

***Infrastructure Investment and Our Intergovernmental System:
Ten Tools for Effective Action***

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Summary

Ultimately, the current societal challenges call for an improved intergovernmental governance framework that supports budgetary rigor and transparency, identifies priorities and risks, and recognizes and avoids costly financial workarounds, all of which are necessary to inject a restructured system with vitality, realism and sustainability.

We welcome continued study of how to improve the state of this country's infrastructure as well as suggestions for other cases that can build understanding of more and less effective practices in policy areas requiring intergovernmental action. This working paper addresses the infrastructure investment system and the intergovernmental aspects and challenges of it, and on the validity of the tools.

Introduction

The COVID-19 pandemic has exposed significant shortcomings in America's capacity to address health and economic challenges. In addition to the immediate pressing needs for health care delivery and emergency response, the revitalization of the economy has emerged as a critical need. Related to the economic recovery is decades of little or no investment in our nation's infrastructure to support effective goods movement through supply chain logistics. Insufficient investment in infrastructure has eroded the national capacity to address modern challenges of climate change and the decline of assets in our built environment.

Infrastructure investment is a wealth-creating activity. By attending to infrastructure, the nation creates wealth in local communities and in regions, putting people to work in jobs that are higher paying than most of the service jobs created in the last decade. A key to revitalizing the economy, facilitating job growth, and addressing 21st century needs for improved supply chain movement and climate change response is new investment partnerships across the country. However, the history of megaproject infrastructure building is characterized by a need for a deeper understanding of the decision-making and policy dynamics needed for success (Wachs, 2018).

This paper describes examples of how the nation has attempted to address infrastructure challenges in the past in three regions in the country. We consider what we have learned from those efforts, what did not work and how through investment partnerships we can chart a new course for the nation's economic revitalization. We begin by explaining the shortcomings of the current intergovernmental system. Then, we present a summary of ten tools of effective intergovernmental action that have been developed from case study research and the National Academy of Public Administration's (the Academy) Standing Panel on the Intergovernmental System. A third section applies the tools to case studies in different regions of the United States to illustrate their usefulness. The cases applied include Chesapeake Bay water protection, Alameda Corridor goods movement, and Los Angeles region air quality. The concluding section considers implications of tool application and case examples for advancing infrastructure development in the United States.

1. Shortcomings of the Current Intergovernmental System

Building infrastructure in the United States—as well as world-wide (Flyvbjerg, 2017)—remains a pressing challenge at the local, state, and federal levels. Funding for infrastructure has fallen from 4.6 percent of GDP in 1968 to 2.8 percent of GDP in 2018. The intergovernmental systems approach of the 1960s through the

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1990s no longer addresses the challenging realities of reduced federal funding, limited local and state funding options, increased environmental mitigations, and changing demographics, such as reduced fertility rates, stymied workforce growth, and an older population which contribute to a reduction in the rate of taxes paid that can be used for infrastructure investments.

The economic downturn resulting from the national response to the coronavirus pandemic will be exacerbated by lack of an effective intergovernmental system. Economic revitalization will need to address the increased transportation demands that contribute to high traffic flow and congestion. The varied approaches to building infrastructure over the past five decades have been characterized by budget overruns and construction delays as the norm (Wachs, 2018). More importantly, the current structure of stove-piped programs that exist to build infrastructure is an impediment to the speed of change and complexity of today's pressing public challenges. The complexity of contemporary infrastructure problems requires innovative integration of the siloed categorical grants programs of the past.

2. Summary of Ten Tools for Effective Intergovernmental Action

This section introduces a set of tools that, if applied, are likely to help address the challenges of building large scale intergovernmental infrastructure projects, bringing such projects in on time and on budget with high quality and functioning results. The varied cases illustrate patterns of action for successfully building infrastructure. They point to the investments needed to support infrastructure building and repair for economic development and environmental safety and quality across the nation, in every state, region, and local government. The cases reinforce the need for applying each tool in order to streamline and advance infrastructure development across the U.S. The ten tools are listed below:

1. **Lead:** Leaders step up, and are designated or agreed upon, who focus on shared objectives and best outcomes. Leaders guide deployment of knowledge, skills, resources, authorities, and relationships to advance collaborative and whole-of-community responses that support realization of best outcomes.
2. **Focus on Outcomes:** Maintain attention on best outcomes that minimize undesirable side effects and unintended consequences.
3. **Address Equity:** Account for impacts on all affected when goal-setting, determining policy and selecting strategies for execution in order to generate net positive impact for all, without favor or bias.
4. **Communicate:** Transmit and receive information in ways that support all levels of government to identify, define, choose, and explain problems, strategies, results, and causal factors and to determine next steps.
5. **Prioritize:** Work collaboratively across boundaries to prioritize problems and select interventions using shared evidence-based knowledge.
6. **Build and Share Knowledge:** Look for and collect data, conduct analytics, and access well-designed measured trials to inform decisions and actions within and across levels of government.
7. **Solve Problems:** Engage agility, efficiency, respect for scale economics and geographical variance in surge demand, when problem solving at the level closest to the problem, and with accountability sorted accordingly within and across levels of government and among all stakeholders.
8. **Work Across Silos:** Build networks and advance trusted professional relationships by negotiating and problem-solving with respect for the interests, capacities, and constraints of others.
9. **Motivate:** Encourage continual evidence-informed improvement of outcomes using well-designed financial and non-financial incentives that do not tempt gaming and/or other perverse consequences.
10. **Remain Mindful of Finances:** Integrate changing costs and resource capacities continually into decisions and actions to advance best outcomes.

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3. Case Studies Illustrating Ten Tools for Effective Intergovernmental Action

Cases of infrastructure development are presented below to explore patterns of action related to key implementation tools that, if applied, could provide for better capital planning, building and results. By better, we mean stronger cohesion in planning for infrastructure and improved management to bring projects in on time and on budget (cut waste and reduce cost overruns), and projects that are high quality, resilient, and sustainable.

For each of the three cases cited to illustrate a specific tool for effective intergovernmental action, greater detail is provided in cases cited in the bibliography. The intent of each case example is to illustrate actions that applied particular tools.

- 1. Lead:** Leaders step up, and are designated or agreed upon, who focus on shared objectives and best outcomes. Leaders guide deployment of knowledge, skills, resources, authorities, and relationships to advance collaborative and whole-of-community responses that support realization of best outcomes. relationships, strategy, experience, and negotiations.

Chesapeake Bay

The Corps of Engineers began a seven-year, \$27 million study, initiated by Senator Mathias (R-Maryland) in 1976 (Franklin, 1983) to address the water quality degradation of the Chesapeake Bay due to agricultural run-off. The study motivated action by the heads of multiple agencies across the organizing states of Virginia, Maryland and Pennsylvania, and the District of Columbia (Chesapeake Bay, 1983). Each state took on analytical and educational roles, and partnered with several non-profits to conduct the initial planning and education that established the Chesapeake Bay Project. The Clean Water Act of 1982 had a separate section that reinforced and supported the effort. The US Environmental Protection Agency (EPA) Secretary at the time, William Ruckelshaus, provided policy leadership along with Governors Parris Glendening (Maryland) and Tom Ridge (Pennsylvania) to form a Tri-State Authority that morphed into a seven-state compact. Without policy champions, this effort would have foundered.

Los Angeles Basin Air Quality

Los Angeles County, along with its outlying counties, had a highly visible problem: air quality so bad you could not see the mountains surrounding the Basin. In the 1970s, Mary Nichols, the attorney for a public interest group, successfully sued the federal government to require preparation of a plan for the entire Basin to meet federal air quality standards. While highly unpopular with certain industries, this effort and local leadership from non-profits and environmental interests led to the passage of the Lewis Act in 1975, sponsored by California Assemblyman Jerry Lewis, that created a four-county Air Quality Management District.

Alameda Corridor

Participants and observers of the process that built consensus for developing the Alameda Corridor agree that leadership played a key role from the start. The initial staff lead, Gill Hicks, was considered a catalyst for engaging varied communities, including the large cities of Long Beach and Los Angeles as well as the considerably smaller seven cities along the corridor for the cargo rail line consolidation. Hicks was central in developing consensus on problem identification, preferred solutions, and mechanisms to connect the varied public entities. He also successfully negotiated with three separate railroad companies. Councilwomen Chris Reed (Santa Monica) and Jackie Bacharach (Rancho Palos Verdes), who were chairs of committees at the Southern California Associations of Governments (SCAG) and the Los Angeles County Transportation

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Commission (LACTC), moved the work of Gill Hicks and other staff through the complex decision-making of both agencies. Their efforts were critical in forming a new agency call the Alameda Corridor Transportation Authority (ACTA).

Leadership Findings

Regarding complex, multiparty, multijurisdictional problem-solving, leadership is the key and essential ingredient for progress, both at the staff and policy levels. Leaders translate the value of knowledge into actionable steps that multiparty organizations can understand, and these leaders move the agendas and power structure of existing agencies and jurisdictions that have their own agendas and power bases. Without these leaders, the inertia of doing what historically is in place dominates and inertia only supports the maintenance of status quo. This is particularly true in periods of rapid change that challenge the status quo. That is, whether large or small, bureaucracies operate to preserve existing operations. For each of the examples above, strong and effective leadership was vital to forward progress.

2. ***Focus on Outcomes:*** Maintain attention on best outcomes that minimize undesirable side effects and unintended consequences.

Chesapeake Bay

The Chesapeake Bay region is home to 18 million people; its 64,000 square-mile watershed, the largest estuary in North America, supports more than 3,600 species of animals, and plants. The Chesapeake Bay intergovernmental partnership involves six states, the District of Columbia, numerous federal agencies, and a vast range of organizations and partners—both public and non-profit. The restoration initiative has developed standards for measuring outcomes to guide both the regulatory and voluntary actions of the participants. The water quality standards established by the Federal Government and the States became the goals. The waste load analysis of the best management program (BMP) was evaluated so that standards could be achieved, forming the driver and catalyst for the entire initiative. However, a review of this program at the American Society of Public Administration (ASPA) annual conference in 2019 revealed rising sea levels and estuary levels that are undermining recent improvements. Further, changes in weather and rising atmospheric rivers are significantly altering the hydrology of the rivers flowing into the Bay, increasing runoff and pollutants. Different hydrology induced from climate change has rendered the previous methodology for doing waste water load analysis nearly useless.

Los Angeles Basin Air Quality

The South Coast Air Quality Management District (AQMD) includes the four most populous counties in the country and some of the worst air quality in the world. Performance goal setting has been established by states, federal agencies, and regional bodies to enact and enforce local controls. These efforts mobilized the largest transit and growth management program in the country, coupled with emission controls, to significantly improve air quality in the Basin. However, one of the recently identified shortcomings in the outcome goal setting process is the lack of a standard for small scale particles, i.e., less than 2.5 milliliters—called nano particles. In the South Coast, these nano particles are mostly derived from diesel combustion and are extremely harmful to human health, particularly to children.

Alameda Corridor

Rail cargo movement started in the Ports of Los Angeles and Long Beach through regional rail and highway corridors that moved freight throughout the nation. The project addressed the need for reduction of rail and truck emissions through reduced traffic congestion, and increased rail cost and speed performance standards for the immediate areas near the port. Public agencies established these performance goals, with

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the active participation of the private sector. These standards were used to determine investment needs and air quality mitigations. The nano particle problem described above remains a challenge, primarily in goods movement, with the diesel trains running on the Alameda Corridor remaining a significant source of nano pollution that negatively impacts the overall regional air quality. In effect, the investments in the corridor supported an increased use of a diesel driven trains that are still harmful to the region.

Focus on Outcome Findings

Regarding infrastructure, outcomes as effective intergovernmental tools are measurable in time to completion and amount of improvement. The outcomes account for geography and context, expressed in terms that are understood by individuals. They also provide starting points for decision-making. The outcomes can be used as a basis for developing consensus with all the participants, as well as anticipating and avoiding undesirable impacts. Federal and state actions developed over the past 50 years have been the cornerstone of driving infrastructure and mitigation outcomes in the United States. However, the dynamic context and evolving particulars of any project suggest the need for outcome measures that are regularly reevaluated and potentially recalibrated to account for emerging science as well as new research to ensure current progress.

- 3. Address Equity:** Account for impacts on all affected when goal-setting, determining policy and selecting strategies for execution in order to generate net positive impact for all, without favor or bias, addressing health, economic, and social marginalization.

Chesapeake Bay

The companies involved in the Bay's reclamation supported lower- and middle-class incomes—a significant and positive impact given the current trend of job losses in those population quintiles. Given that the approaches to control the pollution sources were primarily voluntary, the Commission worked successfully to find BMPs on all the sources of contaminants flowing into the Bay that were effective but not onerous. Improving the Bay water quality, while simultaneously sustaining the local economic base is a highly significant accomplishment. In the future, the potential for extreme weather conditions may create new equity concerns.

Los Angeles Basin Air Quality

The success of the program has had both positive and negative impacts on the equity issue in the Basin. Health and quality of life have been improved for the entire Basin population, particularly for the eastern portion of the Basin which includes mostly lower income households. Unfortunately, the nano particles that are primarily discharged on highways, rails and ports are having a disproportionate effect on lower income populations located adjacent to these sources.

Southern California has the largest concentration of manufacturing firms in the nation. However, the air quality improvement program has contributed to the decline in the manufacturing sector in the Basin. Over the past thirty years, the region has lost half a million jobs and is struggling to develop employment opportunities that can replace that lost income. In the past ten years, 60 percent of all jobs created in the region paid \$18 per hour or less; middle income jobs (\$18- 30 per hour) declined by 80,000; and only 40 percent of all jobs paid above \$30 per hour. As a result, the majority of the population in southern California cannot afford to live there. It is important to note that the effort to improve air quality is only one of many factors driving this change in the economic base.

Alameda Corridor

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This project advanced equity across three dimensions. At the project level, the construction of the grade separations that allow vehicle and truck traffic to go over a below-grade rail trench improved air quality by reducing traffic congestion that previously waited for extended periods for trains to pass in the corridor cities. At the local level, the project remediated significant groundwater contamination affecting several cities, including each of the six individual corridor cities, and funded city-designated improvements. At the individual level, the project funded construction job training and placement programs. However, the region's inability to deal with continued nano particle emissions is stifling growth in the logistics sector by reducing employment opportunities, and has a continuing negative impact on the health of neighboring lower and middle-income populations.

Social Equity Findings

These case studies address equity issues through air quality and health improvements benefiting entire regions. However, the loss of employment opportunities because of industry relocation to avoid the cost of compliance with tighter air quality standards significantly reduced job opportunities in lower income communities.

- 4. Communicate:** Transmit and receive information in ways that support all levels of governments to identify, define, choose, and explain problems, strategies, results, and causal factors and to determine next steps.

Chesapeake Bay

While water quality standards were set by multiple states in the 1970s, it was not until 1983 that the governors of the states surrounding the Bay, including Governor Parris Glendening (Maryland), and Governor Tom Ridge (Pennsylvania), formed a tri-state commission with the District of Columbia to jointly address the health of their common waters (Chesapeake Bay, 1983). The need to restore the Bay's fishery industry, in decline mainly due to the agricultural pollution and urban expansion in the watershed, was the driving force. The key elements of the Executive Commission's changes were voluntary participation and an adaptive vision that included economic sustainability. Stakeholder input was and remains guaranteed, and flexibility, transparency, and accountability are essential, with trust being the glue that holds the agreement together.

Los Angeles Basin Air Quality

While the federal Environmental Protection Agency, under court order, prepared the Los Angeles region plan that garnered strenuous opposition, the California State Legislature set up a new South Coast Air Quality Management District (AQMD) that partnered with the Southern California Association of Governments (SCAG), as the regional federally designated Metropolitan Planning Organization (MPO), and the State Air Resources Board (ARB) to engage communities in conversations on air standards. The result was transformational, with regulations reducing all pollution sources to remediate the problem. The geography of the air pollution problem now aligned with the governance and boundaries of the AQMD. Prior to the AQMD, controls were enacted county by county, though air pollution traveled across political boundaries. The regional collaboration changed the economic base of the region through the controls on almost all sources of air pollution. However, the AQMD jurisdiction for stationary sources did not extend to the federally regulated mobile pollution emitted by planes, trains, and trucks. This bifurcation allows large amounts of nitrous oxide (NOx) pollutants as the largest uncontrolled source of reduced air quality. Furthermore, recent policies of the federal government are aimed at rolling back state authority needed to achieve health standards and controls for carbon dioxide.

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Alameda Corridor

The leaders of the Los Angeles County Transportation Commission formed a Task Force in partnership with the leaders of the SCAG, to begin the planning conversation for this project. The conversation invoked a path-breaking project with significant private sector funding to address the goods movement issue, although the problem remains one of the most critical in the region. Even with all of its progress, the Alameda Corridor covers only a portion of the region. Other parts of the region are still struggling to address the goods movement problem, and the entire corridor suffers from the pollution effects of diesel as a fuel source. Currently, the logistics regions across the country do not have any forum in which to conduct similar local conversations regarding these types of critical infrastructure investment programs. State boundaries and the difficulty of including railroads into decision-making make the conversation even more challenging.

Communication Findings

Each of these cases presents political leaders initiating communication that highlights the need, benefits, and process for success for their project. They only achieved partial success, however, when the conversation did not involve the correct geography or the appropriate constituencies. In all cases, structuring the communication process inclusively is essential to forward progress.

- 5. Prioritize:** Work collaboratively across boundaries to prioritize problems and select interventions using shared evidence-based knowledge.

Chesapeake Bay

Research by the surrounding states on the impact of storm water runoff from developing portions of the Basin initially drove the involvement of these governments. This research was complemented and reinforced by the EPA and state involvement on agricultural runoff, particularly on nutrients that reduced dissolved oxygen in the Bay. This evidence of damage to the oyster, crab, and fishing industries—both commercial and sport fishing—in the Bay was the driving force for action.

Los Angeles Basin Air Quality

Research facilitated the intergovernmental initiative in this case. Cal Tech professor Hagen Schmidt's research that identified the hazard of lead in gasoline helped initiate in the early 1960s the air quality improvement efforts with the establishment of California state standards that preceded the federal standards. The EPA's continued research, evidence of health impacts from vehicle exhaust, and the introduction of catalytic converters in automobiles were major contributors to progress, resulting in the 1977 Clean Air Act. Recent evidence on the lung and asthma impacts of particulates, especially small-scale particulates, is a driving force for eliminating diesel combustion in the Basin. The research organizations of universities in the region are the primary source for developing this data on nano particles, despite a significant absence of federal research on the subject.

Alameda Corridor

Research on inventory management in the nation and evidence of the cost and time savings that improvements in logistics infrastructure could generate were equally important in convincing industry that the Corridor's expenditures were justifiable. Nationally, Members of Congress were engaged because of the number of congressional districts served by goods shipped through the Alameda Corridor. Locally, the data on reducing air pollution and wait times from vehicles at grade crossings was essential in building consensus.

Prioritization Findings

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In each of these cases, data drove the prioritization of projects and the case for funding. In the Alameda Corridor case, for example, data showing goods movement from the ports of Los Angeles and Long Beach to over 400 congressional districts became a centerpiece of the successful appeal for federal loan support (Callahan, 2007). The tracking of emissions as well as estimates of varied industry impacts formed the two-prong data-driven approach of the AQMD. The data on the volume and chemical composition of freshwater run-off into the Chesapeake Bay drove the formation of the governance response.

- 6. Build and Share Knowledge:** Look for and collect data, conduct analytics, and access well-designed measured trials to inform decisions and actions within and across levels of government.

Chesapeake Bay

Data and analytics informed the vision of each state involved in the effort, which then formed the framework for the agreements of the multi-state effort. Each state established extensive monitoring systems that are now used to track annually the progress of the implementation efforts of both public and private actors. As most of these efforts are voluntary, monitoring is vital to maintaining and communicating progress. The results are shared extensively with all the parties, many of which are non-profit and community-based organizations that also track the health and economic performance of the Bay, building trust and accountability through transparency. Unfortunately, the monitoring demonstrated that many of the voluntary BMP measures were not being implemented, a problem that remains unresolved.

Los Angeles Basin Air Quality

Extensive data and analytics drove the four-agency planning and decision-making process. Without these tools, the effort could not have been undertaken. The Air Quality Management Planning Process consolidated data and analysis in a three-part mission:

- a. Monitoring air quality to meet requirements of the California Air Resources Board and U.S. EPA;
- b. Transportation control measures for vehicles miles traveled (VMT) reductions; and
- c. Engagement of the public in implementation of air quality improvements through announcements of “stay indoor” days and a public education program.

The public interest and concern for clean air and health progress requires continual reporting and consultation on the part of all agencies. This continual assessment process identifies gaps and calls attention to these shortfalls. The emerging science on nano particulates and on emissions from federally controlled trucks, ships, and airplanes makes the case for removing combustion of carbon-based fuels from the Los Angeles Air Basin.

Alameda Corridor

Public attention was captured by compelling data on the economic detriment resulting from lack of regional investment in goods movement, the ensuing traffic congestion, and its air quality implications. The data also informed continual litigation and regulatory oversight by the state legislature. The need to complete the construction project on time and on budget to meet the requirements for bond funding called for careful monitoring of construction progress. The project changed executive directors and hired a public manager with more than 20 years of experience directing city, county and redevelopment budgets and construction oversight. The ACTA Board continues to employ accountability tools to track on time and budget, as well as community based hiring for construction, and environmental mitigation.

Build and Share Knowledge Findings

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Large geographic information systems (GIS) sourced by both public and private organizations, including satellite data, are now available to government and private decision-makers. The digital revolution is altering the planning processes of governments at all levels. Goals and performance indicators are now transformed by analytical frameworks. The quantification and measurement of outcomes included in these frameworks, including the effectiveness of alternatives and resources spent, provide examples of best practices. Central to the Chesapeake Bay Commission was the recognition of the need to share data across political jurisdictions because the data from any one jurisdiction was not sufficient to drive coordinated action. In the Alameda Corridor, sharing data between the ports, the cities, and the private sector railroads built the foundation for legal agreements in the public agencies and contracts for a shared rail line between three competitors.

- 7. Solve Problems:** Engage agility, efficiency, respect for scale economics and geographical variance in surge demand, when problem solving at the level closest to the problem, and with accountability sorted accordingly within and across levels of government and among all stakeholders.

Chesapeake Bay

The catalyst was at the local level, addressing the adverse impacts on the Bay, its wildlife, and its economy. The solutions required the involvement of stakeholders, a transparent process, mutual respect, and trust. The Bay Commission used its own resources to implement protection and restoration protocols. All agencies involved were represented on the executive council. Since much of the implementation is by the partners, a management structure coordinated and reported back to all parties carrying out voluntary management actions. However, the management structure did not develop a funding structure to capture the full benefits that the control strategies created; that type of structure could assist in sustaining many of the management practices. Typically, options include either direct regulation of these difficult non-point source control problems or direct payment out of insufficiently funded environmental mitigation programs at state and local levels.

Los Angeles Basin Air Quality

Organizational partnerships across local and state agencies addressed the three sources of pollution: 1) the AQMD for stationary source regulation and overall planning and policy setting; 2) the California Air Resources Board (ARB) for mobile sources that regulate controlled sources and report progress to the federal government; and 3) the SCAG for growth and transportation sources. In order to be effective, all parties need to carry out their responsibilities to meet state and federal standard-setting processes. The Basin has made significant progress, but there are still gaps in the region's control program, including those related to the emerging science on the impact of nano particulate pollution on human health. On balance, an agile problem-solving system, developed to flexibly address specifics, provides accountability for improved air quality to residents of the Basin. However, the absence of participation by the federal government is precluding solutions to known problems and threatening progress made to date.

Alameda Corridor

The challenge of mutual accountability in the Alameda Corridor was even more acute than in the Air Basin itself, since the source of the corridor's air quality problem is primarily under the jurisdiction of inter-state commerce and federal emission controls. SCAG, as the MPO, initiated ACTA to address the problem of trains accessing the port and tying up the surface street traffic in communities surrounding the port in a region with a highway system that was designed prior to the development of the global trade era. With two thirds of the nation's freight moving on the region's highways, these thoroughfares were literally being crushed by volume. The Authority is a governmental joint-powers legal entity (JPA) with seven Board members drawn

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from the two terminal cities, Los Angeles and Long Beach, and their Port Commissions. The project is funded by railroad container fees because the railroads and shipping clients recognize performance productivity gains in cargo movement.

Problem Solving Findings

Each of these cases involved all three levels of government taking-action as partners in the solution. The governance structure for local decision-making included municipal and county representation, as well as large and small city representation. The governance process draws from elected officials closest to the problem, with decision-making as entire boards or sub-committees act quickly to develop information or structure the process.

At the same time, no single level is responsible for all progress. It is important that the legal authority and leaders at each level contribute to the process, creating mutual accountability and true partnership. If actors at any level view their contribution as more important, trust and respect can be lost or withheld, and the effort will falter.

- 8. Work Across Silos:** Build networks and advance trusted professional relationships by negotiating and problem-solving with respect for the interests, capacities, and constraints of others.

Chesapeake Bay

The strategies pursued by the Commission were aimed at addressing the loss of the oyster industry and the significant decline in the sports fishing industry in the Bay. The solution was based on storm water control, agriculture runoff reduction, habitat restoration, and economic development—issues for each of the seven states surrounding the Bay. Existing statutes of the federal and state governments did not spell out regulatory frameworks for implementing agriculture runoff, and the storm water runoff regulations were cumbersome. Thus, the Commission opted for a voluntary compliance strategy. The integrated implementation of the program was chronicled in a 2007 study by the National Academy of Public Administration. The Commission is now challenged by rising sea levels that are adversely affecting storm water protection and pollution runoff but assisting in habitat restoration, and insufficiently funded implementation of the BMPs.

Los Angeles Basin Air Quality

This case spans growth, infrastructure, energy, economic and community development and presents a cross-silo problem involving almost every issue affecting the built and natural environment. New laws have been enacted to facilitate this boundary spanning. California state law SB 375 was based partially on the SCAG growth plan for air quality for the six-county region serving over 20 million residents. SCAG required that local growth plans consider vehicle miles, energy reductions, and air emission for new construction and housing developments. SCAG's guidelines also call for local land use plans with quantified metrics. The plan had to address the political power of the railroads, coupled with the lack of state and regional authority over these sources, and the adverse impact on air quality goals, including carbon dioxide goals, created by trans-loading of containers from rail to trucks.

The continued increase in congestion in this metropolitan area and similar areas across the country points to the need to create additional strategies that utilize scarce urban land and incentivize environmentally sensitive behaviors and the development of new technologies.

Alameda Corridor

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The rail corridor construction is an integrated project addressing transportation, air quality, economic development, ground water clean-up, and energy issues. Fundamentally, the project involved working across the silos of political jurisdictions, the regional transportation funding agency (LACTC), port oversight commissions (Los Angeles and Long Beach), the planning agency (SCAG), federal and state agencies, and cross-sectoral contracts with three separate railroads.

In addition, at the time of the development of the project, the energy emissions reduction issue was focused on reducing truck and rail emissions by decreasing travel time. SCAG and the State Public Utility Commission set forth a strategy to electrify the railroads in the region but were thwarted by recent technology that shifted much of the movement to trucks. Trucks burn diesel, causing particulate emissions that seriously affect air quality. Emissions from trucks, trains and vessels are becoming the largest portion of the Basin's air emissions. Without an energy strategy, the region will not successfully address one of its most serious problems. An investment program aimed at building grid and smaller scale batteries is now under development in the Basin using new agile governance structures (for example, the Infrastructure Funding Alliance found at www.ifalliance.org/about-us/board-of-directors-staff/) designed to implement Economic Infrastructure Financing Districts [EIFDs]). The state and regional strategy is to develop renewable energy that is lower cost than traditional sources coupled with the use of market forces rather than regulatory approaches.

Work across Silos Findings

Each of the cases illustrates the complex intergovernmental landscape. Dimensions of relationships are both vertical and horizontal. Vertical relationships comprise the federal, state, regional, and local levels, reflected in the Alameda Corridor with its cities, regional port, planning, and transportation agencies; the state transportation agency and the legislature; and federal transportation department and Congress. Horizontal relationships are represented in the Chesapeake Bay Commission across three states and the District of Columbia. The capacity to work across silos is nested in the other tools for effective intergovernmental action, particularly in leadership and data sharing, as the example of the Governors of Pennsylvania and Maryland initiating the Chesapeake Bay Commission clearly demonstrates.

- 9. Motivate:** Encourage continual evidence-informed improvement of outcomes using well-designed financial and non-financial incentives that do not tempt gaming and/or other perverse consequences.

Chesapeake Bay

In 1983, states sharing the Chesapeake Bay were motivated to reduce the estimated 263 million pounds of nitrogen runoff estimated to flow annually into the Bay. They alerted farmers to the aggregate amount of nitrogen runoff and then developed practices to limit future flows (Franklin, 1983). Currently, emerging information on changes in the weather patterns that cause hydrology and estuary levels to fluctuate is creating a need for an educational process to inform decision-makers on how to approach this entirely new challenge to the Bay.

Los Angeles Basin Air Quality

The motivation of the Los Angeles Air Basin in the 1960s is noted in research: "From the very start, Los Angeles has had the unenviable distinction of being the most heavily air-polluted community in the nation and continues as an 'extreme' nonattainment region today." (Mazmanian, 2008, p. 90). With new research on the acute health risks posed by nano particulates, especially the health risks of air pollution near schools, coupled with the issues regarding climate change and carbon reduction, air quality improvements are a preeminent contemporary intergovernmental challenge. The emerging challenges for intergovernmental

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action include protecting and improving health, decreasing carbon dioxide to reduce climate change, and reducing car and truck trips. Tools are now under development that will increase understanding of these issues and the educational processes needed to inform decision-makers at all levels of government.

Alameda Corridor

The circumstances described above present several challenges to the rail corridor, including dealing with the new transloading and marketing behavior of the economy, and dealing with the energy source driving the logistics system. Data and information surrounding these challenges and clear evidence of health impacts are emerging. Translating all of this into an educational program for governments at all levels to support effective problem solving is among the more serious challenges facing southern Californians and, by extension, communities adjacent to transportation hubs nation-wide.

Motivation Findings

In each case, the data (on agricultural runoff, air quality health impacts, and track and rail congestions) motivated leaders at the local, state and federal levels to develop new governance mechanisms for funding, regulating, and mitigating impacts on human health.

10. Remain Mindful of Finances: Integrate changing costs and resource capacities continually into decisions and actions to advance best outcomes.

Chesapeake Bay

Each of the original states involved determined that the Bay Conservation Program was of such importance that they programmed state general fund resources to support its operations. Although the implementation efforts are primarily voluntary for both the governmental entities and the private sector, the analytics and follow-up monitoring help to identify the benefits that are generated. With some modifications to existing processes, this information could be used by the parties involved in the Bay implementation program so that the identified benefits could generate revenues that could fund the implementation.

Los Angeles Basin Air Quality

The necessary operating resources are derived from the annual budgets of the participating agencies and are a combination of general fund monies at all levels, fines and penalties collected by the regulatory agencies (state cap and trade), fines collected by the AQMD, and State and Federal grants to SCAG. Infrastructure shortfalls and the difficulty of supporting growth and energy programs make new innovative funding programs even more urgent. California's governor and legislature, in response to recent enabling legislation to enact public funding authorities, are now experimenting with new intergovernmental and cross-sectorial programs to fill this gap, enabling EFIDs to be formed.

These new funding authorities have the capacity to bring new revenues to the table. EFIDs can create new incentive structures that will alter the way that consumers and users relate to the behavior of the system. Tax increment funding in property and sales taxes can capture new wealth that is created so that those benefiting pay for the benefit. EFIDs can also be used to bring new technologies into the system. Finally, EFIDs can create more accountability and transparency. These systems coordinate local governments to collect revenue from the beneficial uses and increased value capture to issue and retire debt.

Alameda Corridor

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For the Alameda Rail Corridor, staying on budget was critical. To overshoot the budget would be to bankrupt the project, and repayment of the \$800 million loan depended on generating the revenue stream of charges per container unit moved as soon as possible. There was no additional revenue stream to repay bond holders, while there did exist a clear and binding contractual agreement to repay them. Initially, financing to repay loans was entirely through fees on containers. Over time, new sources of revenue arose. As new technology for transloading containers to trucks moved containers on free-flow shuttles to transloading centers near ports, land for these centers was available under electric lines, allowing superconducting cables to power the shuttles. This technological innovation offered potential for recovering revenue through superconducting magnetic energy storage system (SMES) batteries. The development of a grid offers an infrastructure to store renewable energy for the port region, while smaller scale batteries are being developed for trucks and trains.

Finance Findings

The Alameda Corridor case, especially, illustrates the centrality of “mindfulness of financing,” driving initial success and completing the project on time and budget. Because of the accountability built into the revised Joint Powers Agreement with the public beneficiaries of the project, the ports, and the cities of Long Beach and Los Angeles, having oversight of the spending was essential. When coupled with the private sector beneficiaries of the three railroads paying the container shipping fees to retire the debt, this provided a formula for success that aligned accountability and funding streams with strong incentive for “on budget” performance.

IV. Implications

The shortcomings of the current U.S. intergovernmental system for building needed infrastructure and improving environmental protection have driven the National Academy of Public Administration’s Standing Panel on the Intergovernmental System to research effective tools for a redesign of the system. Most especially, the current funding paradigm neither maintains the existing system nor provides for new investment needs.

Federal grants fall far short of addressing our nation’s infrastructure needs. Currently, 78 percent of the public infrastructure in the United States is funded with non-federal revenues. This highlights the urgent need to develop effective partnerships among all levels of government for such capital development that can generate an infusion of private capital to pair with the contributions from state and local governments. This will need to be accompanied by expanded options for user- and beneficiary-based financing, including user charges and value-capture (e.g., tax increment) financing, as well as innovative options to reduce market risk and increase access to private capital.

The changing demands confronting governments at all levels are outstripping current capacities. Current intergovernmental financial tools are insufficient to deal with the operation and maintenance of the existing system, and governments often lack the flexibility to respond to new dynamics such as the potential for infrastructure investment to respond to social inequity. Also, we cannot address all of our infrastructure challenges without pricing signals that can change consumer behavior.

Ultimately, an improved governance framework that supports budgetary rigor and transparency, identifies priorities and risks, and recognizes and avoids costly financial workarounds, is necessary to inject a restructured system with vitality, realism, and sustainability.

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The Standing Panel developed these ten tools for effective intergovernmental action from observations of shared patterns of action in past cases. Our intent in applying these tools to explain the successes and limitations of the cases included here that span regions on the East and West Coasts is to illustrate in detail how these tools work in various intergovernmental arenas of infrastructure building and environmental protection. The patterns of effective action suggested by the tools are ones that can be incentivized by Congress.

The work of the Standing Panel regards use of the tools separately and together, as well as consideration of organizing policies to increase investment in infrastructure and environmental protection across the nation. The cases illustrate how financing, investment of leaders' time, and collaborative efforts can be encouraged in a redesigned intergovernmental system that recognizes, incentivizes, and applies tools for effective action. The research on finding patterns for effective action draws on the approach of Elinor Ostrom (1990) regarding micro-situational variables explaining successful preservation and management of common pool resources. The case examples included here show how the tools were used by all levels of government and the private and non-profit sectors to solve complex public problems. There are also suggestions for how this framework may be applied to future legislation at both the state and federal levels. The framework enables us to understand the dynamics that lead to success and unresolved issues.

Successful elements of the cases suggest attention to new institutional arrangements called for by agile governance that enable revenue streams of users and beneficiary-based financing to fund integrated investment programs that enable the funding of goals—both national and local. Additional discussion can consider methods that can be designed to facilitate flexibility in how public and private entities collaborate for project development and building while still ensuring transparency and accountability to the public and the financial community. The best practices and lessons learned, coupled with emerging new theoretical perspectives of governance, if applied nationally could address America's infrastructure, environmental and economic development goals.

There is great need to continue to explore and refine the ten tools and a national infrastructure development framework. For example, data sharing analytics can be used to assess the performance of private investment and determine nexus analysis for private investment decisions that allow the creation of funding streams that amortize debt financing structures. This would allow intergovernmental partners to understand the best use of intergovernmental grants and assistance as well as private investments that can be part of financing public goods. Also, monitoring and tracking create a way of identifying high performing areas and the identification of success stories and innovations that can be shared for knowledge building. Finally, as this is a work in progress, case studies are welcomed on the environment, water, transportation, highway, major bridges, power plants, and other infrastructure and environmental protection projects.

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