Cities and governance for sustainability II: catalysts for change?

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Global city networks

- ICLEI, Local Governments for Sustainability: 1200 local governments since 1990.
- Cities for Climate Protection (part of ICLEI): cities commit to concrete actions for carbon reduction.
- C40 Cities Climate Leadership Group (C40): a network of cities created in 2005 by the London Mayor and the Clinton Foundation’s climate change initiative.
Regional transnational networks

Goals:
- voluntary commitments
- enhance local capacity
- push for more ambitious policy at higher levels of government

- Cities for Climate Protection
- Climate Alliance
- Energie-Cités

Kern, Bulkeley 2009
Cities Committed to the Compact of Mayors
Methods of governing

Internally
- Communication: diffusion of best practices -> heuristics
- Cooperative bids for national or supra-national funding for projects
- Recognition, benchmarking, certification: attempt to create peer-pressure

Externally:
- Brokerage with key decision-makers at supra-national level (e.g. European commission)
- Observer status at COP; able to publicize what actions have been tried
1000 city officials at COP21
Issues raised: lifting some of the limits on cities

- Recall, urban governance can be a zero-sum game (because of competition and leakage)
- Non zero-sum strategies: 24 cities of C40 commit to purchases together to lower the price of electric buses
- Focus in COP21 put on bringing funds to the local level: Cities Climate Finance Leadership Alliance: bringing attention to $4.1-4.3 trillion dollar gap in urban climate finance
- Cities as place to build constituencies: make climate change more concrete to citizens and engage them
Paris Accord: a Universal and Pragmatic strategy

- Strong market signal to invest (why strong? because unity and long-term)
- Increased ambition to a 1.5C limit, despite increasing difficulty of reaching it
- Common but differentiated responsibility
- Start with voluntary action plans by each nation
- Establishes a regular mandatory process for monitoring emissions and increasing ambitions
- $100 billion/year (non-legally binding) pledge by 2020
- Features of urban governance for sustainability
  - networks
  - information
  - voluntary commitments

- Key question:
  - under what conditions can we expect these initiatives to exert influence on higher-level policy and broader outcomes?

{ common to intl treaty as well }
Critical voices: it’s only feel good politics

“Fossil fuels continue to dominate new energy infrastructure. Maersk is not unveiling solar powered container ships. Boeing and Airbus appear content with the age of kerosene. Steel makers are sticking with coal. 20 million new cars are added to China’s roads each year. Electric cars remain marginal everywhere: in Germany, where they wanted 1 million of them on the roads by 2020 and in America where Obama spoke of 1 million being on the roads by 2015. Despite what you may read, China is still opening roughly one new coal power plant each week. India plans to double its coal production by 2020. Green Germany just opened a new coal power plant last month. Britain announced a phase out of coal power plants, but plans to build a new fleet of gas power plants.” —Robert Wilson, University of Strathclyde
Moving the needle?

The sum of all sub-national initiatives would stabilize US emissions to 2010 level by 2020

For the most part, we do not yet know how these will translate into concrete ecological gain!

But we can reason about mechanisms by which cities can catalyze change:
- INNOVATION
- POLICY DIFFUSION
- CHANGING POLITICAL DYNAMICS
Cities and green innovation?

Clean-tech innovation in California: limited venture capital and start-up growth?

Chapple et al. 2011
Coordination: one of the challenges of green innovation

- Tesla’s design is radically new

- Tesla’s plant is fully vertically integrated (including IT functions)

- Initial attempts at dealing with a decentralized supplier base led to massive coordination problems (Dyer et al. 2015)
Most technologies involve multiple components. In fact, most innovation involves combinations of existing components.
Technological systems exhibit *epistasis*, the performance of one component depends on the characteristics of other components.
What about across a supply chain?

Innovation can be intense in modular engineering systems

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What about across a supply chain?

In highly interdependent systems, innovation is harder to achieve in a decentralized fashion.

Toyota network in the 90’s

GM network in the 90’s

Dyer 1996, Specialized Supplier Networks as a Source of Competitive Advantage
Coordination failures in innovation

- Coordination with suppliers is necessary for each producer.
- Risk dominant solution: invest in « marginal » innovations.
- Central supplier does not necessarily want to coordinate on radical innovation if there is uncertainty in how each producer will resolve uncertainty in the design.
- Type of coordination failure not currently considered in research policy and that cities could address.

*Dumas, Dugoua, In Prep*
Policy diffusion

- Lateral diffusion has been widely documented in many policy domains especially between states and countries
- Policies are reinvented and evolve as they spread
- Trickle-up diffusion (Volden Shipan, 2006)
Taking actions that change future power balances - Melbourne example

MELBOURNE RENEWABLE ENERGY PROJECT

In an Australian first, some of Melbourne's most iconic businesses, universities, cultural institutions and Councils are banding together to drive investment in new renewable energy.

The group wants to buy:

110 GWh energy = 15 wind turbines = 250,000 solar panels

or enough to power 28,475 households in Melbourne for a year

or the equivalent of planting 160,012 trees
Feedback between policy and politics

A model to determine how two competing parties with differing ideology about energy will invest in renewable power when they can lock-in future investments thanks to technological learning.

Technological learning (from Trancik, 2014)

Stochastic dynamic optimization by the two parties

Dumas et al. 2016
Uncertain transition paths
Local actions that affect national politics: the case of citizen suits
Local actions that affect national politics: the case of citizen suits
With very few exceptions, the enforcement of the laws depends upon individual citizens to initiate the legal process. By virtue of this dependence, an aggregation of individual citizens acting largely in their own interests strongly influences the form and extent of the implementation of public policy thereby the allocation of power and authority.” Zemans, 1983

citizen suits affecting the implementation of the public policy
Scattered power in society builds a compromise

![Graph showingFully Diverse Court](image)
Involvement of citizens through courts can improve legislative decision-making.

- Welfare
  - w/o citizen suits
  - w/ citizen suits

- Free-riding within majority group reduced
- Better compromise because minority voice included
What are the dynamic properties of the law?

Alternative Models of the Law

**Rule of Law Model**

Courts gain independent authority over the institutional evolution of society, if they maintain legitimacy by:

- adapting rules to contexts
- facilitating normative deliberation
- providing commitment

**Law as Beholden to Politics**

Courts act strategically, given constraints by politicians

Legal change is autonomous from politics

Legal change is driven by shifts in political alliances
Empirical analysis of the dynamics of legal rules

Measuring legal change:

- A measure of *Novelty*: appearance of new, influential rules
- A measure of *Controversy*: overruling of past, influential rules
- A measure of *Directed Reinforcement*: changes in the frequency with which past rules are re-used and re-asserted
Congress #

Novelty measure

Congress #

Controversy measure

- air
- water
- historical preservation
- hazardous waste
- NEPA
- ESA
- CERCLA
Environmental law has evolved autonomously from partisan shifts in power.

Shifts in political preferences of elected officials does not affect novelty and controversy in the law.

Log(shift in pol preferences)
Environmental law has evolved autonomously from partisan shifts in power.

Absence of directed reinforcement
Feedback between policy and politics

- Participation in agenda setting and policy making at broader scale
- Agency function (implementation of policy)
- Self-governance
self-governance

participation in agenda setting and policy making at broader scale

responsibility to implement

autonomy and influence from expertise and on the ground action

experiments knowledge solutions

agency function
Formal versus Real Authority: the key role of information

- The more cities, citizens, NGOs can acquire information about how to effect outcomes, the more real authority they have relative to formal policy-makers (Aghion, Tirole 1997)
- If the latter accept to rescind some control, these actors will be motivated to act and will affect outcomes (Fehr, 2010)
- Supra-national decision-makers have reasons to support these actors: they are a channel to affect reality on the ground without passing through national politics
How can we study complex policy systems such as city networks?
Types of network datasets

- Nodes may have attributes and ties may have weights
- Directed/undirected tie
- Unidimensional/multiplex: multiple types of ties
- Unipartite/multipartite: multiple types of nodes and relationships between them
- Dynamic: longitudinal analysis
Node-level characteristics
Communities and modularity

Typically, the distribution of edges is inhomogeneous, leading to community structure. Goal: find group of nodes with denser within-group connections than between-group connections.
Network-level properties & information

- **Centralization** (Sandstrom, 2008)
  - coordination
  - leadership

- **Modularity**:
  - Specialization of knowledge (Ghimire et al. 2004)
  - Robustness again synchronization

- **Networks support cooperation by**:
  - spreading information on behavior (requires dense networks)
  - allowing clustering of cooperative individuals and exclusion of uncooperative individuals
Coordination and cooperation

**Figure 1** Network Structures for Coordination and Cooperation

A. Coordination through Open Two-Paths

\[ s_{i1}(x) = \# \{ j \mid x_{ij} = 0, \max_{h} (x_{ih}x_{hj}) > 0 \} \]

B. Coordination through Popular Alterns

\[ s_{i2}(x) = x_{ij} \sum_{l,h} x_{hl} \]

C. Cooperation through Reciprocity

\[ s_{i3}(x) = \sum_{j} x_{ij}x_{ji} \]

D. Cooperation through Transitive Triads

\[ s_{i4}(x) = \sum_{j,h} x_{ij}x_{ih}x_{jh} \]
## Statistical models of networks

<table>
<thead>
<tr>
<th>Method</th>
<th>Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Exponential random graph model</strong></td>
<td>are policy actors seeking network closure? are policy actors seeking new sources of information or on the contrary to form coalitions with like-minded individuals?</td>
</tr>
<tr>
<td>Estimates the prevalence of specific configurations relative to random assembly: <em>tendency toward centralization</em> (k-stars), <em>closure</em> (k-triangles), <em>multiple connectivity</em> (k-2paths) + attribute effects (e.g. homophily)</td>
<td>do information networks of communication correspond to formal hierarchy? Do governments share policy entrepreneurs and does that explain common policy adoption?</td>
</tr>
<tr>
<td><strong>Quadratic assignment procedures</strong></td>
<td>do actors that bridge communities become more central over time? how often do actors update their policy network? are cities influenced by each others’ policies?</td>
</tr>
<tr>
<td><strong>Stochastic actor-oriented model</strong></td>
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<tr>
<td>statistical test of whether 2 matrices are correlated using bootstrapping procedure</td>
<td>longitudinal data jointly estimate <em>partner selection function</em> (based on structure and actor attributes) and <em>behavior function</em> (social influence)</td>
</tr>
</tbody>
</table>
Endogenous policy networks, in early stages:

- actors seek central partners that expand their bridging capital in order to discover collaborative possibilities and resolve relatively simple, low-risk dilemmas.
- they also seek reciprocal relationships to provide credibility for smaller projects and quickly learn to trust or distrust those they rely on.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Longitudinal Model (Coefficients)</th>
<th>Influence Effect on Trust</th>
</tr>
</thead>
<tbody>
<tr>
<td>PARTNER SELECTION</td>
<td>Average Choices per Actor</td>
<td></td>
</tr>
<tr>
<td>Network Structures</td>
<td>Outdegree</td>
<td></td>
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<tr>
<td>Low-Risk Coordination</td>
<td>Popularity of Alter</td>
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<td></td>
<td>Transitive Triplets</td>
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<td>Ego’s Effects</td>
<td>Trust Tendency</td>
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<td></td>
<td>Effect of Trust Measured in 1999</td>
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<td></td>
<td>Effect of Government Type</td>
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<td></td>
<td>Effect of Prodevelopment Beliefs</td>
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<td></td>
<td>Influence of Alters’ Trust</td>
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<tr>
<td>PARTNER SELECTION</td>
<td>4.85** (0.51)</td>
<td>7.05** (1.80)</td>
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<tr>
<td>Network Structures</td>
<td>Outdegree -2.20** (0.12)</td>
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<tr>
<td>Low-Risk Coordination</td>
<td>Popularity of Alter 0.21** (0.02)</td>
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<td>High-Risk Cooperation</td>
<td>Reciprocity 0.66** (0.24)</td>
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<td>Transitive Triplets 0.12 (0.07)</td>
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<td>Ego’s Effects</td>
<td>Trust Tendency 0.01 (0.05)</td>
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<td>Effect of Trust Measured in 1999 -0.00 (0.02)</td>
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<tr>
<td></td>
<td>Effect of Government Type 0.11 (0.10)</td>
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<td>Effect of Prodevelopment Beliefs -0.27 (0.33)</td>
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<tr>
<td></td>
<td>Influence of Alters’ Trust 4.78** (1.62)</td>
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Transportation and land-use planning networks

- Are actors in metropolitan transportation planning networks split into belief systems?
Coalition politics

![Diagram of Ego, A, and B with a statement about brokerage, independence, two-path, and transitive triad.]

<table>
<thead>
<tr>
<th></th>
<th>Merced</th>
<th>Riverside</th>
<th>San Diego</th>
<th>Sacramento</th>
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<tbody>
<tr>
<td><strong>Ideological distance</strong></td>
<td></td>
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<tr>
<td>Aggregated belief distance</td>
<td>-0.27* (0.11)</td>
<td>-0.21* (0.10)</td>
<td>-0.22* (0.11)</td>
<td>-0.28* (0.07)</td>
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<td>Environmentalism</td>
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<td>-0.08 (0.08)</td>
<td>-0.10 (0.07)</td>
<td>-0.08 (0.04)</td>
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<tr>
<td>Economic conservatism</td>
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<td>-0.05 (0.09)</td>
<td>0.03 (0.08)</td>
<td>-0.16* (0.04)</td>
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<tr>
<td>Inclusiveness</td>
<td>-0.02 (0.11)</td>
<td>0.02 (0.14)</td>
<td>0.18 (0.10)</td>
<td>-0.07 (0.07)</td>
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<tr>
<td>Smart Growth</td>
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<td>0.06 (0.13)</td>
<td>-0.02 (0.09)</td>
<td>0.06 (0.06)</td>
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<td>Environment and urbanization</td>
<td>-0.10 (0.10)</td>
<td>-0.09 (0.10)</td>
<td>-0.08 (0.08)</td>
<td>0.01 (0.04)</td>
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<td>Crowding and infrastructure</td>
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<td>0.01 (0.10)</td>
<td>0.10 (0.08)</td>
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<td>Costs</td>
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<td>-0.09 (0.08)</td>
<td>-0.14* (0.06)</td>
<td>-0.10 (0.06)</td>
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<td><strong>Social capital</strong></td>
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<tr>
<td>Reciprocity</td>
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</tr>
<tr>
<td>Transitivity</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Three-cycles</td>
<td>-0.15* (0.05)</td>
<td>-0.14* (0.05)</td>
<td>-0.16* (0.03)</td>
<td>-0.10* (0.03)</td>
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<tr>
<td>Two-paths</td>
<td>-0.02 (0.02)</td>
<td>-0.02 (0.03)</td>
<td>-0.02* (0.01)</td>
<td>-0.02* (0.01)</td>
</tr>
</tbody>
</table>
Regional politics and policy brokers

Brokers are highly diverse and can help bridge communities

Collaborations also assort by political similarity

<table>
<thead>
<tr>
<th>Variable</th>
<th>ERG Model 1</th>
<th>ERG Model 2</th>
<th>ERG Model 3</th>
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<tr>
<td>Political Distance</td>
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<tr>
<td>Party Registration</td>
<td>-.026***</td>
<td>-.019**</td>
<td>-.016*</td>
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<tr>
<td></td>
<td>(.008)</td>
<td>(.009)</td>
<td>(.009)</td>
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<tr>
<td>Socioeconomic Distance</td>
<td></td>
<td></td>
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<tr>
<td>Percent Latino</td>
<td>-.018***</td>
<td>-.020**</td>
<td>-.021**</td>
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<tr>
<td></td>
<td>(.006)</td>
<td>(.008)</td>
<td>(.009)</td>
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<tr>
<td>Median HH Income</td>
<td>-.018**</td>
<td>-.021**</td>
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<td></td>
<td>(.007)</td>
<td>(.009)</td>
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<tbody>
<tr>
<td>1. Staff: County of Merced</td>
<td>Staff: County of Riverside</td>
<td>US Fish and Wildlife</td>
<td>Neighborhood Organizations (3)</td>
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<tr>
<td>2. Elected/Appointed:</td>
<td>Elected/Appointed: Organization/ Regional Transportation Planning Agency(2)</td>
<td>Neighborhood Organizations (3)</td>
<td>Regional Water Quality Control Board (2)</td>
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<td>3. Developer/Real Estate</td>
<td>Council of Governments (3)</td>
<td>Metropolitan Planning Organization/ Regional Transportation Planning Agency(2)</td>
<td>California Department of Transportation (3)</td>
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<td>4. Council of Governments (3)</td>
<td>State Department Fish and Game (3)</td>
<td>Environmental Organizations (3)</td>
<td>State Department Fish and Game (3)</td>
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<tr>
<td>5. State Department Fish and Game (3)</td>
<td>Special Services District (3)</td>
<td>California Department of Transportation (3)</td>
<td>State Department Water Resources</td>
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<tr>
<td>6. Farming/Ranching</td>
<td>Metropolitan Planning Organization/ Regional Transportation Planning Agency(2)</td>
<td>Staff: County of San Diego</td>
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<tr>
<td>7. Private Consultant (2)</td>
<td>School District (2)</td>
<td>School District (2)</td>
<td>Local Agency Formation Commission</td>
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<td>8. Staff: City of Merced</td>
<td>Elected/Appointed: County of Riverside</td>
<td>Council of Governments (3)</td>
<td>Environmental Organizations (3)</td>
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<td>9. California Department of Transportation (3)</td>
<td>Neighborhood Organizations (3)</td>
<td>Regional Water Quality Control Board (2)</td>
<td>Private Consultant (2)</td>
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<td>10. Elected/Appointed:</td>
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Conclusion

- Policy change can arise at small scale and catalyze larger scale change
- Collaborative policy networks to facilitate cooperation, coordination and diffusion of ideas are proliferating

BUT

- Need for powerful brokers able to bridge arenas
- Information and learning are important, but these are still political battles
- Little is known about city networks for sustainability and their policy outputs but tools exist to study them!