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KEEPING AMERICA'S INFRASTRUCTURE DEBATE IN PERSPECTIVE

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ABSTRACT

Describing the state of nation's infrastructure in terms of such pessimistic jargon as "shoddy", "crumbling", "deteriorating", and "in disrepair", appears to receive a high level of popularity in the media and elsewhere. Ironically, the majority of the steadfast skeptics do not offer any concrete remedial solutions to the problem other than urging the Government to inject billions of dollars into the construction without considering the viability and sustainability of such a program.

Fortunately, at the other end of the spectrum, there are personalities, experts and think-tanks who—while acknowledging both the shortcomings of the system and the need for corrective action—intellectually and passionately strive to seek means to address the issues surrounding this fundamental national interest. And, in between, there are those who unceasingly work in the trenches to keep the infrastructure system functional and advancing.

Considering the complexities inherent in the national infrastructure debate, this article aims to transcend the customary mindset that funding is the mere "panacea" for the resolution of America's Infrastructure deficiencies and present a more comprehensive view of the issue. Instead of focusing on a singular "road map" for the transformation of America's national infrastructure into the 21st century, it would be more effective to shift paradigms into a "systems thinking" approach, where one considers the system holistically, with the emphasis on both the significance of the whole and the interdependence of its parts, in order to keep the debate in proper perspective.

INTRODUCTION:

One of the unique aspects of the infrastructure is that we tend to take it for granted. "Infrastructure is like air" declare Schatz and Berlin Jr. "you need it at all times but only notice it when it is broken." Fortunately, today the infrastructure challenges confronting nations around the world in general and the United States in particular are well elaborated and abundantly debated in the media and discussed at numerous forums, raising the public's awareness.

For more than two centuries America's infrastructure has been recognized as the corner stone of the nation's prosperity and become the envy of the world. Not surprisingly however, all the magnificent accomplishments in the development of the national infrastructure shared a number of key characteristics in response to the most urgent challenges of their time. They were created through bold, persuasive strategic visions for the nation's future growth and development. While they were national in scale, they relied on state and local institutions to implement. And above of all, they received the commitment and leadership from the President of the United States.

Although in every era since the founding of the nation, United States administrations have generally maintained improvement of nation's infrastructure as part of their agenda, major policy advances in this area have seldom been achieved without the President's commitment and leadership. George Washington founded the Potomac Canal Company even before he became president and Abraham Lincoln supported the construction of the Transcontinental Railroad. According to historian Robert Fishman: "At the request of President Thomas Jefferson, Treasury Secretary Albert Gallatin created a national plan of ports, roads, and inland waterways to encourage settlement of the nation and facilitate trade among independent farmers scattered across the land. This plan was inspired by visions of George Washington and Thomas Jefferson of an egalitarian society – the "homestead vision" first made possible by the Land Ordinance of 1785. While the plan's implementation was slowed by growing north-south divisions between slave and Free states, several states moved aggressively to implement Gallatin's vision. New York State, for example, built the Erie Canal, changing the geography of commerce in the nation." (America 2050, An Infrastructure Vision for 21st Century America.)

Fishman also reminds us that in 1933 President Franklin Roosevelt established The National Resources Planning Board "to guide infrastructure investments promoted by the economic stimulus programs of his Depression-era New Deal." Accordingly, "The Board performed crucial services throughout the 1930s in coordinating public works and forming policy for land use, forests, parks, hydrology, and government-sponsored defense-plant location." (America 2050, An Infrastructure Vision for 21st Century America.) Perhaps the Board's most important contribution to the nation's infrastructure system was to enable President Eisenhower's vision of the development of America's Interstate Highway system come true when he signed the Federal Highway Act of 1956 into law. President Johnson initiated the creation of Department of Transportation and President George H.W. Bush made changes critical to the surface transportation system with the passage of Intermodal Surface Transportation Efficiency Act.

President Obama began to push for greater infrastructure investments even before he took office. At the outset of the 2007-2008 financial crisis he successfully used the appeal of "shovel ready" infrastructure projects to sell his \$787 billion stimulus legislation to the Congress. Other initiatives followed since: The American Recovery and Reinvestment Act of 2009, which committed billions to infrastructure investments, American Jobs Act of 2011 and creation of a National Infrastructure Bank, investing in a "fix-it-first" policy, attracting private investment through a "Rebuild America Partnership," an "America Fast Forward" bonds program, to name a few. More recently in July 2014, the President announced a new executive action the *Build America Investment Initiative*, designed to expand private investment and collaboration in infrastructure by launching the Transportation Investment Center "to increase infrastructure investment and economic growth." The Center – located in the Department of Transportation "is to serve as a one-stop shop for cities and states seeking to use innovative financing and partnerships with the private sector to support transportation infrastructure."

ASCE'S CALL-TO-ACTION:

"As civil engineers, ASCE believes that we are the stewards of infrastructure", noted Gregory E. DiLoreto former president of American Society of Civil Engineers (ASCE), "we designed it, we built it, and we actually oversee the operations and maintenance of it in many cases."

As part of its stated mission, in 1989 and once every four years since, ASCE has published a Report Card for America's Infrastructure, using an A to F school format. The goal of this enormous undertaking has been to: "both assigning grades and making recommendations for how to raise the grades." ASCE's 2013 Report Card graded 16 categories of nation's infrastructure, comprising: aviation, bridges, dams, drinking water, energy, hazardous waste, inland waterways, levees, ports, public parks and recreation, rail, roads, schools, solid waste, transit and wastewater. The ASCE's Advisory Council assigned the grades based on the assessment of each category with respect to eight "rigorous" criteria: capacity, condition, funding, future need, operation and maintenance, public safety, resilience and innovation arriving at what ASCE called "good news" that America's infrastructure "GPA" has gone from a D of four years ago to a D+. The Report Card concludes that "to raise the grades and get our infrastructure at an acceptable level, a total investment of \$3.6 trillion is needed by 2020 across the entire 16 sectors. Currently, only about \$2 trillion in infrastructure spending is projected, leaving an estimated shortfall of approximately \$1.6 trillion."

The idea of issuing a Report Card for America's Infrastructure was probably initiated in 1988 by Council for Public Works Improvement with *Fragile Foundation: A Report on America's Public Works*, which graded eight categories of infrastructure. Nonetheless, Reactions to ASCE's alarming report cards have been overwhelming. They are cited at

every Congressional hearing, political meeting, the media, and think-tank conferences that are about infrastructure or transportation, just as ASCE former President Andrew W. Herrmann had envisioned: “We as civil engineering professionals feel that it is our obligation to point out to the White House, Congress, and state and local legislators what is happening to the infrastructure in the U.S.”

In President Obama’s January 2011 State of the Union address, America’s infrastructure took front and center stage. “Our infrastructure used to be the best but our lead has slipped.” Said the President, “South Korean homes now have greater Internet access than we do. Countries in Europe and Russia invest more in their roads and railways than we do. China is building faster trains and newer airports. Meanwhile, when our own engineers graded our nation’s infrastructure, they gave us a “D.”

Not all responses to the ASCE Report Cards have been supportive. Charles Manson, a planner and an engineer said: “The ASCE report is an embarrassment to the engineering profession. The fact that politicians, journalists and bloggers are all lined up to mindlessly parrot these conclusions is pathetic.” (The ASCE Infrastructure Cult, Strong Towns, August 8, 2011). And Adam J. White said: “Of course, asking civil engineers whether America needs to invest in infrastructure is like asking a barber whether you need a haircut.” (Infrastructure Policy: Lessons from American History the New Atlantis)

“ America’s infrastructure needs intelligent reform, not floods of extra financing or quixotic dreams of new moon adventures or high-speed railways to nowhere.”

In Boston Globe of April 7, 2011, Harvard economics Professor Edward L. Glaeser made reference to ASCE 2011 Report Card in his article “What crisis? Inadequacies with the nation’s infrastructure have been oversold.” He wrote: “An infrastructure crisis is also proclaimed by an American Society of Civil Engineers’ Report that gives America a “D,” but that report contains no quantitative benchmarks, no global comparisons, and not even the faintest whiff of trading costs against benefits. The nation’s drinking water gets a “D-“despite the report’s verdict that “Americans still enjoy some of the best tap water in the world. The low marks are used to justify a call for \$2.2 trillion of spending over five years. One wonders whether this is just another special interest lobbying for more public spending on its industry.”

GLOBAL VIEW OF INFRASTRUCTURE

For more than three decades the universally respected Global Competitiveness Report (GCR), published by the World Economic Forum has provided constructive insight into the key factors and their interrelations that determine the present and predict the future prosperity of the nations of the world. The 2014-2015 report assesses the competitiveness landscape of 144 economies, casting light on “drivers of their productivity and prosperity.” The report is claimed to be “the most comprehensive assessment of national competitiveness worldwide, providing a platform for dialogue between government, business and civil society about the actions required to improve economic prosperity.” GCR defines “Competitiveness” as “the set of institutions, policies and factors that determine the level of productivity of a country.” It also asserts that in turn “the level of productivity sets the level of prosperity that can be earned by an economy.” The competitiveness analysis is based on Global Competitiveness Index (GCI) which is defined as “a comprehensive tool that measures the microeconomic and macroeconomic foundations of national competitiveness.”

GCI is measured by “including a weighted average of many different components, each measuring a different aspect of competitiveness.” The components are grouped into 12 pillars of competitiveness. *Institutions* is the first pillar and is determined by “the legal and administrative framework within which individuals, firms, and governments interact to generate wealth.” The second pillar is *Infrastructure*. The Report affirms that “extensive and efficient infrastructure is critical for ensuring the effective functioning of the economy.” Since the other 10 pillars are less applicable to the present discussion, they are not mentioned here.

In the 2014-2015 GCR the top *overall index* rankings for the sixth consecutive year is led by Switzerland with Singapore in the second place. The United States, has climbed to the third place and Japan, risen three ranks to the 6th position. The role of the first pillar, “Institutions”, according to the Report comprises attributes such as Government attitudes toward markets and freedoms and the efficiency of its operations, excessive bureaucracy and red tape,

overregulation, corruption, lack of transparency and trustworthiness, inability to provide appropriate services for the business sector, and the proper management of public finances in the national business environment.

As for the second pillar, “Quality of Infrastructure”, the United States is ranked sixteenth Behind Denmark. Switzerland ranks first, followed by Hong Kong, United Arab Emirates, Finland and Singapore. It is interesting to note that amongst the advanced economies Japan infrastructure is ranked ninth, France tenth, Germany eleventh, United Kingdom twenty fourth, Australia thirty fifth, and China, surprisingly, sixty fourth.

In its January 2013 Report “Infrastructure productivity: How to save \$1 trillion a year”, McKinsey Global Institute summarizes the status of the world’s infrastructure in the following terms:

“Just keeping pace with projected global GDP growth will require an estimated \$57 trillion in infrastructure investment between now and 2030.” That is nearly 60 percent more than the \$36 trillion spent over the past 18 years...The \$57 trillion required investment is more than the estimated value of today’s infrastructure. And this figure does not include costs such as clearing maintenance backlogs, meeting development goals in emerging countries, and making infrastructure more resilient to climate change. But given widespread fiscal constraints in the wake of the global financial crisis, even assembling the minimum investment required to meet growth predictions is a challenge.” McKinsey Global Institute argues that while “the debate about the growing need for infrastructure focuses on whether financing is sufficient to meet it, there are clear ways to create more and better infrastructure for less.” (Report – McKinsey Global Institute, January 2013)

In its October 2014 “World Economic Outlook: Legacies, Clouds, Uncertainties”, International Monetary Fund (IMF) contended that “increased public infrastructure investment raises output in both the short and long term, particularly during periods of economic slack and when investment efficiency is high. This suggests that in countries with infrastructure needs, the time is right for an infrastructure push: borrowing costs are low and demand is weak in advanced economies, and there are infrastructure bottlenecks in many emerging market and developing economies.” (Chapter 3: Is it time for an infrastructure push? The macroeconomic effects of public Investment)

THE PATH FORWARD: FUTURE OF AMERICA’S INFRASTRUCTURE

Inadequate or inefficient infrastructure is a global concern for both advanced and emerging economies. The fact is that the United States is not the only nation that is confronted with the challenges brought about by the inadequacy of national infrastructure that would be vital for the twenty first century. Since nations of the world are different in size, demography, culture, wealth, and are at different stages of social, political and economic development, a generic prescription would not be a universal cure nor would one size fit all. Nonetheless, in developing an infrastructure strategy for the United States, one could learn valuable lessons from the experience of other nations.

In June 2013 “Infrastructure Australia” introduced The National Infrastructure Plan “outlining the major infrastructure reforms that are needed to lay the foundations for a more productive Australia over the next 50 years.” In the United Kingdom, the first ever National Infrastructure Plan was published in 2010 with subsequent annual updates, eventually leading to the “National Infrastructure Plan 2013”. In 2008 the Urban Redevelopment Authority of Singapore created a Long - term Master Plan, to be reevaluated every 10 years to ensure it will meet population and economic growth. And in October 2013, Roland Burger Strategy Consultants published “Planning and Financing Transportation Infrastructures in the EU – A Best Practice Study.” In writing this article, the essence of these endeavors and others have been taken into account. In particular, the writer is indebted to the inspirations received from Great Britain’s Sir John Armit CBE’s “An independent review of long term infrastructure planning commissioned for Labor’s Policy Review”, dated September 2013.

Traditionally the debate about how to deal with the nation’s infrastructure, becomes entangled in the tunnel vision of how to fund and finance the infrastructure without jeopardizing other equally important national priorities. While President Obama’s commitment to the transformation of nation’s infrastructure and his numerous bold initiatives are commendable, they often focus on the funding and financing pieces of the “jigsaw puzzle” without taking the view of the picture in “front of the box”, and hoping that eventually it will all come together.

While no body in their right mind could deny the significance of funding the infrastructure, viewing it as the only or the most important component of the issue would be an oversimplification of the challenge. Professor Glaeser argues that “The U.S. owes its emergence as a great power to magnificent investments in infrastructure. The

emerging giant of today, China, is following that example. Many imagine that we must again build big to stay on top. But success in middle-age for people and nations - requires wisdom and cunning more than pumped-up brawn. America's infrastructure needs intelligent reform, not floods of extra financing or quixotic dreams of new moon adventures or high-speed railways to nowhere."

"The recognition of the problem is not the challenge", points out America 2050, "rather it is the lack of imagination, creativity, and most of all, political will and leadership to re-think the fundamental principles and institutional design of our policy-making and governing processes of the nation." (America 2050 - An Infrastructure Vision for 21st Century America – November 18, 2010)

Customarily, the United States infrastructure industry has been resistant to rethinking its piecemeal approach to the implementation of projects by embracing a holistic systems strategic vision that would simply ask where we are, what kind of infrastructure do we need in order to cope with the ever growing national demand for affordable, clean energy, modern communication systems, transportation networks, etc. and how do we propose to achieve it?

REFORMING AMERICA'S INFRASTRUCTURE THROUGH "SYSTEMS THINKING"

In the words of Albert Einstein "We cannot solve problems with the same thinking we used to create them." While the conventional piecemeal approach of addressing only one problem at a time then moving to the next may have worked in the past, the chances are that it will not be effective in the twenty first century's ever-changing environment. Rather, we need to make a fundamental paradigm shift to *systems thinking* where "the performance of a system is not the sum of the performance of its parts taken separately, but the product of their interactions." (Russell L. Ackoff) This is the essence of systems thinking, where "the focus is consistently on outcomes and adjusting the relationships among the parts as necessary to keep on track." (Stephen G. Hayines)

“ Visioning is a process of thinking and learning about events that could happen in the future before they occur.”

To address complex issues such as the future of the nation's infrastructure, America needs to develop a strategic *vision*, and come up with a comprehensive *national strategy* using systems approach. "A vision is a description of a future state and the role that an individual, organization, institution, government or country will play in that future. For that reason, the future needs to be, what I call, a 360 degree look at life in a particular time frame." (Sheila R. Ronis)

Visioning is a process of thinking and learning about events that could happen in the future before they occur. Visioning is not a prediction, rather it is a planning tool in any organization's planning cycle and part of its strategic management process.

Recent American Administrations have failed to set strategic priorities for infrastructure based on the projection of the nation's future needs. And there is little evidence of clear and cohesive long term strategies about what those needs are and how to satisfy them. Moreover, the collaboration among the numerous federal and state agencies leaves a lot to be desired. Public awareness is rarely encouraged and support is seldom sought.

Not only to maintain but to improve America's international competitiveness and provide the high quality of life desired for the United States citizens, among other things, we urgently need to come up with a 30 year or so coherent national infrastructure strategic vision firmly based on a thorough, and credible assessment of our holistic needs and clear plans as to how these needs will be satisfied. The successful development and implementation of the strategy will firstly require a strong and enduring political will and secondly a competent, resourceful institutional structure with unwavering support from the President, the Congress, the Governors, the State Agencies, Private Sector and the Public.

As emphasized earlier, the history of the United States attests to the fact that major visionary advances in the area of infrastructure have seldom been achieved without the President's commitment and leadership. Keeping that in mind, the remaining part of the article will be devoted to the introduction of a framework of a meaningful *conceptual model* of an appropriate *institution* to meet the challenges of a national infrastructure transformation management system. To this end, the writer is indebted to the inspirations provided by initiatives of other nations

with progressive infrastructure agenda and in particular Great Britain's Sir John Armitage CBE's "An independent review of long term infrastructure planning commissioned for Labor's Policy Review", of September 2013 and the United Kingdom's National Infrastructure Plan 2013.

The *central piece* of the proposed model is a *National Infrastructure Commission* (NIC) with statutory independence under the leadership of *National Infrastructure Czar* (Chair), nominated by the President and confirmed by the Congress. The intent of the NIC is to create the notion of the military "Command and Control" within a civilian context. Albert and Hayes identify the following functions that are associated with the command and control of a given undertaking: (a) Establishing intent, (b) Determining roles, responsibilities, and relationships, (c) Establishing rules and constraints, Monitoring and assessing the situation and progress, (d) Inspiring, motivating and engendering trust, and (e) Training and education. (Albert and Hayes, Understanding Command and Control)

The following proposal presents only a few fundamental ideas about the "main frame" of the NIC structure, and leaves the details to the many experts with better understanding of the political, social, legal, financial and other requirement and constraints.

The proposed NIC will consist of 8-10 multi-partisan members selected from the political parties by the Czar and recommended for President's approval, making sure that each nominee has the knowledge and the experience likely to be relevant to the performance of NIC's responsibilities. Czar will also appoint a person as the chief executive of NIC who will not be a member of the Commission. The Czar may establish committees and subcommittees consisting of individuals with specific expertise.

THE MAJOR RESPONSIBILITIES OF NIC INCLUDES BUT IS NOT LIMITED TO THE FOLLOWING:

1. To identify the status of the America's infrastructure and its current and future inadequacies by conducting a nationwide research in close cooperation with the State and local infrastructure sectors. To make sure that such assessment of the status quo would cover all of the essential infrastructure sectors interdependencies holistically rather than in isolation;
2. To determine the United States' infrastructure needs over the next 30 years or so in order to foster consistent economic growth and maintain America's worldwide competitive edge;
3. To formulate; based on the needs assessment; a realistic and credible Strategic Visioning through Systems (holistic) Thinking;
4. To prioritize the type and amount of investment needed for the United States in order to advance its global competitiveness and
5. To develop conclusions by considering a wide range of projections such as economic growth forecasts, demographic trend, technological advances, environmental issues, and federal and state regulatory requirements for each sector. In so doing, the Commission would seek advice from outside experts, including infrastructure providers, public and private organizations, local government, national and the international investors, financial institutions and regulators.

One of the most effective way of gathering information about the status of US infrastructure and receive suggestions for its present improvements and future development is to send out questionnaires to individuals and organizations with experience of promoting, planning and delivering infrastructure in the United States and even overseas. The following structured questions are a few ideas that might be beneficial to America's needs assessment endeavor:

- **Diagnosis of current issues and difficulties** – what are the failings of the America's previous/existing decision making mechanisms for infrastructure and what have been the consequences of these failings?
- **Lessons that can be learned from elsewhere** – what can be learned from institutional structures established overseas to promote long term infrastructure planning?
- **The responsibility of an independent Infrastructure Commission** – what would be an appropriate planning horizon for a Commission, what sectors should it cover and how should it interact with existing system?
- **How would bipartisan consensus best be achieved** – where should the members of the Commission be drawn from, how would the Congress review the Commission's proposals for implementation?

Once the strategic visioning and the *assessment plan* are completed, they will be submitted to the President and passed on to the Congress for debate. Following Congressional debate, and possible integration of amendments, and approval within six months or thereabouts of both the Senate and House of Representatives, the individual Government Departments would have an obligation to produce within say 12 months, Sector Plans – transportation, energy, telecommunications, etc. – based on the independent infrastructure sector assessments of the 50 States and District of Columbia.

The Sector Infrastructure Plans would be debated for approval in the Congress, upon which approval, the Sector Infrastructure Plan would become America’s National Infrastructure Plan. NIC would then annually monitor implementation of the Sector Infrastructure Plans against the projections.

CONCLUSION

The paradigm shift outlined in this article and the resulting National Infrastructure Plan are not intended to suggest a “one size fit all” approach. Rather, they are offered as a vehicle for bringing together issues surrounding the current United States infrastructure system and harmonizing its future alignment with the global advancement of its time. Furthermore, to provide a systems approach that would address such questions as prioritization, financing, technological advancements, efficiency and value for money.

Ideally a National Infrastructure Plan should:

- Assess and analyze the state of the United States’ 2015 infrastructure;
- Assess the United States’ infrastructure needs now and for the long term future (30 years or so);
- Determine and articulate transparently the national strategic vision for America’s infrastructure;
- Set out the Government’s overall approach for each sector and each area of the country, define strategic objectives and expected milestone and outcomes;
- Explain strategies for public and private investment in the next 10, 20 and 30 years;
- Provide strategies and guidelines for innovative financing such as Public-Private Partnership (PPP);
- Promote renovation and comprehensive maintenance of the existing infrastructure;
- Promote Research and Development and technology advancement in infrastructure;
- Take into account the appropriate balance between investing in new infrastructure and optimizing use of the existing infrastructure;
- Outline Government’s approach to prioritizing and justification for that policy approach; and
- Set out a comprehensive procedure for appropriate infrastructure delivery.

Every ten years NIC would produce a National Infrastructure Assessment in order to identify the next 30 year infrastructure needs and vision. “You have to learn the rules of the game” said Albert Einstein, “and then you have to play better than anyone else.”

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