

Polycentric Governance for a New Environmental Regime: Theoretical Frontiers in Policy Reform and Public Administration

Panel: Polycentric Public Policy and the Environment

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ABSTRACT

Polycentric governance is characterized by an organizational structure where multiple independent actors mutually order their relationships with one another under a general system of rules (V. Ostrom 1972). We argue that the idea of polycentricity is an idea whose time has come because of its powerful implications for the discourse on post-governance. The premise is simple; governance of complex, modern societies requires institutional diversity embodied in multi-level, multi-purpose, multi-sectoral, and multi-functional units of governance. In the first part of this paper, we explore the epistemological and ontological foundations of polycentricity, describe its essential features, and outline the preconditions for a polycentric system of governance and its implications for efficiency and democratic administration. We critique the old and new public management, arguing that the current discourse on network governance merely reinforces the old concept of public administration. We also consider implications for a second-generation research agenda on governance that takes into account the logic of polycentricity. In the second part of this paper, these concepts are illustrated through a comparative example of environmental management featuring a mature polycentric governance structure and a developing one. The disciplined, multi-jurisdictional approach of the San Francisco Bay Area contrasts sharply with a weakly administered environmental management regime in Rayong Province, Thailand. These examples are compared to illuminate effective strategies and governance challenges in the polycentric approach to environmental management; the findings may have implications for the development of larger scale polycentric governance structures addressing global-scale environmental issues.

CONCEPTUAL PROVENANCE

The concept of polycentric governance assumes an organizational structure where multiple independent actors mutually order their relationships under a general system of rules (V. Ostrom 1972). The necessary conditions for polycentric governance – what Vincent Ostrom refers to as a *compound republic* – include “polycentricity in the organization of (1) market arrangements; (2) the legal community; (3) constitutional rule; and (4) political conditions [selection of political leadership and formation of political conditions].” Polycentricity is relevant to the discourse on post-governance. The premise is that modern societies embody institutional diversity reflected in multi-level, multi-purpose, multi-sectoral, and multi-functional units of governance.

Multi-level governance – local, provincial, national, regional, and global – is necessary to deal with the different scales of market and government failures. The growing diversity of preferences and local conditions has led to the emergence of cross-jurisdictional governance units such as economic zones, tribal districts, school districts, water districts, charter cities, autonomous governments, trade and monetary zones, among others. In the United States, there are more than 80,000 of these types of governance units, in addition to state and federal government. Multi-functional governance incorporates specialized units for provision, production, financing, coordination, monitoring, sanctioning, and dispute resolution, all of which are needed for effective governance. At the same time, the need to provide for general public goods – rule of law, defense, security, etc. – necessitates the maintenance of nested jurisdictions such as federalist structures and plurinational states (e.g. the EU).

Since the 1950s, the concept of polycentricity has attempted to problematize the challenges of cross-jurisdictional governance, and explain how autonomous actors in fragmented environments interact. Early studies also provide a conceptual framework for related concepts such as network and collaborative governance, but institutional scholars in particular have advanced the theoretical foundations of polycentricity and established a basis for its practical implementation (McGinnis & Ostrom, 2011). Early

research about polycentricity extends from the premise that there is a market for public goods in any interactive system, and this market resembles private markets. For example, Polanyi (1951) examines relationship dynamics within the scientific community and finds that actors pursue individual interests while a collective but implicit research agenda develops. The tacit authority structure Polanyi observes resembles a market system that accommodates multiple opinions while rewarding activities that complement the collective agenda (Polanyi, 1951). Research progress is an expression of aggregated individual interests. Tiebout (1956) adds another dimension, proposing that optimal levels of common goods consumption are determined by tacit market signals that establish equilibrium point for public economies. “Voting with one’s feet” is the associated colloquial expression.

Research about polycentricity gathers momentum with the work of Vincent Ostrom et al. (1961) about metropolitan governance. Their findings indicate that the uncoordinated fragmentation of jurisdictions often lacks a unifying governance apparatus to address challenges in public goods provision; therefore many autonomous, formally independent bodies interact for shared solutions (Ostrom, Tiebout, & Warren, 1961). The authors note that *gargantua*, regional governance structures, are often hierarchical and potentially unresponsive to local interests. This may be overcome through informal relationships among governments to address issues at scale, in an inter-organizational (and *multinucleated*) framework that formally or informally institutionalizes cooperation, competition, and conflict (Ostrom, Tiebout, & Warren, 1961).

With the development of the IAD framework, Ostrom and researchers of the Bloomington School have expanded the concept of polycentricity beyond the urban environment, applying it to common pool environmental resource management in rural areas; examples are Araral’s studies of irrigation in the Philippines, Koontz’s of forest management, Imperial and Yandal’s of fisheries, Heikkila’s of water management, and Agrawal’s commons management research methodology. Andersson and Ostrom (2008) identify a lack of research on multi-level dynamics in environmental policy for developing countries, and study the relevance of super-local institutions in self-ordered natural resource management

regimes. In this study, Andersson and Ostrom identify evolving trends in environmental governance, from a centralized approach in the 1970s and 1980s to a decentralized, local approach more recently. The problem identified in both approaches is the lure of purism; both assume that agencies at either end of the jurisdictional scale are exclusively responsible for governance of a given environmental resource. For example, the concept of “subsidiarity,” namely that regulatory authority should be assigned to as local a level as possible, derives in the U.S. context from the American Constitution (Sovacool & Brown, 2009). In many studies, fragmented metropolitan areas have been identified as the most efficient model of governance (Oakerson, 1999). Likewise, approaches favoring pure centralization are common. Later research on polycentricity searches for a *third way*, focusing on mutuality and the advantages of mixed responsibility. This discourse reflects emerging trends in theory and application across increasingly diverse examples and disciplines.

A more theoretical line of polycentricity research has revisited the concept of public markets. McGinnis proposes polycentricity as a multi-scalar model within the public goods market that accommodates a variety of consumers, providers, and producers (McGinnis M. , 1999). A market-like mechanism steers collective interests towards the providers that serve them most efficiently. As such, the polycentric provision of public goods is most efficient when consumers have the ability to choose from multiple providers and co-producers, both public and private (McGinnis M. , 1999). For example, business improvement districts may best be organized locally, while pollution management initiatives may require a collective – and polycentric – solution. In market-oriented societies, the behavior of constituent elements is steered by market-oriented inducements instead of authoritative mandates (Lindblom, 1979).

“Polycentricity can be utilized as a conceptual framework for drawing inspiration not only from the market but also from democracy or any other complex system incorporating the simultaneous functioning of multiple centers of governance and decision making with different interests, perspectives, and values.”

(Aligica & Tarko, 2012)

Scholars have variously approached polycentricity, enriching its definition with theories from outside the field of institutional studies. For example, Andereis and Janssen (2013) explore the concept of *modularity*, from biological sciences, which embodies polycentricity in a redundant structure where discrete modules are loosely linked but the failure of one does not compromise the whole. They also indicate that relationships among modules allow each to learn from experiments done in others. One model of polycentric environmental governance, according to their research, may be a system where coordination, monitoring, and synthesis occur at “high” governance levels, while local units pursue the policy goal autonomously but are accountable for implementation and outcomes (Andereis & Janssen, 2013). According to Asheim (2009), polycentricity is now being applied in European planning as a normative concept with the aim of achieving certain goals; this countervails the monocentric structure of some European countries, where adoption of polycentricity is often met with skepticism. Although belief in the efficacy of polycentricity continues in some cases to be rooted in geographical proximity, Asheim finds that cooperation and connections drive polycentric initiatives in Finland, without regard to physical isolation. From the perspective of urban planning, polycentricity has been stretched beyond its city-focused roots to address the relationship between rural and urban areas in hinterland development initiatives (Asheim, 2009).

Fundamental to the concept of polycentricity is the ability of groups to solve their own problems based on options that are institutionally enabled in a self-governance regime (McGinnis M. , 1999). This may or may not include the oversight of formalized “high” governance bodies. As such, the efficacy of a polycentric system may be dependent in part on the ability of constituent members to structurally adapt and change (Spohrer, Piciocchi, & Cassano). Regardless of the formality of the relationship structure, this flexibility can be seen as fundamental but elusive; participant bodies may have unequal degrees of capacity for change. In regards to relationship dynamics among participant bodies, Lindblom (1979) references *partisan mutual adjustment*, in which autonomous actors mutually affect one another in a

highly fragmented and decentralized system. The concept of mutual impact is critical for examining how actors interrelate within the confines of variously structured institutions. McGinnis and Ostrom (2011) find that in policymaking negotiations, citizens and officials collaborate for specially-suited solutions to challenges of individual communities. The process requires experimentation and an entrepreneurial approach (McGinnis & Ostrom, 2011). These collaborative concepts are relevant when examining the potential efficacy of regional and global governance systems for unbounded challenges such as pollution and climate change.

Debates about polycentricity seem to focus primarily on its application. The first critique is that it tacitly advocates central planning. In response, the Ostroms emphasize that public goods be procured at the relevant scale (Aligica & Tarko, 2012). The complexity of environmental challenges may in some cases necessitate institutional structures that account for all scales and dimensions of the problem (Andersson & Ostrom, 2008). As such, Ostrom et al. insist that polycentricity, despite its seeming focus on collectivity, is a response to – and not endorsement of – metropolitan consolidation that influenced many local governance restructuring initiatives in 1960s America (McGinnis & Ostrom, 2011). The Ostroms conclude that governance systems with multiple sub-regional units of varying sizes (*polycentric*) perform better than those with only a small number of large departments (*monocentric*) (Aligica & Tarko, 2012). Furthermore, one of the central tenets of the Ostroms' research regarding metropolitan governance and police districts is that multiplicity is not necessarily inefficient, and that such complexity should not be interpreted as *chaos* (Ostrom E. , 2010). The path of research on polycentricity, especially the work of the Ostroms, eludes categorization in advocating any single type of structure.

In a second critique, Lieberman (2011) examines decentralization and the rise of non-government organizations in the context of health policy, concluding that polycentric governance faces “crucial pathologies” attributable in part to the uniqueness of his South Africa example. These include free ridership, lack of accountability, and information asymmetry negatively impacting the public. In the same vein, the Virginia School of institutional analysis, from which the public choice approach emerged,

proposes that government officials act in their own interest, rather than for the good of society (McGinnis & Ostrom, 2011). This claim has a deep philosophical history. Hobbes (1651/1960) insists that man acts out of motivation to satisfy appetites. Within the Hobbesian *state of nature*, characterized by the absence of law, men pursue self-interest which logically implies an underproduction of public goods. This line of criticism may not be so much an assault on the concept of polycentricity as on the feasibility of relying on unstructured and informal institutions lacking legally enforceable checks and balances.

Finally, due to its presence at a variety of scales – within and between cities, and more recently among regions – polycentricity may be seen as ambiguous because it encompasses governance and geographical systems that often lack comparability (Asheim, 2009; Davoudi, 2003). Miettinen (2000) insists that polycentricity has become a *transdiscursive* concept, characterized by a process where the term is first adopted by scientists in a specific field, then by other disciplines and non-academic communities, and ultimately criticized by the original users as being too loosely applied and lacking empirical validity. Perhaps due in part to this definitional ambiguity, empirical tests of polycentric governance are few (Lieberman, 2011). Absent a coherent and universally accepted definition of polycentricity, normative evaluations of such governance systems are difficult (Mostert, 2012). Additionally, effective application of polycentricity relies on clear boundaries, but some problems (environmental) require approaches that are not always geographically or legally coterminous (Andereis & Janssen, 2013). Any uncertainty about the demarcation of jurisdictions may compromise the legitimacy of institutions governing the polycentric region. However, the flexibility of the definition, and its potential for application in a variety of environments, may be the reason polycentricity enjoys relevance both in academia and practice. Rather than confining the concept to a few narrow contexts, research may carry forward the salient and universal elements of polycentricity in exploring its broader potential. The path of polycentricity has been intertwined with the ebb and flow of prevailing governance ideologies. While other concepts have captured some of the essence of the term, polycentricity still captures the essence of how institutions are ordered in an otherwise loosely coordinated environment of autonomous actors.

POLYCENTRICITY AND PUBLIC ADMINISTRATION PARADIGMS

This paper proposes a new public administration (PA) paradigm. Early public administration applied scientific reasoning to management of organizations, focusing on efficiency in the provision of public goods. Rigid operational protocols entrenched themselves in government bureaucracies, which were seen by literature in traditional public administration (TPA) as a corrective mechanism to government failures. New Public Management (NPM) built the case for private sector engagement in public good provision, reasoning that efficient business processes would bring accountability and efficacy to public markets and that market forces could appropriate resources optimally. In the public-private dichotomy, both traditional PA and NPM occupied opposite poles. Underscoring the usefulness of a hybrid approach, collaborative governance (CG) proposed joint policy development and public good provision emphasizing stakeholder engagement. Bridging the divide between dominant paradigms, CG advocated democratic structures involving government, private sector, and civil society.

The time has come for a new paradigm, not only because enhanced understanding of public economies and institutions enable theoretical progress, but because there is empirical support for the recognition of a new model of governance. While polycentricity builds on elements of all three generations of PA thought, it makes a unique contribution to literature addressing trends in a post-governance regime. The contribution is a model for governance in complex societies that face the types of challenges that no previous PA paradigm has comprehensively addressed. Polycentricity does not simply occupy some point on the public-private continuum, but establishes a new, perpendicular dimension which focuses not only on policy systems but the scope and nature of challenges in increasingly ambiguous governance environments. This section (see **Table 1**) outlines the basic tenets of each PA paradigm, their weaknesses, and the contribution of PC.

Table 1: Dimensions of PA Paradigms

	TPA	NPM	CG	Polycentricity
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Approach	Top-down	Bottom-up	Guided collaboration	Bounded autonomy
Scope	National	National or cross national	Cross-jurisdictional	Global
Governance environment	Democratic-authoritarian	Democratic-market oriented	Liberal-democratic	Fragmented/various
Issue type	Measurable	Cross-sector	Issue-specific	Wicked
Example issue	Fertility policy	Healthcare provision	Affordable housing	Climate change
Weaknesses	Rigid	Captured	Not scalable	Ambiguous

Traditional Public Administration

TPA has roots in the work of Woodrow Wilson (1887), who makes the example for a politics-administration dichotomy. Arguing for a rational and systematic implementation of state priorities, Wilson focuses on the necessity for a scientific study of administration. In a 1922 piece, Max Weber (1922) describes bureaucracy as a logical organisation of systems that facilitate government tasks, focusing on coded efficiency in limiting self-serving actions among officials. In Weber’s concept of bureaucracy, the principle-agent “problem” is solved through protocols, systems, procedures, and meritocracy. Although Weber’s analysis is largely descriptive, the concept of bureaucracy has been applied normatively and helped support post-Depression government stimulus programs in the United States. Gulick (1937) visited bureaucracy through organization theory by proposing that division of tasks is necessary for increasingly complicated issues, and these must be coordinated through a hierarchy based on efficient management structures. A common thread in literature about TPA is the concept of scientific management. Frederick Taylor (1911) advanced the concept in research about the relationship between supervisors and line workers, arguing for the use of tests and experiments in understanding optimal management structures. This has been carried forward throughout decades of TPA-inclined scholarship, and the roots of the concept continue to inform modern governance (e.g. evidence-based policy making).

It is unnecessary to comprehensively critique TPA here; reactions to TPA are numerous and well documented in the PA literature. TPA has several weaknesses. First, the concept of government failures (Weimer & Vining, 2010) has been used to discredit the concept of TPA. These include the inefficiency of direct democracy and representative government, and challenges of bureaucratic supply and decentralization pressure. Second, the relevance of a strong, centralized bureaucracy is compromised by the increasing popularity of democratic structures and collaborative systems. Recent movements for democracy have eroded the legitimacy of strong central government in many countries. Third, TPA is faulted by free market adherents as being unresponsive, inflexible, and intrusive on the activities of the private sector. Entrenched rigidities of procedure also leave little freedom for creativity and policy entrepreneurship. Finally, TPA is not suitable in all contexts; the social and political environments of some countries may not adequately accommodate bureaucratic structures as articulated by early 20th century scholars. As such, models must be sensitive to unique contexts, especially for cross-national issues. The general command-and-control ethic of TPA may be stale in a global governance environment that increasingly focuses on the needs of civil society and its potential as a governance partner.

New Public Management

The following generation of PA literature reacted to TPA by espousing privatization and free market determinism (Hood, 1991). Early stirrings focused on the managerial aspects of PA, such as service delivery (Li & Ye). Originating in the 1970s and gaining popularity in the 1980s, NPM scholarship overcame an initial lack of coherence to become the rival paradigm to TPA, which had been entrenched in practice and scholarship since the early 20th century. Focusing on smaller government and public service accountability, NPM not only characterizes TPA as supporting inefficient bureaucracies, but proposes alternative governance structures with implications for fiscal and monetary policy (Karagiannis & Madjd-Sadjadi, 2007). As such, NPM specifically addresses blended procurement models, incorporation of private sector management techniques, and alternatives to public goods provision; it may also be associated with philosophical reform movements discrediting “big” government.

Embedded in NPM is the concept of government “steering” rather than “rowing.” NPM’s versatility has facilitated its percolation throughout the academic literature; it has been applied in administration science and political economy, among others (Hood, 1991). Pollitt (2001) credits NPM with for the convergence of public management literature, including conceptual agendas, mechanics, and policy outcomes. NPM applies the Taylorist management approach to evaluating governance systems, but broadens the base of solutions to address system deficiencies.

NPM has been robustly critiqued. As government failures were cited in critiques of TPA, so too have market failures been used against NPM. Common themes include externalities, natural monopolies, information asymmetries, and the inadequate provision of public goods (Weimer & Vining, 2010). The blended approach of NPM may allow such failures to emerge in public goods especially where oversight and enforcement are weak. Distributional concerns also plague NPM and TPA, for different reasons. While each is focused on efficiency, neither comprehensively addresses the citizen, whether marginalized or otherwise, in the policy making process. Additionally, the recent financial crisis has raised questions about the wisdom of the private sector; a model that replaces government with private sector providers in selected industries may come under the same critique. With a weakening bureaucracy, some may also see NPM as enabling the capture of policy making by corporate interests. Monitoring of private interests will continue to be a burdensome critique for NPM. While NPM usefully alerts scholars and practitioners to some of the failings of traditional bureaucracies, its message resonates with a larger population of private sector entrepreneurs and political theorists with libertarian perspectives. In the public-private continuum, NPM defines the argument at one end, providing a “line in the sand” for opponents of TPA.

Collaborative Governance

The pendulum having swung in both directions, research frontiers emerged in the middle. CG focused not only on optimization but on policy innovations that emerge from collaborative effort. In the CG model, multiple stakeholders are represented at every stage of the public good value chain.

Participatory structures engage government, the private sector, non-government organizations, advocacy groups, and other interested parties, with a focus on cultural and socio-economic diversity (Beresford, 2002). CG has stimulated various scholarly debates within PA, including customer vs. partner (Vigoda, 2002). CG advocates civil society mobilization not only for input but provision. The paradigm has also been credited with pushing public-private partnerships (PPPs) into the research agenda.

Critiques of CG are often that it leans too far one way or the other on the public-private continuum; this may be an issue of implementation as much as conceptualization. For example, Stone (2012) finds that accountability is lacking in CG structures, especially with regard to PPPs. Stone also notes an emergent pattern of hierarchy in CG structures, which are ostensibly “flat” in their horizontal linkage of stakeholders. Additionally, CG is limited in scope, and it is unclear what relevance it has in emerging and democratizing economies, or in those with hybrid democratic-authoritarian systems. Finally, CG is most adept at addressing coordination problems, but may be less efficacious for challenges with multiple self-interests, such as climate change (GDP ambitions), terrorism (diplomatic sensitivity), and financial regulation (business interests). Indeed, collective action problems go beyond coordination. Holzinger (2003) identifies five in addition to collective action, including distribution, defection, disagreement, instability, and pure conflict. Although CG addresses some, it is limited in scope across governance systems, both vertically and jurisdictionally. Implied in CG is horizontality and the existence of a primary agent, and this is not always the case for complex problems.

The Case for Polycentricity as Emerging Public Administration Paradigm

The test of longevity for all three paradigms might not be their resistance to alternative paradigms, but their ability to maintain relevance within new paradigms. While polycentricity builds on tenets of each paradigm, it addresses their shortcomings in proposing a step-change for governance scholarship. In comparison to TPA, polycentricity addresses problems that are multi-faceted and cross-jurisdictional, enabling parties to maintain their sovereignty while collaborating on specific issues.

Polycentricity goes beyond efforts to solve the principal-agent problem, replacing structured hierarchy with a democratic approach to policy that emphasizes ownership of issues among stakeholders integrated vertically and horizontally. In comparison to NPM, polycentricity maintains a strong orientation towards efficient public provision while accommodating value-laden issues such as distribution and social equality.

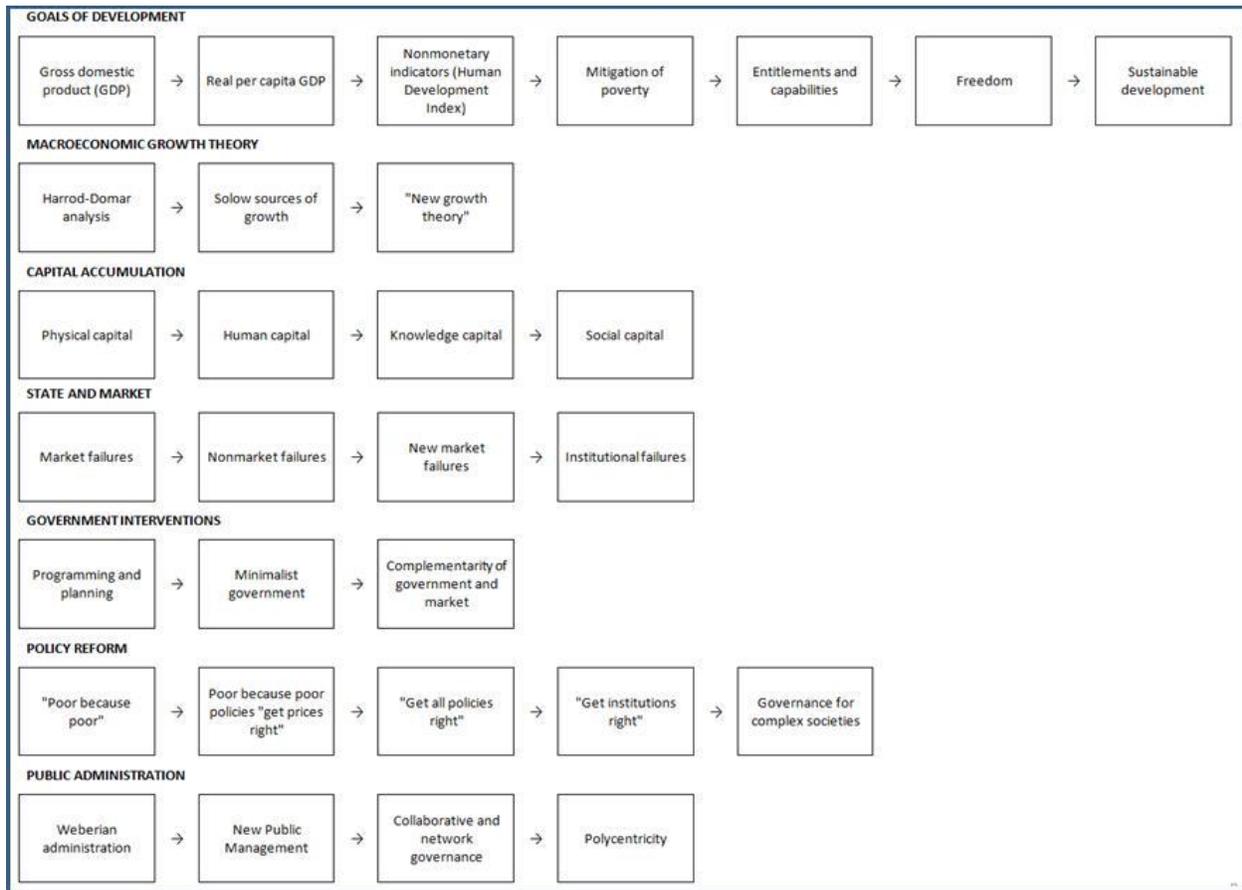
The comparison of polycentricity to CG is more subtle but distinct enough to justify the adoption of a new paradigm. While both incorporate multiple actors, CG is still largely places the government at the center of collaborative structures as the principal guiding body. The CG paradigm has been useful in evaluating a variety of single-issue challenges across jurisdictions that fall under a largely uniform political system (national or sub-national). However, a versatile PA paradigm should be relevant to a robust scholarly understanding of policy challenges of scale and complexity. Polycentricity parts with CG in that polycentric governance structures can occur in a broad variety of circumstances, formal and informal, between countries or across the international community; this is a departure from the logic of linearity observed by previous paradigms. Rather than being simply a looser form of CG, polycentricity coordinates around the agenda, and not around a hegemonic body such as a single government. Indeed, the management of “black swan” events can be ineffectual when coordinated down the chain of command within a rigid hierarchy; bounded rationality and “bottlenecks” in the upper levels of policy making can hinder responsiveness (Ho, 2013). The alternative is either an approach of “muddling through,” as proposed by Lindblom, or marshaling the resources of multiple actors (crowd sourcing) and the motivations of market structures to inspire innovative solutions and informed foresight. As wicked problems complicate analysis and introduce uncertainty in poorly understood environments, polycentricity elevates the capacity of governance to encompass multiple actors not only in policy making and service delivery, but in developing a robust frame of knowledge on which the latter can rely. In focusing on getting institutions right, the unique design of polycentricity is more relevant for dealing with emerging global challenges within and among increasingly complex societies.

Table 2: Markets and Polycentricity Compared

	Features	Remediation
Markets	<ul style="list-style-type: none"> • Easy entry and exit • Transaction costs • Many buyers and sellers 	<ul style="list-style-type: none"> • Institutions supporting free market structures and property rights • Information availability
Polycentricity	<ul style="list-style-type: none"> • Multiple actors of differing types • Common-pool resources • Disparate individual goals • Issue-specific common goal 	<ul style="list-style-type: none"> • Institutions enabling equal access • Delineation of the bounds of autonomy with regard to specific issues • Multi-government solutions

In its proposal for *bounded autonomy* in managing complex societies, polycentricity occupies an empty space in the literature. The notion of bounded autonomy implies that autonomous actors pursue their interests within the parameters of a common goal, self-organizing to address emerging challenges. The notion of *complex society* recognizes not only emerging diversity (cultural, social, etc.) that are found in developed and developing countries, but also the presence of sophisticated governance structures that emerge from competing visions of centralization and decentralization. *Complex society* also reflects the increasing interconnectedness of countries driven by globalization and technology, and the urgency of confronting international “black swan” challenges such as climate change, terrorism, and financial crises. Polycentricity is versatile enough to apply in such complicated situations.

Figure 1: Evolution of Development Thought



Polycentricity should not be interpreted as a model in which an invisible hand is the sole mechanism. The paradigm advocates various levels of governance involvement, depending on the nature and scope of the issue. The role of the government is in many cases to lower transaction costs and facilitate markets. Polycentricity seeks to institutionalize the mechanisms that “free” public markets, including property rights allocation, deregulation, and the creation of marketable goods. Polycentricity embodies both a horizontal and vertical dimension to coordination, building on social capital and enabling coordination at the relevant scale. This multi-player, evolutionary game may be the justifiable replacement for governance models, sponsored by each preceding paradigm, that have failed to adequately address the increasingly complex issues.

POLYCENTRICITY AND URBAN GOVERNANCE

Polycentricity is a common term in the urban planning literature. Scholars have increasingly recognized urban regions as a polycentric phenomenon, largely from a morphological and functional perspective that measures economic nodes and transport networks (Vasanen, 2012). It broadly refers to a spatial configuration of multiple “urban centers” bound by economic competition or cooperation, but can also describe relationships among cities at an institutional scale, or among actors within urban systems (Cowell, 2010). The urban planning notion of polycentricity has roots in Ebenezer Howard’s garden city concept, and has surfaced in many dominant theories about urban sprawl, including recent scholarship about mega-city regions (Hall, Pain, & Green, 2006). Broader scale applications in the planning and geography literature include *New Regionalism*, which explains cooperative or competitive interaction among countries impacted by globalization and multilateral liberalization (Ethier, 1998).

The expanded interpretation of polycentricity, regarding economic and governance relationships in expanding urban regions, is a research frontier that is being explored more systematically by urbanists. For example, Cowell (2010) uses *correspondence analysis* to identify polycentric relationships in three metropolitan areas, measuring points of complementarity and disparity. Using *complexity science* to examine mega-region dynamics, Innes et al. (2010) propose that flexibility and willingness to experiment and learn are necessities for metropolitan governance characterized by nonlinearity, interaction, and unpredictability. This concept is echoed by Folke et al. (Folke, Hahn, Olsson, & Norberg, 2005) in a study of the social dynamics of ecosystem-based management during disruptive change. Such governance may be especially effective at addressing climate change, smart growth, economic development, and natural resource allocation (Innes, Booher, & Di Vittorio, 2010). Further, this type of governance is built around systems incorporating all levels of government, businesses, non-governmental organizations, and other representatives of the public interest (Innes, Booher, & Di Vittorio, 2010). However, some scholars have cautioned against the adoption of a regional corporatist model in which governance power is

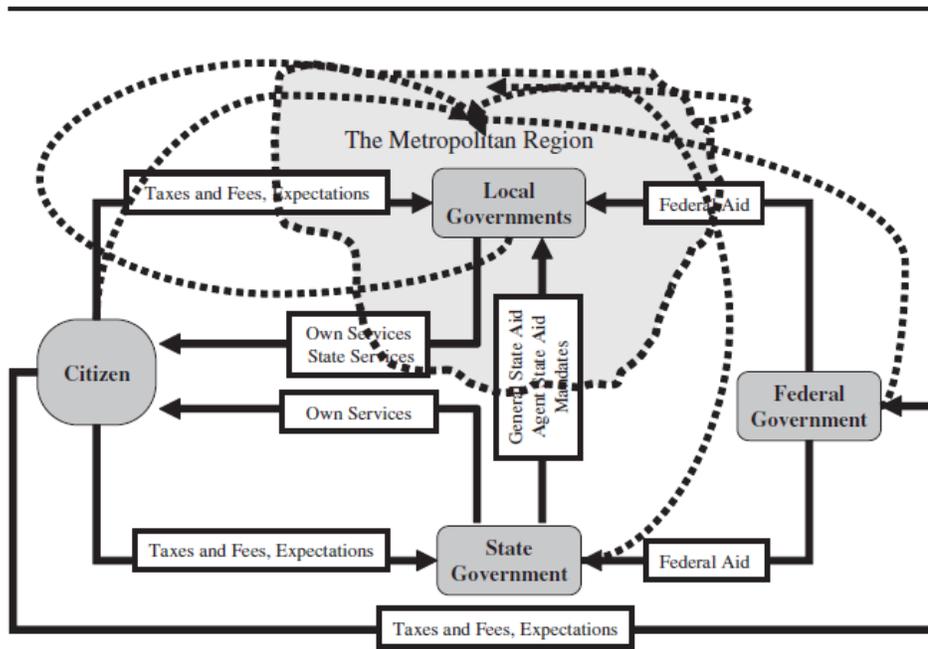
appropriated to a “small elite” (Amin, 1999). Regional governance may be most effective when engaging a public arena that is pluralist and interactive, incorporating non-governmental institutions (Amin, 1999).

“The complexity and diversity of resource systems around the world and the range of uncertainty they face is beyond the capacity of central governments to manage.”

(Janssen & Andereis, 2013)

Metropolitan governance can be traced to mid-19th century London, where the predecessor to the eventual London City Council was organized to address public works; a similar approach was taken in Boston and gained popularity with the outward growth of US cities and with the postwar economic recovery in Europe (Wheeler, 2000). The *statism* of the 1960s represented the last great push for metropolitan governance before reform-minded, decentralized, and market-oriented alternatives were proposed (Scott, 2007). In recent decades, the success of regionalism has been limited by local interests, political battles, and ideological headwinds (Wheeler, 2000). The value of local sovereignty was underscored by T.J. Kent (1964), who used the concept of *home rule* to describe a structure in which regional planners are beholden to the directives of elected officials. However, according to Hamilton et al. (2004) decentralization has been associated with lost competitiveness and diminished long-term economic growth; the best model may be metropolitan unification within a decentralized state. The representative schematic (**Error! Reference source not found.**) illustrates the complexities of institutional interaction within US cities, including capital flows and service responsibilities. The metropolitan area is a sub-state body but transcends local government boundaries.

Figure 2: Metropolitan Governance Interactions (Hamilton, Miller, & Paytas, 2004)



Situational imperatives such as climate change and environmental degradation may foster a revived interest in expanded-scope regionalism and metropolitan governance (Lewis, 1998). So-called *smart growth* priorities, manifest in legislation and the formation of advocacy groups, have also emerged in response to suburban sprawl (Filion, 2003). Although the smart growth concept emerged from governance frameworks emphasizing volunteerism and localization (Scott, 2007), it may ultimately galvanize stakeholder interests addressed in a regional governance context. Furthermore, as sprawl crosses jurisdictions, polycentric governance may be an appropriate environmental management model.

EXAMPLE APPLICATION

Polycentric governance is exhibited in environmental management, as pollution ignores jurisdictional boundaries and requires governance systems scaled to impact (Butler & Macey, 1996). This paper concludes with a comparative example of environmental governance featuring a mature polycentric governance structure and a developing one. The metropolitan Bay Area – encompassing nine counties – has a decades-long legacy of addressing environmental concerns in a polycentric manner. The Air Quality Management District, Association of Bay Area Governments, and San Francisco Bay Conservation and

Development Commission are examples of cross-jurisdictional governance collaborations charged with imposing emissions standards and regulating activities that visit environmental impacts on regional communities. This example contrasts with that of Rayong Province, Thailand, where environmental impacts of Map Ta Phut (MTP) industrial estate have exposed the deficiencies of a governance regime that is weakly coordinated and lacking efficacy. Despite being at the center of three overlapping jurisdictions – the Industrial Estate Authority of Thailand (IEAT), local/provincial government, and central government – MTP suffers from structural governance inefficiencies that fail to clearly assign environmental management responsibility. As a result, citizen groups have mobilized to address externalities, reflecting Dewey’s “great community” (1927); this adds a dimension to the governance environment that is increasingly common in developing countries. Both examples are compared to illuminate effective strategies and governance challenges in a polycentric approach.

San Francisco Bay Area, USA

The San Francisco Bay Area is a metropolitan region with over seven million residents, and urban growth is geographically constrained by the Pacific Ocean, multiple inland water bodies, and the surrounding mountainous terrain; this necessitates an approach to development that shuns American-style sprawl. San Francisco is a region of environmental sensitivity. With an increasing population and growing demand for urban land, San Francisco faces a constellation of challenges that left unmanaged would have detrimental environmental and public health implications.

The Bay Area comprises nine counties and 151 municipalities. These entities work together through the Association of Bay Area Governments (ABAG) to address growth challenges and issues of regional impact. With a mission to address economic, social, and environmental concerns, ABAG builds coalitions and partnerships among member municipalities (ABAG, 2008). Created by the California Legislature in 1955, the Bay Area Air Quality Management District (BAAQMD) regulates stationary sources of air pollution, and is overseen by a board of representatives from all nine regional counties

(BAAQMD, 2011). The Air Resources Board (CARB) is the state-level regulator and works with local authorities to develop emissions assessments and targets; much of this work currently supports recently-passed environmental legislation at the state level (Kloc, 2011).ⁱ In 1965, the California Legislature commissioned the formation of the San Francisco Bay Conservation and Development Commission (BCDC) in response to growing public concern about environmental sensitivity at waterfronts and coastal wetlands (BCDC, 2007). There is also a metropolitan body addressing water quality, the Regional Water Quality Control Board (Scott, 2007). The City of San Francisco, the economic anchor of the region, attempted to address sustainability in the 1997 establishment of a Department of the Environment; however, it suffered from inadequate funding and tepid political support (Wheeler, 2000). In the absence of environmental leadership at the individual municipality scale, civic and non-governmental organizations have filled the institutional void.ⁱⁱ

In an example of how collaboration is institutionalized, multiple organizations work together under the umbrella of two collective bodies, the Bay Area Joint Policy Committee (JPC) and FOCUS. JPC facilitates collaborative projects among ABAG, BAAQMD, BCDC, and the San Francisco Metropolitan Transportation commission (BAJPC, 2013). Cooperative endeavors address environmental issues, including the Bay Area Climate & Energy Resilience Project which involves a variety of stakeholders in supporting climate adaptation strategies. FOCUS also engages the above agencies, in their roles as regulators of land use and urban development, to promote compact growth in serving environmental conservation strategies (Bay Area Vision). The FOCUS program has utilized stakeholder input forums and policy discussions, in addition to direct grants, in crafting and implementing a vision of urban growth that includes priority development areas for housing, parks, and public facilities. However, there are challenges to this structure. Metropolitan councils of government have been faulted for being ineffectual, as they are beholden to member cities and may not act in conflict with that interest (Jones & Rothblatt, 1993). ABAG is also perceived as a weak institution in regards to planning and enforcement (Wheeler, 2000; Cowell, 2010). It is largely an advisory body (Scott, 2007).

Despite the prevalence of *home rule* and local autonomy ideologies that resist regionalism, visionary leadership and an active citizenry have supported management of environmental resources in a polycentric governance framework. This has been achieved with the involvement of multiple stakeholders, including businesses and NGOs, the latter having a strong legacy of policy activism in the San Francisco area (Scott, 2007). This example illustrates polycentricity as a dynamic process, not an event; it develops incrementally on an issue-specific basis, in a Lindblomian (1959) *muddling through* that suits the region's political and environmental realities. Indeed, many proposed regulations have come in response to immediate needs, but over time have aggregated to form a comprehensive regulatory framework whose development process and end product may serve as a useful model as global cities increasingly confront the effects of climate change. That San Francisco successfully fought statutory regional governance has enabled alternative – and in some examples more practically applicable – institutional structures to evolve.

Ultimately, San Francisco owes its governance efficacy to path dependency. A convergence of circumstances has led to decades' worth of institutional refinement and legislative action. A unique physical environment underscored conservation concerns as early as the mid-20th century, an historically politically active citizenry took advantage of a highly democratic policy structure to pursue specific environmental agendas, grassroots organizations such as the Greenbelt Alliance ossified and became increasingly influential, and the governance environment generated institutions that incorporate input from the local, regional, and state-wide levels. These are some of the lessons of this example.

Map Ta Phut Industrial Estate, Thailand

In Thailand, industrial estates host much FDI-sponsored manufacturing and have supported economic growth through agglomeration, infrastructure, and organizational capacity. However, they are also producers of environmental externalities and their contribution to development may be contingent on effective management in a polycentric environment.

The distribution of IEs in Thailand can be explained theoretically by Perroux's concept of "growth poles," where development derives from industry "dominance" within a region and the resultant positive externalities perpetuate growth (Perroux, 1950). In practice, central planning strategies have often pursued this approach in developing hinterland regions. Through infrastructure provision, Thailand has created satellite agglomerations to spread development more evenly. Rayong Province is one example. The region southeast of Bangkok has been targeted for expansion in a variety of infrastructure types, reflecting the government's belief in the standard development strategies outlined by agglomeration literature. Institutional, political, and geographic factors have combined to generate a landscape in which agricultural land is being converted into industrial facilities; MTP is an exemplar of this process (Pinyochatchinda & Walsh, 2012).

MTP is Thailand's largest IE and the world's 8th largest petrochemical hub. Managed by IEAT, it claims to be a harmonious enterprise sensitive to social and environmental concerns (MTPIE, 2004). Government, the private sector, and community are said to play a role in governance and advice, ostensibly reflecting the structure of polycentric governance. An environmental management committee comprises the departments of industry, environment, pollution control, health, and local and regional governments. MTP is also part of IEAT's eco-IE initiative, which seeks to promote environmental management for community benefit. According to MTP strategy, local communities "should be encouraged" to produce a development plan (MTPIE, 2004); however, it is unclear what legitimacy this plan would have in management processes. Regarding collaboration, the goal is to "bring down fences" around companies and encourage cooperation.ⁱⁱⁱ

MTP's environmental record is troublesome. In May 2012, MTP suffered a petrochemical factory explosion that resulted in 12 deaths and multiple injuries. 17 communities are located within a five-kilometer radius, many of which were evacuated following the disaster. Some journalists have reported lower public confidence in safety and pollution control procedures, and deteriorating estate-village

relations (Deboonme, 2012). MTP may also have visited harmful externalities on underrepresented residents over a longer period of time (Fuller, 2009) (Hurights Osaka, 2012) (Peluso, et al., 2010).^{iv}

In 2009, 27 residents of Rayong province – led by the Eastern People’s Action Network – sued the central government to designate the area around MTP a pollution control zone. This led to a year-long suspension of 76 new industrial projects in MTP due to non-compliance with environmental regulations stipulated in the new Thai constitution (The Nation, 2012). A similar injunction in 2007 led to the suspension of work on US\$9B worth of projects. As many as 2,000 Thai factories have failed to observe the stipulated environmental impact assessment (EIA) protocols (Asia News Monitor, 2012). A lax regulatory enforcement regime in most parts of Thailand may have equally long-term impacts on the environment, even after manufacturing activity has potentially moved to countries with a lower labor cost structure.

MTP is a useful example for exploring informal institutional capacity in the context of a polycentric governance structure that has not reached its full potential. The central government imposes a growth agenda on localities, who assume responsibility for the associated impacts; in essence, benefits are nationalized and disbenefits localized. Separate districts reflect the priorities of managing corporate entities, IEAT, and resident manufacturers. As MTP is often recognized as a large polluter and target of community criticism (Pinyochatchinda & Walsh, 2012), local activists have mobilized the community to address these citizen concerns in the absence of effective management from local and central government authorities (Kovidhavanij, 2012). The Eastern People’s Network has led protests and managed petition drives to open legal investigations into central government involvement in MTP.^v In a study of social movements in Thailand, Forsyth (Forsyth, 2007) classifies environmental activism as “green” (conservationist) and “red-green” (socially-based). The findings suggest that media coverage of such movements – which is often the only visibility they receive – often links environmental activism with “democratization,” based on the notion of citizens criticizing the state and mobilizing at the grass-roots level. The strategies of environmental activist groups may therefore be a template for similar actions in

regions having polycentric governance structures, many of which in their more developmental infancy may be experiencing similar challenges of rapid industrialization in the coming decades. The Thailand example illustrates that polycentric environments can vary in structure and outcome, and lack of formality and endogeneity can compromise the efficacy of polycentric initiatives.

Although polycentricity has an extended heritage, there is research space for it to be analyzed as an environmental governance strategy in the context of developing countries, with potential applications to a broader scale. The examples of San Francisco and Thailand are comparable in that they both exhibit how environmental externalities are addressed in a polycentric governance system. However, the San Francisco example is an example of how management frameworks have been developed from both the top-down and bottom-up, fostering an environment where regional priorities that are collaboratively established between the state and localities guide strategic and operational activities of individual agencies and municipalities. Robust input processes have been formally designed into the policy making framework, and the resulting dialogues are enriched by the informal participation of community activist groups and citizen journalists. In the Thai example, growth priorities and the attendant environmental impacts are largely the concern of the central government's economic development policy makers and the IEAT. The local government is responsible for addressing the collateral damage of environmental degradation, including public health and groundwater management. Without the resources to address these issues adequately, local administrators must prioritize investments. The resulting problems have captured the attention of citizen activist groups, who seek through informal mobilization to uncover and publicize the scale and causes of public health degradation. Bottom-up institutional development has happened more out of necessity than design.

While the governance framework at MTP resembles a polycentric approach in a descriptive sense, the active strategy of polycentric governance that has produced positive outcomes in other examples has been lacking in Thailand; environmental accountability continues to be somewhat unclear and inefficiently assigned. As hard infrastructure has played a role in 20th century economic growth, and

to some degree the management of its environmental impacts, soft infrastructure may likewise be relevant in the 21st century, encompassing citizen involvement and innovative capacity. However, even if these are not formally organized, hegemonic institutions may benefit from developing capacity to absorb such citizen participation in policy making about environmental management. Although San Francisco's environmental governance institutions are mature, they also have a degree of flexibility that accommodates evolving priorities from grassroots activism and state legislation. Although imperfect, San Francisco's approach has made more progress towards this end and may inform efforts to adapt developed world governance models for application in examples such as MTP.

CONCLUSION

Polycentricity is increasingly relevant to theoretical and applied governance discussions in a world with increasingly fragmented and complex societies. It justifies not only the emergence of a new PA paradigm that refines the notion of CG, but also supports the prospect of conceptual research that explores the feasibility of importing models of polycentric governance into global issues such as climate change. Testing these models in countries where rapid economic development involves the types of activities that will produce much of the coming century's industrial emissions may be a useful exercise for both scholars and government administrators. The important distinction future research may need to consider is the notion of polycentricity as either a descriptive term, or an active strategy with intentionally designed systems of governance, production, and provision in public economies. The coming decades of economic growth, environmental sensitivity, and democratization may test the evolutionary capacity of polycentric governance frameworks in many countries. This paper has aimed to move the scholarly discussion in that direction.

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ⁱ Senate Bill 375 (2008) involves local communities and metropolitan planning organizations (MPOs) in establishing regional air pollution reduction targets; it is built on similar regional frameworks for affordable housing provision and transportation planning (Institute for Local Government). CARB was granted, in 2006 by legislation known as Assembly Bill 32, regulatory authority to address greenhouse gas emissions, including a majority of transportation sources, which account for 40% of such emissions.

ⁱⁱ The Greenbelt Alliance was formed in 1989 and is among the highest profile civic organizations addressing sustainability and environmental preservation. The now-defunct Bay Area Alliance for Sustainable Communities operated for 11 years, providing a forum for “multi-stakeholder coalitions” to discuss environmental planning (Scott, 2007). The Save San Francisco Bay Association successfully lobbied for legislation to control waterfront development.

ⁱⁱⁱ Jababeka is an industrial cluster and full-service city, master-planned and built under the ownership and management of a publicly listed development corporation. Located 35 km east of Jakarta along a major transport thoroughfare, Jababeka has grown in the past 20 years from an IE into a 5,600 hectare, 1,500-company satellite city with residential, recreational, and educational facilities (Jababeka, 2011). Jababeka’s governance resembles that of a standard corporation, with a board of commissioners, board of directors, audit committee, and business units addressing infrastructure, commercial, industrial, residential, leisure, education, and port facilities. The company finances its operations and investments through stock and bond issues, the most recent of which raised SGD\$175M on the Singapore Stock Exchange for debt restructuring and property acquisitions (Mahardhika, 2012). In Indonesia, complexity of operations and divisions of responsibility across institutions complicate efforts to address environmental concerns (Hainesworth, 1985). The KLH (Institutional Ministry of the Environment) was developed to facilitate collaboration, but environmental causes are often taken up by NGOs.

^{iv} Source: <http://www.youtube.com/watch?v=GMGn7B8KVBU> (accessed 19 October 2012) This video by International Video Journalism outlines the plight of residents near MTP and efforts by the Eastern Peoples Network to raise environmental awareness.

^v When well planned, IEs can minimize negative impacts on the surrounding community. A survey of residents near IEs in Jurong, Singapore found generally satisfaction with family life and overall quality of life, although consumer goods, environment, and politics scored lower (Ibrahim & Chung, 2003). However, there are some problems with this study. First, there is no concurrent “control” group; the authors instead compare data to a survey conducted five years earlier. Some factors may also have changed over that time. Second, the authors include indicators that would be plausibly unrelated to IE externalities (e.g. “politics”). Nonetheless, new IE development approaches have shown some progress, including eco-industrial estates, which present one design template to address environmental management of pollution-intensive activities (Geng & Hengxin, 2009).