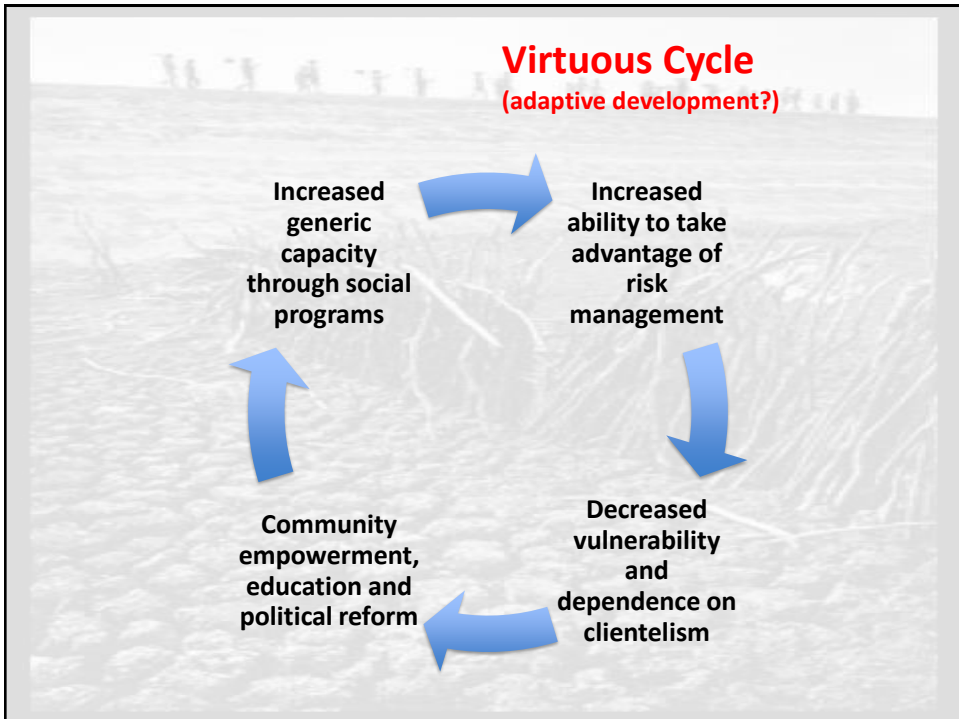
Implications of Bolsa Familia

- **Shifting resources** from traditional emergency interventions (work fronts; food baskets, water trucks) to poverty reduction programs **as a way to increase overall AC**
- **Alternative risk management interventions**
 - Small crop insurance
 - Access to drought resistant seed and animal feed
 - Additional income in case of drought
- **Long-term transformation**
 - From a vicious to a virtuous cycle

12



13

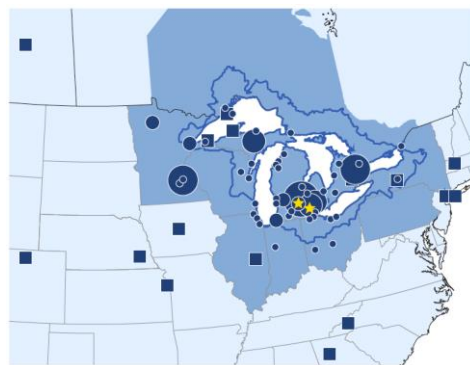


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Great Lakes: GLISA

More knowledge, more capacity

15



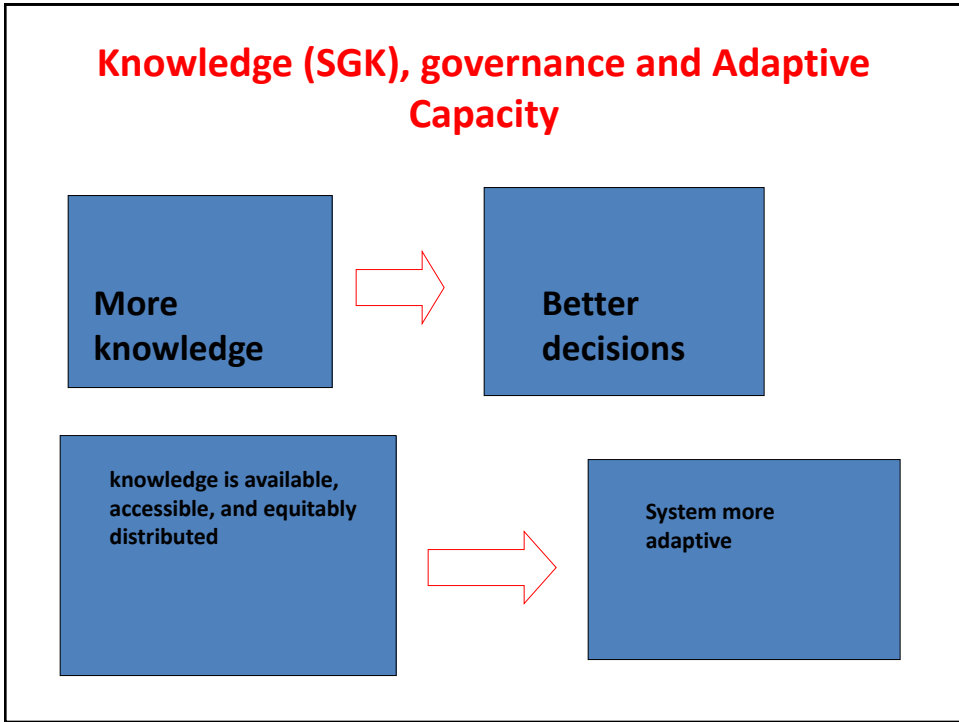
COLLABORATORS PER LOCATION

- One
- Two
- Three
- Four
- Five

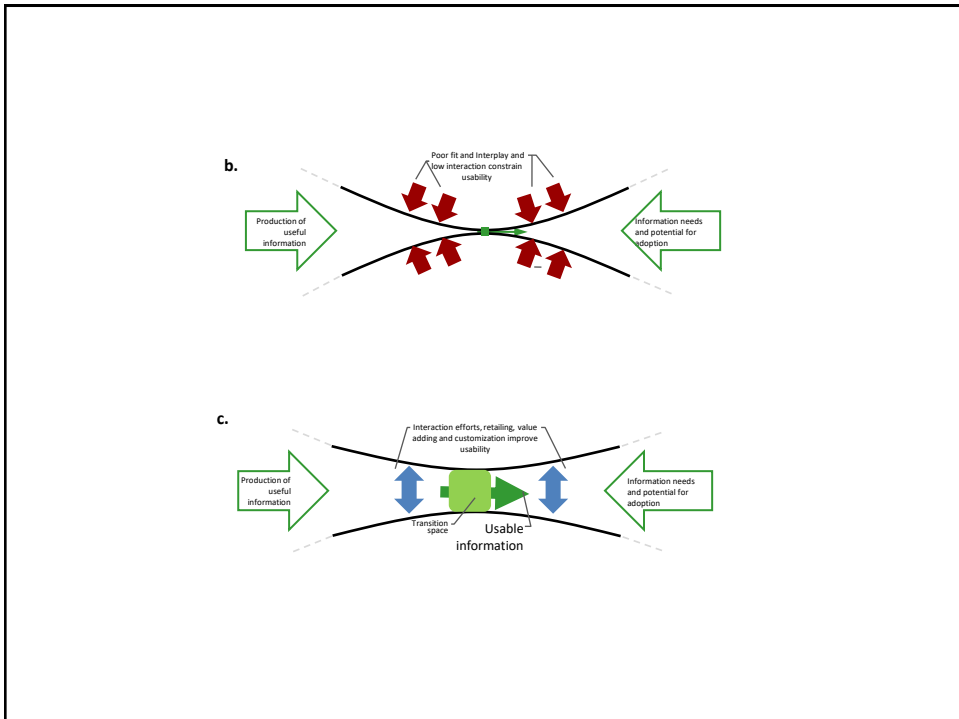
■ National Climate Partners ★ GLISA ■ GLISA Region □ Great Lakes Basin

2 Countries 5 Great Lakes 95,000 Square Miles of Surface Water
8 States 10,201 Miles of Shoreline 35 Million People

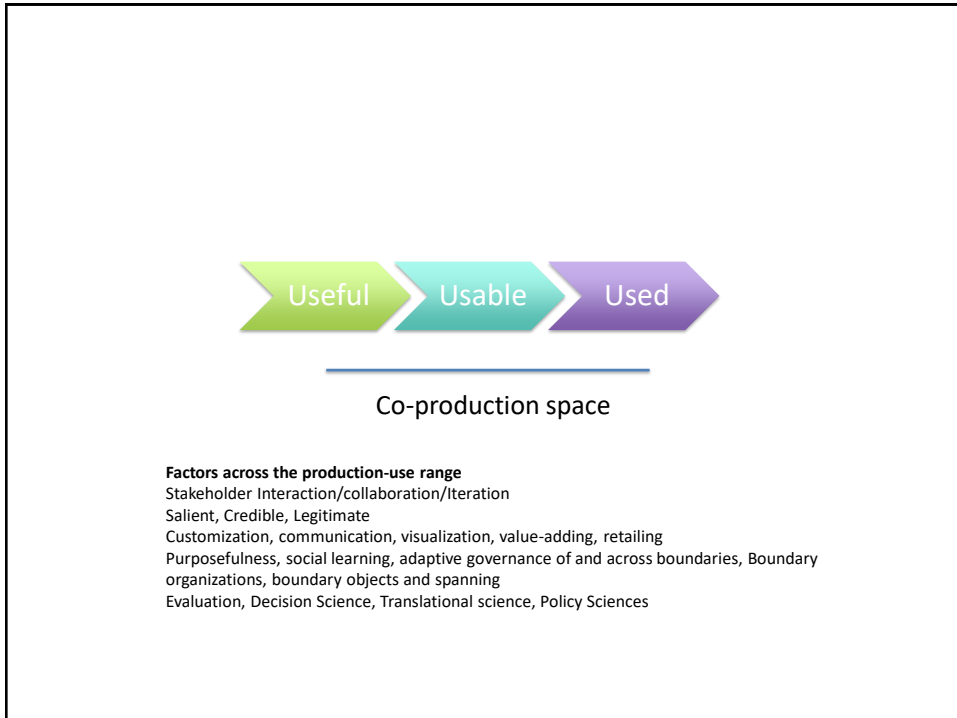
16



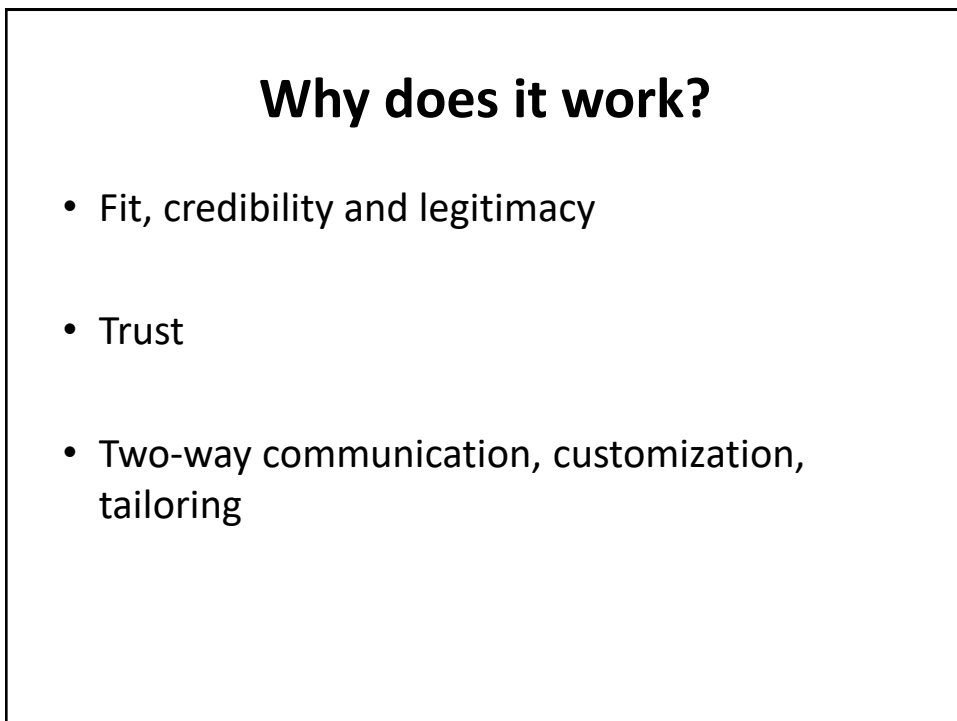
17



18



19



20

Scaling up co-production

- Accelerating interaction and broadening participation: boundary chains, remote interaction, crowdsourcing
- Disseminating co-produced Knowledge: Knowledge Networks, Marketing campaigns, communities of practice
- Aggregating impact: working with policy-makers, practitioners

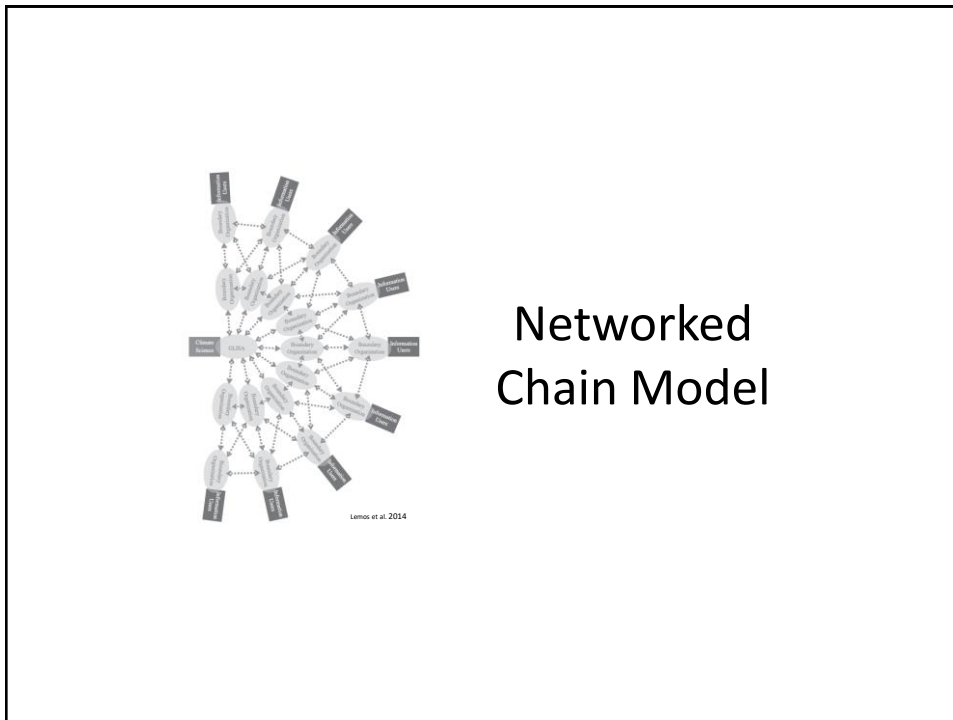
21

Boundary Chains

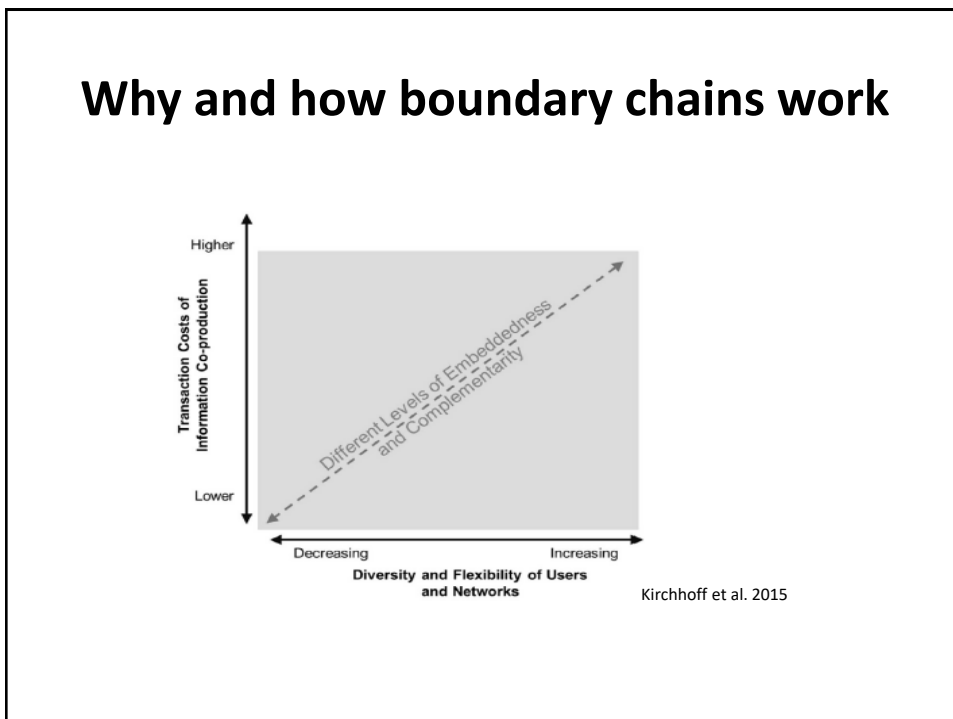


Linked Chain Arrangement

22

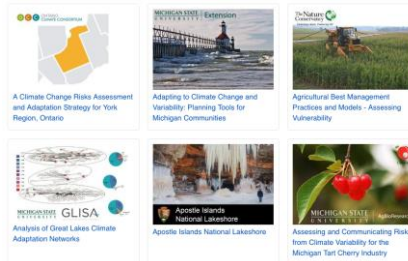


23



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The GLISA Small Grants Program: the limits of supply-driven demand



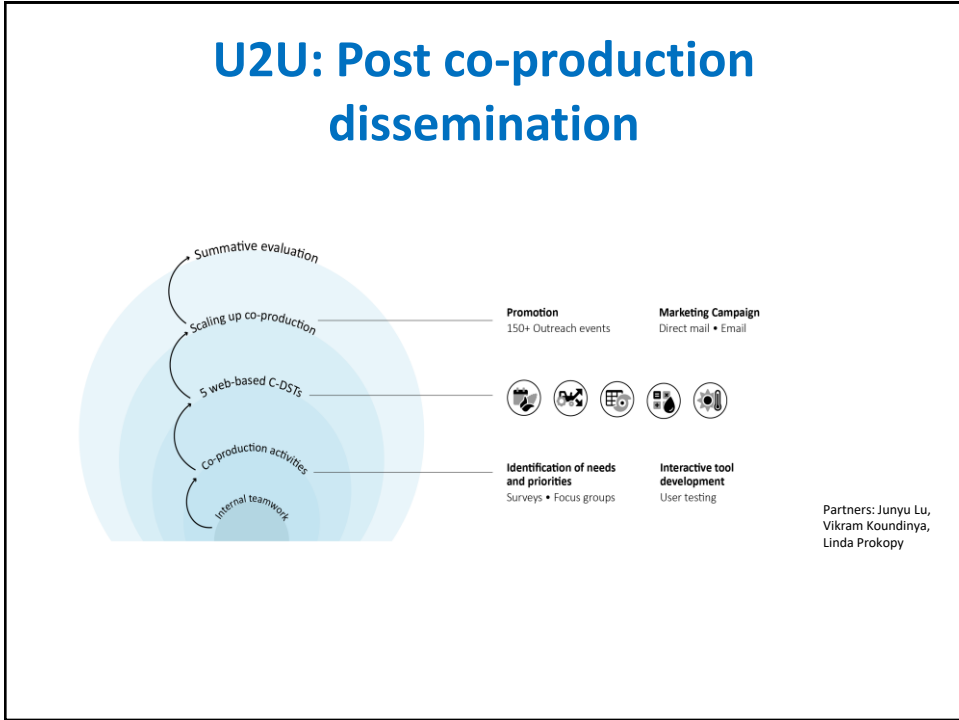
25

Scaling up and broadening participation: The closer, the better?

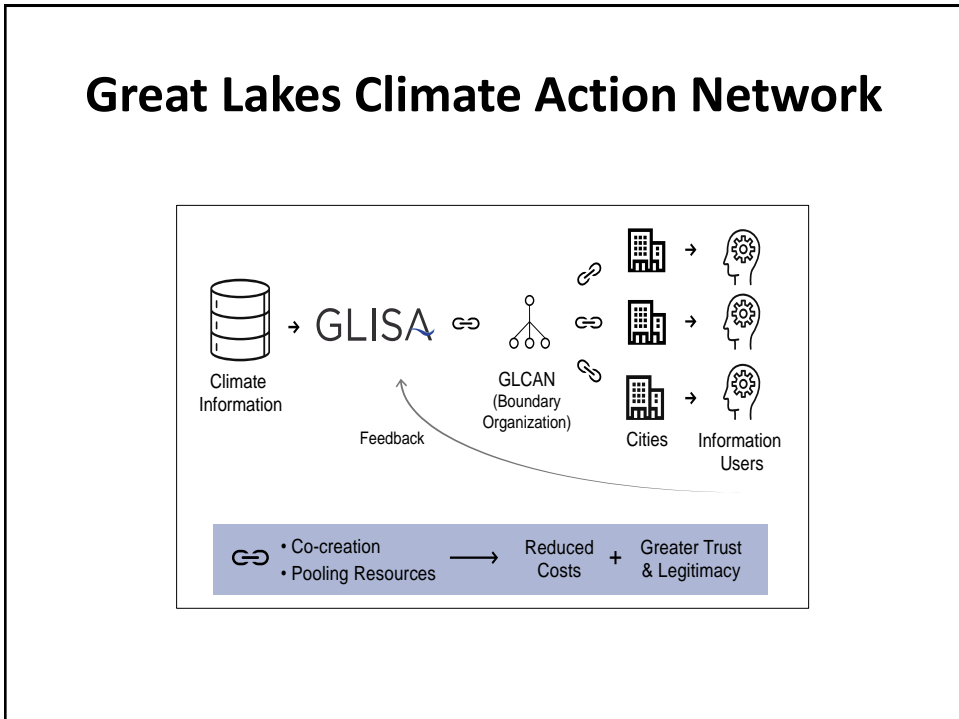
- Experiments with three treatments: face to face, webinar, and self-instructed
- Measured credibility, access and understanding.
- Not a significant difference between webinar and face to face
- A means of scaling up? Decreasing costs?



26



27



28



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Building Adaptive Capacity

- Main areas:
 - stormwater management
 - Urban forestry
 - Heat islands
- Mainstreaming: bundling vs 'adaptation by stealth'
- Role of politics and entrepreneurship

30

Role of climate knowledge

- Great Lakes Cities Adaptation Network (GLCAN)
 - Customized climatologies
 - Co-production support
- Boundary Chains:
 - Decreasing transaction costs
 - Embeddedness and complementary

31

AGGREGATING OUTCOMES

32

Yet not all co-production leads to inclusion, use or desirable use and not all science needs to be co-produced

33

Does co-production need tough love? Potential Pitfalls

- High costs: time, money, commitment, pressure
- Potential for not meeting goals or even have undesirable outcomes
- Lack of intentional care for issues of justice, equity, inclusion and diversity
- Pressure on scientists and practitioners
 - “stakeholder fatigue”
 - ‘gold standard’
 - performance evaluation
 - devaluation of basic science

34

GAPs and future research

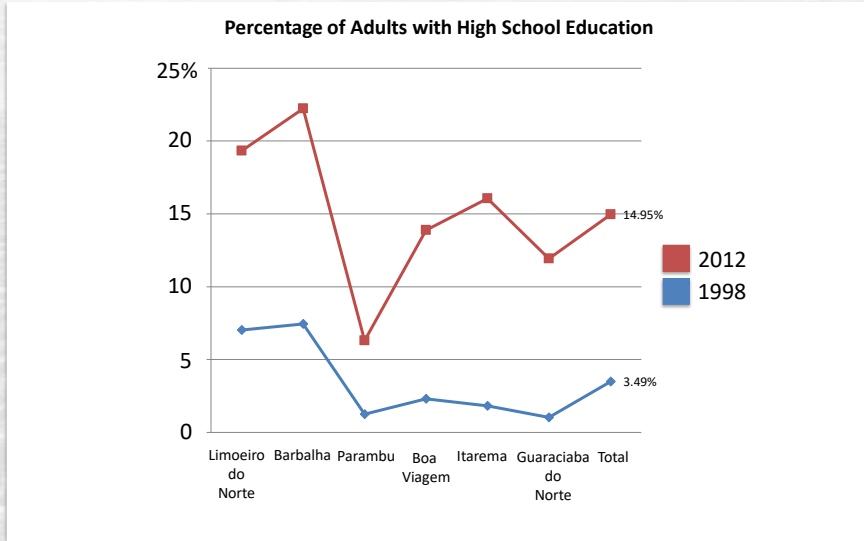
- Larger databases to understand the value and opportunity costs of co-production
- Better frameworks for evaluation
- Equity and politics
- Comparing different approaches to 'use': counterfactuals

35



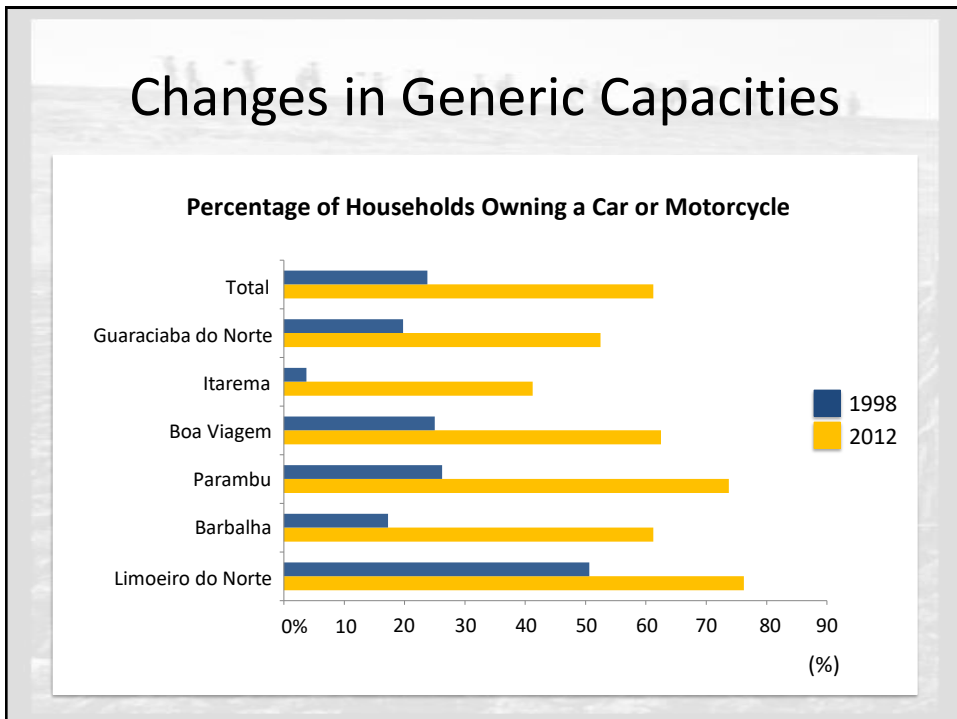
36

Changes in Generic Capacities



37

Changes in Generic Capacities



38

Two analyses

- Comparison between 1998-2012 especially focusing on the role of anti-poverty intervention in level of vulnerability (measured as food security).
- Focus on 2012-present drought and understanding the relationship between generic and specific capacities in modulating vulnerability among households

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1998-2012 between droughts

- Although drought was comparable or less in four sites (with higher levels of poverty overall), households are more food insecure in 2012 than they were in 1998, despite overall higher income.
- Two more affluent sites where drought was more severe in 2012 reported similar rates of food insecurity for both years. Both sets of results may suggest that combinations of different capacities maybe critical.

40

2012

- Goal: how different kinds of capacity (generic and specific) shape the vulnerability of poor agricultural households
- Specifically:
 - 1) the relative importance of different kinds of capacity in shaping vulnerability on these households and
 - 2) how the level of generic capacities may influence the access to specific ones (synergy).

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2012: relative capacities

- relatively higher levels of generic capacity (in terms of income in general, and climate-neutral income specifically) are associated with relatively higher levels of specific capacity (irrigation). Access to irrigation is associated with higher levels of food security, but is irrigation the solution?
- Is money? Interestingly, having income from *Bolsa Familia* did not appear to have a substantial significant impact on food insecurity, notwithstanding the celebrated role in poverty reduction.
- Is it about how much income (generic) would it take to replace risk management? But patterns of investment and spending among our households are worrisome in terms of food security.

42

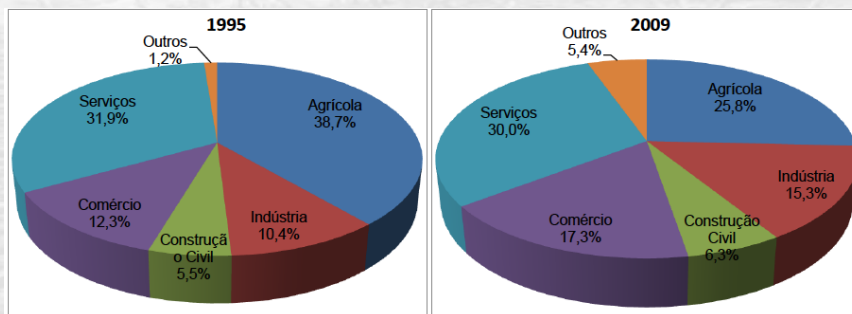
Conclusions

Our results suggest that higher GC maybe a necessary but insufficient condition to manage risk adaptively, that is, it is not only about human development but also specific responses

- The character of rural livelihoods has been shifting
 - Steady shift in migration patterns (from seasonal to economic)
 - Emergence of ‘new problems’: violence, drugs, fraud, indebtedness
- **Policy Implications**
 - Focus on risk management?
 - Seeds for longterm transformation?

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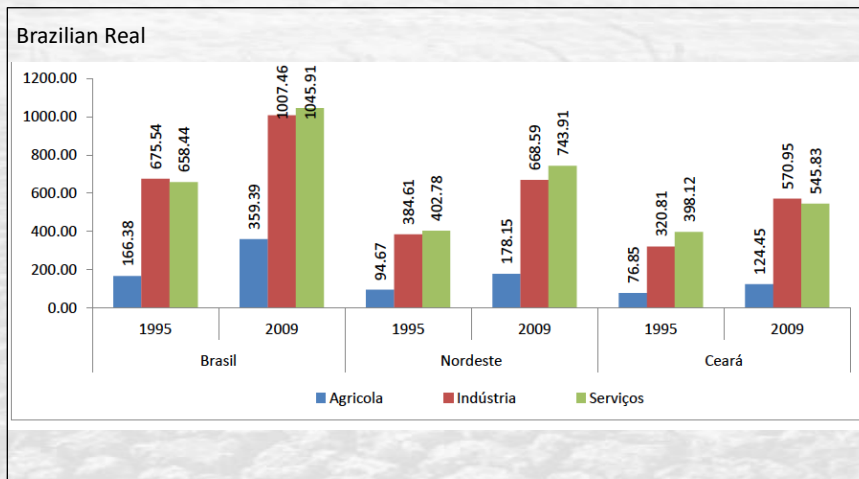
Percentage of workers older than ten years old per sector, 1995 & 2009



Fonte: IBGE/PNAD. Elaboração: IPECE

44

Medium Income per sector

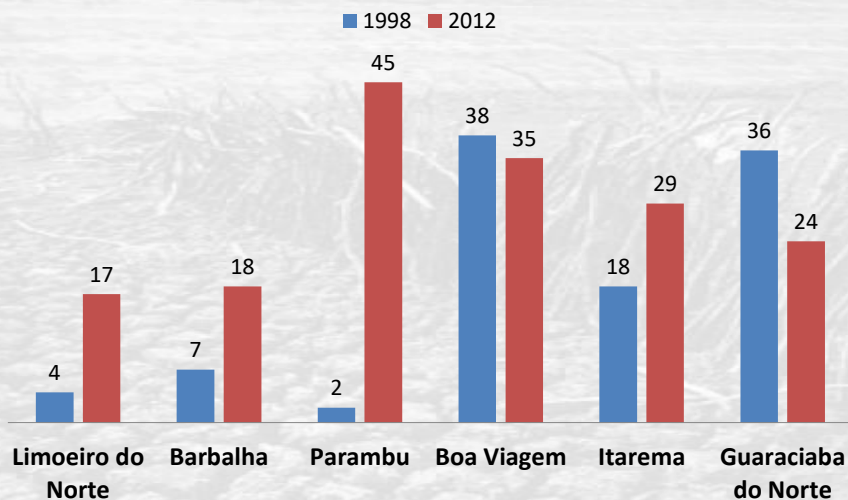


Source: IBGE/PNAD/IPECE

Note: in 2009 values

45

Food Insecure HH 1998 2012



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Test Results

ANOVA for Generic Adaptive Capacity by 1998 and 2012*

	1998		2012		F-test	P-value
	Mean	SD	Mean	SD		
Generic Adaptive Capacity						
Per Capita Annual Income	5.89	1.04	6.66	1.06	120.77	0.00
Vulnerable	5.46	1.07	6.25	1.01		
Not Vulnerable	6.01	1.00	6.89	1.01		
Per Capita Livestock Assets	0.80	1.04	0.66	1.05	4.43	0.04
% Income from Social Security	0.29	0.41	0.36	0.43	6.83	0.01
Consumer goods index	0.13	0.12	0.27	0.12	354.84	0.00

* To achieve the normality assumption, the log transformation is applied to the variables of Per Capita Annual Income and Per Capita Livestock Assets

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Model Results

Logistic Generalized Linear Model

Variable	Dependent Variable: Vulnerability		
	Coeff.	SE	P-Value
Panel of Year			
1998	-1.65	0.63	0.00
2012	--	--	--
Município			
Limoeiro do Norte	-1.02	0.34	0.00
Barbalha	-1.13	0.30	0.00
Parambu	-0.58	0.28	0.04
Boa Viagem	0.43	0.28	0.12
Itarema	-0.60	0.28	0.03
Guaraciaba do Norte	--	--	--
Generic & Specific Adaptive Capacity			
Per Capita Annual Income	-0.39	0.10	0.00
Per Capita Livestock Assets	-0.31	0.10	0.00
Dependability of irrigation	-0.81	0.34	0.02
% Income from Social Security	-0.45	0.24	0.06
Consumer goods index	-2.09	0.95	0.03
Interaction			
Panel dependability of irrigation	1.05	0.51	0.04

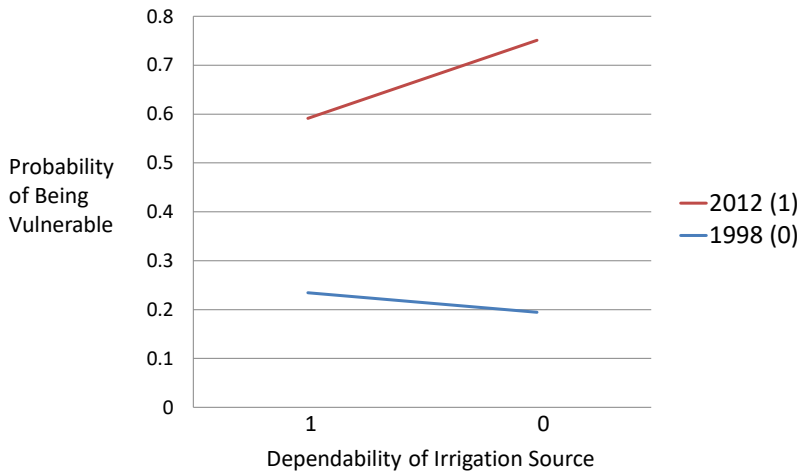
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Comparisons of Indicators for Food Insecure HH

Household-level Indicators	1998 (n=105)	2012 (n=168)	T-test/ χ^2 -test* (p-value)
Generic Capacities			
% of Owned a car of motorcycle	12.5	53.0	44.902* (p<0.001)
Mean of Dependency ratio	0.339	0.478	4.618 (p<0.001)
Mean % of adults with high school degree	0.012	0.114	5.635 (p<0.001)
Specific Capacities			
% of Had irrigation	11.7	11.0	0.029* (p=.865)
% of Use Agricultural Technology	17.1	25.6	2.660* (p=.104)
Mean of income sources per capital	0.371	0.592	5.466 (p<0.001)

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Results



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The Critical Relationship

- In less developed regions there is a direct relationship between building adaptive capacity and development.
- **...many of the causes of vulnerability are directly connected to development deficits...**
- Implications for global distribution of resources for adaptation.

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Ceará: Social Indicators

Indicators	1987	1997	2005	2010
Infant Mortality	137.0 ⁽¹⁾	40.0	33.2 ⁽⁴⁾	26.6
Illiteracy (% of the population over 7 years-old)	43.3	31.7	26.5 ⁽⁵⁾	18.8 ⁽⁶⁾
Households with piped water (%)	31.5	53.3	74.0	77.2
Houses with electricity (%)	53.1 ⁽³⁾	75.6	95.6	98.9
Households with garbage collection (%)	28.0	49.0	72.2	75.3

Source: IBGE/PNAD, SEDUC, SESA, Government of the State of Ceará, 2000, 2010

Notes:

(1) 1986

(2) the rate for 1997 is 42/1,000

(3) (Folke and T. Hahn) 1985

(4) (Folke and T. Hahn) 2004

(5) % of the population over 15 years old

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Impact:

- 10.6 million affected
- R\$ 3,6 billion in crop losses
- R\$ 12.6 billion spent in emergency and structural works, and special credit lines
- Climate change?

24/03/2014 08h28 - Atualizado em 24/03/2014 20h04

Nordeste do Brasil teve pior seca dos últimos 50 anos em 2013, diz relatório

Dados da Organização Meteorológica Mundial mostram clima extremo. Austrália e Argentina também sofreram com calor.

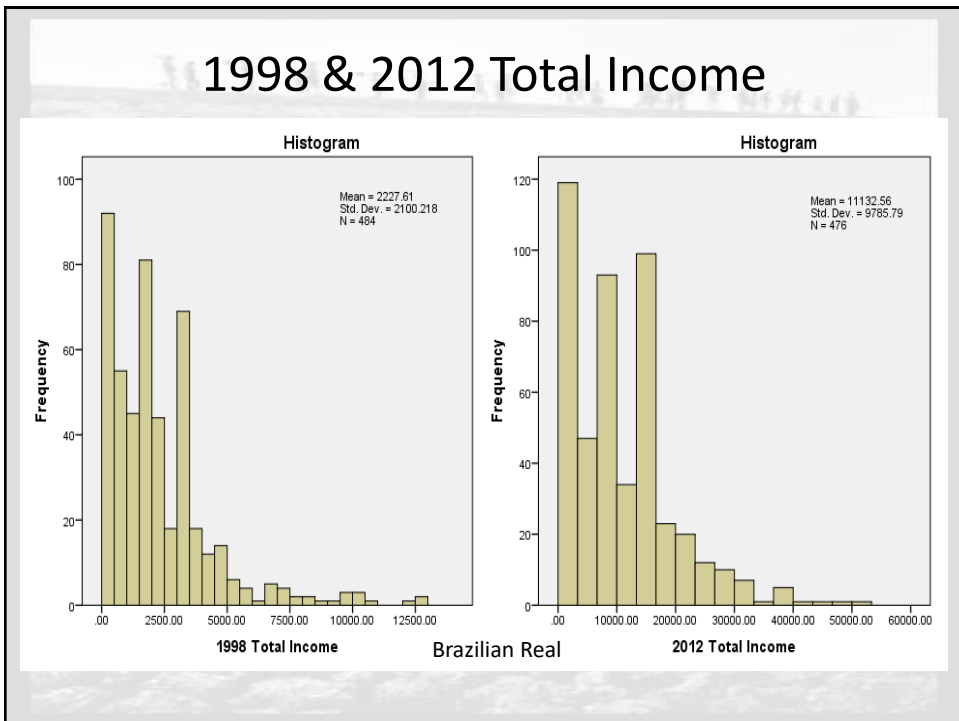
Do G1, em São Paulo

102 comentários [Tweeter](#) 215 [Recomendar](#) 323



Em 2013, seca provocou a morte de animais no interior do Rio Grande do Norte (Foto: Aldair Dantas)

53



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