

# **Smart for Whom?**

## **On the governance of smart city infrastructure**

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# Overview

- Focus will be on the governance of technology infrastructure(s)
- Infrastructure plays a special role in society
- Some questions
  - Why consider the *governance* of infrastructures?
  - What academic theories apply?
  - What are the implications for SDG 16?

# Some principles

- Governance  $\neq$  Government!
- Infrastructure resources satisfy the following criteria (Frischmann, 2005)
  - The resource may be consumed non-rivalrously (or partially so)
  - Social demand for the resource is driven by downstream productive activity for which the resource is an input
  - The resource may be used as an input into a wide range of goods and services, which may be private, public or nonmarket
- But is that all?

# Social aspects of infrastructure

- “Infrastructure” can mean many things
  - Laws and regulations (see, e.g., Hadfield, 2016)
  - Physical resources (roads, bridges, etc.)
  - Cultural norms
  - Etc.
- Human behavior adapts to infrastructure
- Infrastructure becomes “invisible” (until it breaks)

# Social aspects of infrastructure

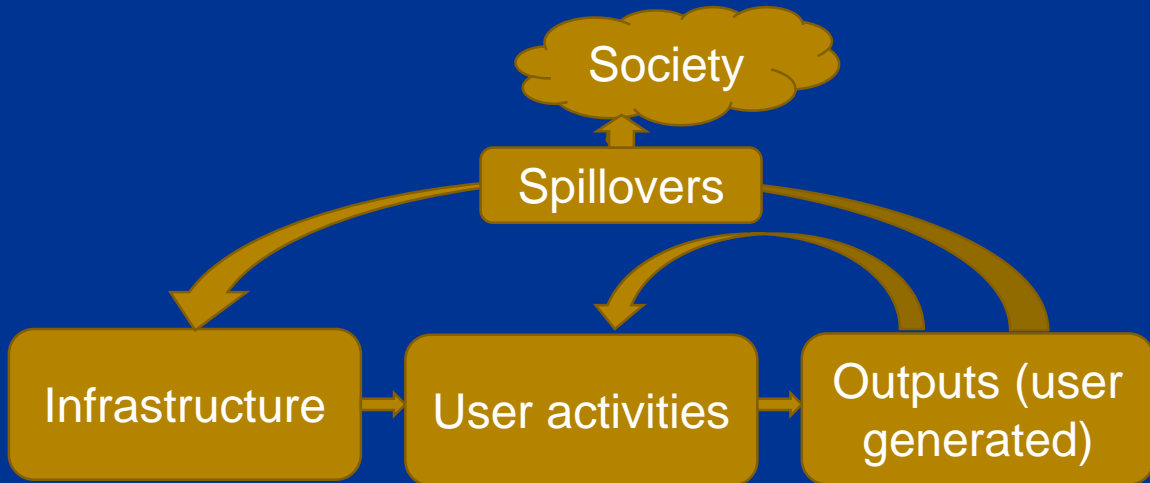
Significant literature exists on “infrastructure studies” (see, for example Edwards et.al., 2007)

- Scales matter
  - Short vs. long term
  - Scope (geographic, economic, or human)
- Transition from “building” to “sustaining” is often institutionally difficult
  - Funding
  - Differing objectives of “builders” and “sustainers”
- New infrastructures-to-be are often fragmented
  - Focussed on smaller scales
  - Competing institutions/technologies
  - Gateways between islands
- Interrelationship between design and use
  - Organic growth vs. ex ante design
  - Responds to environment and use
- The fallacy of “future proof”
- Role of breakdowns
- Adaptions
  - Infrastructure to humans
  - Humans to infrastructures

# Features of (physical) infrastructure

- Infrastructure is an *intermediate* product so demand for infrastructure can be difficult to measure
  - Infrastructures and behaviors are constantly adaptive
  - This challenging *information* problem
- Infrastructure often features declining average costs to scale
  - This is a challenging *economic* problem
  - This is a challenging problem for *sustainability*

# Economic framework of infrastructures



# Infrastructure as a Commons

- Characteristics of a commons (Ostrom)

	Low subtractability of use	High subtractability of use
Difficult to exclude	Public goods	Common pool goods
Easy to exclude	Toll or Club goods	Private goods

- Why can infrastructures be thought of as commons
  - Exclusion may be difficult, costly, or undesirable (socially or privately)
  - Resource can be depleted (Subtractability or rivalrous consumption), either directly or through congestion externalities
- Commons  $\neq$  Open Access!



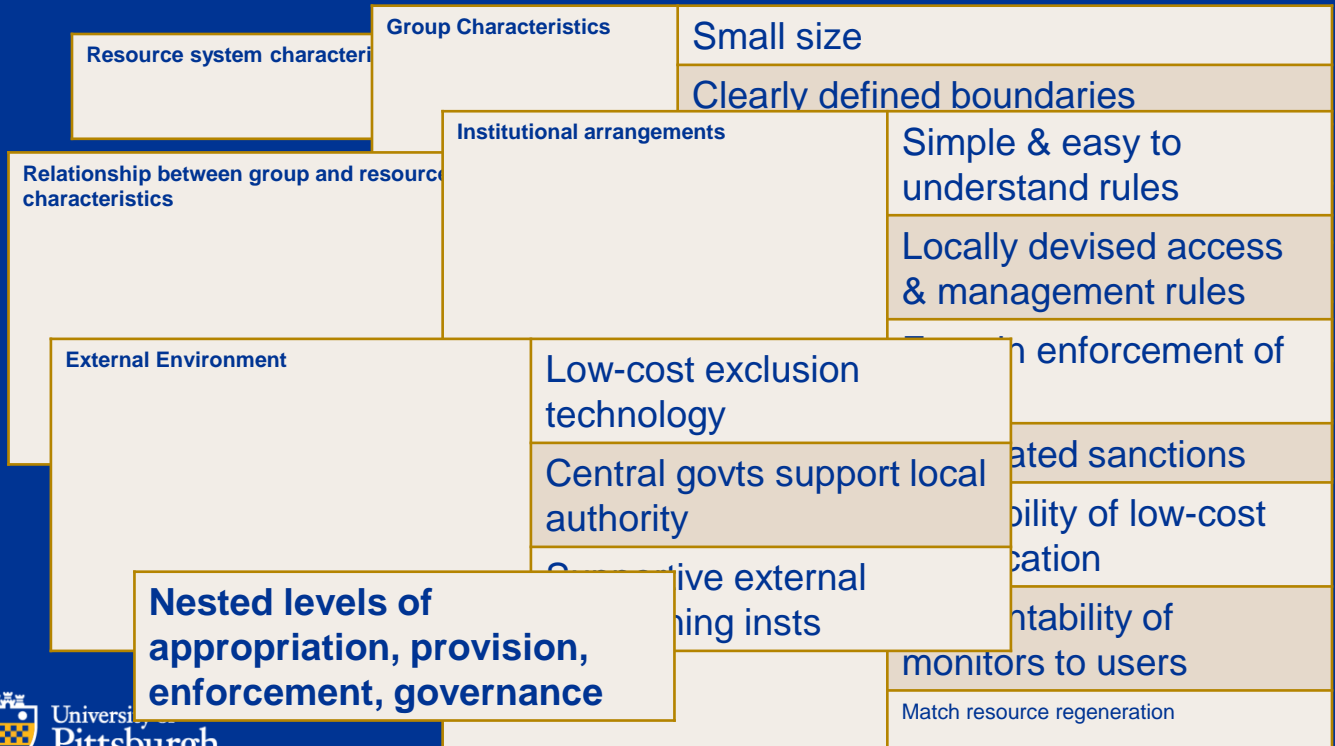
# Why do we need governance of infrastructure?

- Common pool goods need governance to avoid the “Tragedy of the Commons”
  - Manage access
  - Restore/maintain the “resource”
- Social
  - To support “fair” access for users
  - To support “fair” pricing
  - To support adequate supply of infrastructure
  - To align with social goals/priorities/preferences
- Provider (Private)
  - To enable productive user activities
  - To not foreclose future user activities (eg. Platforms, APIs)

# What does this mean for smart city technologies?

- Many smart city technologies are infrastructure
  - Sensors
  - Algorithms
  - Etc.
- They may be privately or publicly provided
- They are not an end to themselves but *enable* productive user outputs
- Thus, Frischmann's (2012) ideas apply directly
- But, so do Edwards et.al.'s (2007) observations

# When does CPR governance work? (Ostrom)



# Smart for Whom?

- (Physical) infrastructure owners may have different objectives than infrastructure users
- These objectives are sometimes inconsistent or in conflict
- But
  - Users may not always be aware of the consequences of intelligence in infrastructure
  - Social norms are dynamic

# Parting thoughts

- Governance affords the opportunity to bring competing objectives/preferences into a stable configuration
- Governance allows for learning
  - Users learn about capabilities/limitations/consequences
  - Owners can learn about new applications/uses that can increase the value of their investment
- Reconsider smart city *failures* from a governance perspective!

# Why CGM?

- We have an Ostromian approach to understanding these socio-technical problems
- Much of our work analyzes topics such as these from bottom-up perspectives
- We have network of global partners
- Regarding smart cities
  - We want to understand how rules affect the ability of communities to engage in effective collective action