



The Achieving
VISION
for
Civil Engineering in
2025

A Roadmap
for the
Profession

ASCE
AMERICAN SOCIETY OF CIVIL ENGINEERS

Achieving

The **VISION**  **N**

for
Civil Engineering in
2025

A Roadmap
for the
Profession

Prepared by the ASCE Task Committee to Achieve
the Vision for Civil Engineering in 2025

August 2009

ASCE
AMERICAN SOCIETY OF CIVIL ENGINEERS

ASCE and American Society of Civil Engineers - Registered
in U.S. Patent and Trademark Office.

American Society of Civil Engineers
1801 Alexander Bell Drive
Reston, Virginia, 20191-4400

www.asce.org

Copyright © 2009 by the
American Society of Civil Engineers.
All Right Reserved.
Manufactured in the United States of America



Entrusted by society
to create a sustainable world and
enhance the global quality of life,
civil engineers
serve competently, collaboratively, and ethically as master:

- planners, designers, constructors, and operators of society's economic and social engine—the built environment;
- stewards of the natural environment and its resources;
- innovators and integrators of ideas and technology across the public, private, and academic sectors;
- managers of risk and uncertainty caused by natural events, accidents, and other threats; and
- leaders in discussions and decisions shaping public environmental and infrastructure policy.

Table of Contents

Executive Summary	5
Achieving Vision 2025	9
Creating the Roadmap	13
The Roadmap	15
Vision 2025 Outcome 1	16
Vision 2025 Outcome 2	22
Vision 2025 Outcome 3	26
Vision 2025 Outcome 4	29
Vision 2025 Outcome 5	33
What's Next?	37
Get on the Road, Get Moving	41
Notes.....	42
Appendix A	
Some Potential Actions for the Roadmap Tactics	45
Appendix B	
Types of Organizations	65
Appendix C	
ASCE Task Committee to Achieve the Vision for Civil Engineering in 2025.....	67

Executive Summary

“Now that the Summit [on the Future of Civil Engineering—2025] is complete, the Vision articulated, and the report completed, leaders of civil engineering organizations around the globe should move the civil engineering community toward the Vision.” Those words concluded the “Executive Summary” of the groundbreaking 2007 report *The Vision for Civil Engineering in 2025*.¹ They afford a fitting start to the summary of this new plan for action—an ambitious “roadmap” for civil engineers to shape their own future and grasp a bold Vision for their profession.

Vision 2025 sets an aspirational target for a new global state of affairs: Civil engineers will be entrusted by society to help achieve a sustainable world and raise the global quality of life. Civil engineers, as a body of professionals, will be master (1) planners, designers, and constructors; (2) stewards of the natural environment; (3) innovators and integrators of technology; (4) managers of risk; and (5) leaders in shaping public policy, where “master” implies “leader” in both role and knowledge. Those are intrepid, far-reaching words, and following the release of the Vision 2025 report, the American Society of Civil Engineers (ASCE) selected a group of member volunteers to sketch a roadmap to transform that Vision into concrete action. The Roadmap is articulated through the five Vision statement outcomes and a series of “supporting outcomes.” These are followed by high-level action steps called “tactics” to achieve each supporting outcome, augmented in Appendix A by some potential, more detailed “actions.”

Master Builders

To achieve the first Vision outcome, civil engineers—as leaders in planning, designing, and constructing the built environment—will have to light the torch and position themselves at the helm of multi-disciplinary, global, collaborative teams that carry out successful projects. In their role as master builders, they will have to acquire a new, more expansive body of knowledge, provide ethical guidance, attract a diverse workforce, and define the knowledge and responsibilities for each member of a well-defined hierarchy of professionals and paraprofessionals. In addition, civil engineers must educate their colleagues, partners, and the public on what civil engineers bring to the table, and become knowledgeable, vocal advocates of sustainable economic growth through infrastructure renewal.



Civil engineers have set an aspirational vision for the profession in 2025.



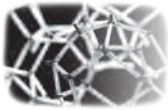
Civil engineers, as master builders, will lead multi-disciplinary, collaborative teams consisting of a well-defined hierarchy of professionals and paraprofessionals.



Civil engineers will employ new technology and business approaches to foster sustainable practices for the built and natural environment.

Stewards of the Environment

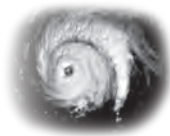
Civil engineers will enter 2025 having long recognized the imperative for sustainable practices and the urgency for social equity in the consumption of resources. In that year, policies and government funding will encourage or require sustainability and resilient approaches. Civil engineers will have put new technology, techniques, and financial methods in place for sustainable planning, design, construction, operation, and maintenance in carrying out their vital role. In addition, civil engineers will routinely encourage owners to adopt new environmental technologies and techniques to improve the quality of life, while environmental stewardship becomes an integral part of engineering education and research.



Civil engineers will become innovators and integrators of new technology and help define the research agenda.

Innovators

To become master innovators and integrators of technology, civil engineers must define the strategic research direction for leading-edge technologies in the built and natural environment and serve as active participants and partners in the research process. This will take a variety of efforts, including identifying and prioritizing emerging technologies and innovations, fostering civil engineering input into strategic research planning, influencing and bolstering funds for research, promoting faster application of new technologies and multi-national knowledge exchange, championing diversity and inclusion in the profession, and accelerating the integration of technology through spirited partnerships among diverse sectors.



Civil engineers will assess and manage risk and thereby reduce the incidence and effects of natural and man-made disasters.

Managers of Risk

To achieve the managers of risk outcome, civil engineers will have shown their mettle in assessing and managing risk—forging new tactics for reducing the incidence and effects of natural and man-made disasters. Civil engineers will lead enterprise-wide risk management efforts and routinely make project-specific risk decisions, communicating risks and mitigation options to project colleagues, clients, government agencies, and the general public. At the same time, they will advance new approaches to balance business risk and reward. To have an impact, risk management must become part of every civil engineering project—a step as basic as scheduling and budgeting—and a key ingredient of all communication channels.

Leaders in Public Policy

Finally, to greatly expand their role as public policy leaders, civil engineers will possess the skills for broad-based policy discussions and serve as opportunity finders as well as problem solvers. They will become the go-to professionals for insights on public policy decisions that shape the built and natural environment. Through the efforts of civil engineers, policy-makers and the public will understand the hard-wired link between infrastructure and the quality of life. That means civil engineers must be given the tools and training for engagement in public policy work, while they become more vocal participants in public policy forums and increasingly serve in appointed and elected positions. Civil engineers will learn to lead and become motivated to initiate, communicate, negotiate, and participate in cross-professional efforts to envision societal changes that shape the quality of life.



Civil engineers will be leaders in public policy discussions on the built and natural environment.

Getting There

Turning the Roadmap's tactics into long-term action plans can be summarized in a few overarching steps. First, the global civil engineering community must broadly embrace the Roadmap, with a burgeoning collection of stakeholders—individuals and organizations—getting involved. That community must be armed with an inventory of what is already being done to achieve the Vision, be enthused about doing more, and have a sense for the possible barriers and how to break them down. Civil engineers around the globe must be informed, educated, and recruited to help achieve the Vision, and bring to the fore key issues for stakeholders. Finally, the whole effort must be monitored, evaluated, and measured over the long term, with course corrections made along the way. Such a broad activity set will not be centrally controlled, but ASCE will do its part to stimulate and facilitate coordination. In the end, the common, unifying driver will have to be the Vision, and the Roadmap to achieve the Vision. By achieving the Vision, civil engineers will have reshaped their professional stature and remained the force behind their own destiny, discovering a practical reality in what was once just imagined.

Civil engineers around the globe must embrace and help implement the Roadmap to achieve the Vision.

Achieving Vision 2025



The Buzz—Civil Engineers Take Note

When *The Vision for Civil Engineering in 2025* hit the streets and cyberspace in June 2007, an aspirational vision became a launching pad for inspiration. Civil engineers cracked the covers of the book—or checked the Web—to find something transformational. Here was a 90-word statement that professed nothing less than a new role for the profession—a bright, ambitious goal that would guide civil engineers around the globe to a new level of leadership and professionalism.

Civil engineers would be *entrusted by society* to help achieve a sustainable world and raise the global quality of life. They would be master planners, designers, and constructors; lead stewards of the natural environment; master innovators and integrators; managers of risk; and leaders in shaping public policy. They would embrace a new level of leadership and responsibility for the global engine of societal betterment—the built environment.

Vision 2025 grabbed attention on many fronts. When some educators from South America searched the Web for insights on transforming the engineering curricula in their country, they stumbled across Vision 2025 and found new stimulus and direction. They wanted to learn more.

When one professor gave his civil engineering students a taste of the Vision 2025 report, he could have published their quotes on a promotional book jacket or in a tabloid ad for *Vision 2025: The Movie*:

“A powerful statement.”

“Very impressive and enlightening.”

“One of the best professions.”

“Civil engineers will elevate standards of living.”

“Civil engineers are intelligent, charismatic, and powerful.”

Did Vision 2025 go to their heads? Not particularly. One student made this point: With the word “master” or “leader” fronting all those future civil engineer competencies, isn’t that too much for mere mortals to get their arms around?

When released in June 2007, Vision 2025 caught the attention of civil engineers around the globe.

Vision 2025 resonated with civil engineering students.

That depends. Vision 2025 was intended to be aspirational. By definition it might be a stretch. As the Vision 2025 report notes, a vision is “mental, cognitive—not reality, or even close to reality, as we know it today. It is influenced, at least in part, by imagination, reflective of actual or desired values, and focused on ‘what’, not ‘how’.... A vision is stimulating, energizing, engaging, and inclusive.”

*Many engineers
asked themselves
how such an
ambitious
vision could be
achieved.*

But is it unattainable? Only in the sense that a curve never reaches its asymptote—but it can certainly get close. That is what the Vision put before the global civil engineering community—a beacon to target, a motivation for civil engineers to shape their own future rather than sitting back passively as world events and forces shape it for them. Ultimately, only a few civil engineers may master all aspects of the Vision individually, but as a body of professionals, civil engineers should be viewed as mastering all that the Vision encompasses.

Of course, the critical task that the Vision 2025 report did not address was how the global civil engineering community could attain that goal. A vision provides the point of future arrival but not the path; that was left to the Task Committee to Achieve the Vision for Civil Engineering in 2025 (see Appendix C for members). This group was charged by the ASCE Executive Committee to lay out the course for a global, multi-year civil engineering marathon. The task committee’s successors then need to identify the stakeholder organizations and professions who must come to the starting line; show them the many interconnected routes of their run; help get them primed, organized, and energized; and make sure those hundreds of participants can all work together for one group victory. There is no place for solo runners here.

Aspiration becomes perspiration.

The Aspiration—A Summit Sets a Goal

*A picture of
the global
environment in
2025 leads to a
new portrait of
the civil engineer.*

The aspirational world view presented in *The Vision for Civil Engineering in 2025* emerged from an ASCE-organized gathering of some 60 thought leaders with highly varied backgrounds from all career levels. Participants represented civil engineers, engineers from other disciplines, architects, educators, association and society executives, and other leaders—including individuals from eight countries outside the United States. The resulting Summit report was published in June 2007 and was distributed widely among the global civil engineering community.

The Summit participants collected their ideas through a series of high-profile keynote presentations and break-out group discussions. Participants first painted a profile of the global environment in 2025—the world in which the civil engineer will likely be working. They then tackled what the civil engineer’s role should be within that markedly different world. Finally, they identified the varied knowledge, skills, and attitudes these future civil engineers would need to possess.

The Summit proved to be a stimulating, uplifting, collaborative, and creative experience for participants. The wide-ranging discussions and post-Summit synthesis of their ideas yielded no less than a proactive choice for the civil engineering profession’s future—civil engineers choosing their own destiny rather than letting others do it for them. The final Vision emerged as follows:

Entrusted by society
to create a sustainable world and
enhance the global quality of life,
civil engineers
serve competently, collaboratively, and ethically as master:

- planners, designers, constructors, and operators of society’s economic and social engine—the built environment;
- stewards of the natural environment and its resources;
- innovators and integrators of ideas and technology across the public, private, and academic sectors;
- managers of risk and uncertainty caused by natural events, accidents, and other threats; and
- leaders in discussions and decisions shaping public environmental and infrastructure policy.

The Perspiration—Stakeholders Face Some Work

If the Summit process had ended with the release of the Vision 2025 report, nothing would have been accomplished beyond a stimulating intellectual exercise that looked attractive on a shelf. That was clearly not the goal. The Summit participants knew from the start that their efforts would be just the first step of a forward-looking process—the Vision must guide policies, plans, processes, and progress within the civil engineering community and beyond—all around the globe.

The global civil engineering profession has taken up the challenge.

As the Summit report notes: “[Looking] ahead toward the unknown presents considerable risk. Future realities may not be captured and some aspects of the Vision may prove to be a mirage. But the visionary gauntlet has been thrown down. . . . [Summit participants placed] their signposts for what the civil engineering profession should attain by 2025. The march toward those markers—and the enlightened struggles needed to get there—are only just beginning. The global civil engineering profession has taken up the challenge.”

The Task Committee to Achieve the Vision for Civil Engineering in 2025 took the first step in tackling that challenge, and its report represents the Roadmap for a formidable and exciting journey.

Creating the Roadmap



The task committee started its work on the very fertile ground of the Vision 2025 report, accepting it as is and developing a roadmap to achieve the Vision. While some stakeholders expressed concern about certain words in the Vision statement, the task committee felt that this carefully crafted output from the Summit, which had already received wide distribution, should not be altered.

The task committee saw that the Vision embodied a number of outcomes for the future; that is, new states of affairs within the social and civil engineering environment that should be in place by the year 2025. These outcomes are written in the present tense—assumed to be current realities in 2025. The Vision’s introduction describes a future in which civil engineers are “entrusted by society” and “serve”—not just work—to enhance the global quality of life “competently, collaboratively, and ethically,” with sustainable techniques and results. These introductory words and concepts define who civil engineers will be, how they will be viewed and accepted, and how they will practice their profession. None of the words is incidental; each was carefully considered and placed.

Vision 2025 embodies a number of outcomes for the future.

The Vision’s five bulleted elements provide specific insights into what civil engineers will be doing in the year 2025 and their role in society. The word “master” precedes each of these elements, indicating that civil engineers, as a body of professionals, possess the widely recognized and valued knowledge, skills, and attributes necessary to lead and achieve in each of these areas, while collaborating with others.² Thus, “master” can be viewed as interchangeable with “leader.” As envisioned here, civil engineers serve as master:

1. Planners, designers, constructors, and operators of society’s economic and social engine—the built environment;
2. Stewards of the natural environment and its resources;
3. Innovators and integrators of ideas and technology across the public, private, and academic sectors;
4. Managers of risk and uncertainty caused by natural events, accidents, and other threats; and
5. Leaders in discussions and decisions shaping public environmental and infrastructure policy.

The Roadmap refers to these five bulleted statements as “Vision outcomes,” and they form the larger framework to achieve the

Vision. These Vision outcomes have been numbered above and are referenced by those numbers in subsequent sections of this report. For completeness, each outcome statement should be considered in tandem with the Vision’s introduction.

In addition, the Task Committee developed supporting outcomes—more detailed statements of future realities—in each of the five areas to focus and to facilitate their implementation.³ These supporting outcomes were seen as realistically achievable and within the realm of the civil engineering profession to impact; however, “realistically” was not considered synonymous with “easily.”

Once the supporting outcomes had been identified, the task committee drafted the high-level steps to achieve each outcome. These tactics include an action verb—identify, promote, facilitate, develop, and the like—to indicate that a definitive task must be actively undertaken to make the outcome a reality. This Roadmap proposes 24 supporting outcomes and more than one hundred tactics.

Appendix A provides some potential, more detailed actions to help achieve the tactics.

Task committee discussion to develop the tactics often yielded additional, more detailed action steps, which have been incorporated in the Roadmap as potential actions and are listed in Appendix A beneath the tactics they support. However, the task committee did not pursue action development as a specific charge. That step will be assumed by those who take responsibility for executing each tactic.

In developing the outcome–tactic–action structure, the task committee worked to keep the language broad, global, and inclusive. Although the Summit was convened by ASCE and the task committee is an ASCE entity, the Vision effort was never intended as an ASCE or United States initiative. Task committee members from around the globe participated, and the Vision represents an “aspirational global vision for the future of civil engineering,” not specific to any nation, culture, organization, sub-discipline, or practice area. Every effort was made to craft outcome statements, tactics, and actions with appropriately generic terminology.

The Roadmap

Vision 2025 states a new reality, one that does not exist today. Part of that reality is encapsulated in several overarching concepts that precede the Vision statement:

In 2025 civil engineers:

- Are entrusted by society
- Create a sustainable world
- Enhance the global quality of life
- Serve competently, collaboratively, and ethically
- Demonstrate a mastery and leadership within five key areas of practice and influence—the Vision outcomes.

“Entrusted by society” stands out as a major component and a heady challenge. Through their demonstrated abilities and roles in 2025, civil engineers will have earned society’s trust and will be regarded as key leaders and advisors in both delivering the world’s built environment and sustaining the natural environment. Much of that trust can be earned by fulfilling the promise of the five Vision outcomes.

The Roadmap is organized in five parts, corresponding to outcomes from the original Vision statement. For each section, the themes of the Vision outcomes are discussed, and then the supporting outcomes and tactics are presented.

Some tactics require a series of steps to be undertaken concurrently. Others are sequential steps, each building on the previous to enable civil engineers to lead by identifying, learning, sharing, and then applying certain techniques or tools.

In the end, each element leads us toward the ultimate realization of the civil engineer’s role in 2025.



Civil engineers will have earned society’s trust to lead sustainable efforts that improve the quality of life.



Vision 2025 **Outcome 1** *Master Builders*

Entrusted by society to create a sustainable world and enhance the global quality of life, civil engineers serve competently, collaboratively, and ethically as master:

- *planners, designers, constructors, and operators of society's economic and social engine—the built environment.*

Civilization has always needed the master designer, builder.

Throughout history civil engineers have been a key factor in humankind's ability to function and flourish. To live and conduct the business of living, people need reliable water, shelter, roads, waste disposal, and bridges across their rivers of trade. Those doers may not have always been called civil engineers, but civilization has always needed the master designer and builder. Despite their titles, they undertook what we today would call the planning, design, construction, and operation of public and private works. Some true heroes of civil engineering graced the world in the last two centuries, who through genius, will, and force of personality created works that still stand today as marvels of both aesthetics and durability. With the advent of powerful computer technology and the trend toward increasing specialization, civil engineers' roles often limit their leadership opportunities. At times, their expertise is taken for granted—a cookbook solution that you buy at the “civil engineering hardware store.” The built environment and the potential for bettering human welfare can be hit hard in the process. Vision 2025 calls on civil engineers to reclaim some of the roles that they once held and to expand their influence as leaders to better serve society through their unique and valuable expertise.

The civil engineer of 2025 needs to have mastered a comprehensive body of knowledge.

A lot must happen for civil engineers to become the “master planners, designers, constructors, and operators leading society's economic and social engine—the built environment.” A first key to unlock that door remains civil engineers' education and training. Few will deny that civil engineers today get an excellent grounding in the fundamental technical tools, but civil engineering practice will continue to change dramatically in the future. As noted in the second edition of the *Civil Engineering Body of Knowledge for the 21st Century*,⁴ “[This future] change is necessitated by forces such as globalization; sustainability requirements; emerging technology; and increased complexity with the corresponding need to identify, define, and solve problems at the boundaries of traditional disciplines.”

Of course, accomplishing Vision outcome 1 goes well beyond the basics of technical study. To lead and execute complex projects that involve many and varied stakeholders and meaningful collaboration, civil engineers will have to command the multi-disciplinary, multi-cultural, team-building, and leadership aspects of their work. This broad union of civil engineering technical and non-technical knowledge will put more weight behind society's recognition of civil engineering as a learned profession. Civil engineering should be known for its comprehensive, energetic acquisition and creative application of knowledge and experience. Putting these skills to work in a global economy represents another neon signpost on the Vision 2025 Roadmap. Civil engineers should have foreign language and cultural skills, and they must have opportunities for targeted learning and for gaining a practical footing on the global stage. They must also be universally recognized as representing a respected and diverse body of dedicated professionals who maintain high ethical standards in the varied procurement processes that quilt the world.



As the Vision Roadmap notes, project delivery will require a new and well-defined hierarchy of professionals and paraprofessionals, with civil engineers leading the team as master builders and integrators. The civil engineer will practice much like the licensed physician who heads a team of radiologists, nurses, nurse practitioners, and the like. As the original Vision 2025 report pointed out, many tasks that we consider civil engineering today will no longer be performed by professional engineers in the future but, with the aid of computer technology, by technicians and technologists. Such paraprofessional work will represent an important and rewarding endeavor, although in 2025 it will no longer be the work of the professional civil engineer. The future of these engineers in a transforming world represents a broader, higher, more professional role.

Civil engineers will serve as master builders and integrators, leading multi-disciplinary teams of professionals and paraprofessionals.

This kind of professional leadership should garner sufficient societal recognition for the value of civil engineers, along with the appropriate rewards. Such leadership will also require an identification of each engineering team member's competencies and the proper role for outsourced talent on global teams. What is more, to ensure public health, safety, and welfare, civil engineers will have to drive the establishment of worldwide civil engineering standards—adaptable to local cultures and environments. In the end, for civil engineers to achieve the Vision, they must be recognized as a vital profession that creates the infrastructure that drives sustainable economic growth and development.



In summary, what supports this “engineer leader” Vision outcome? Through the more prosaic demands of roadmap planning, the task committee had to organize information into manageable, referenceable lists. In this first arena, the task committee developed eight supporting outcomes around the following themes: leading multi-disciplinary projects, attaining and employing advanced knowledge and experience, developing skills for global practice, ensuring ethical practice, adapting and expanding the workplace, creating a broader and more stable workplace, gaining worldwide adoption of civil engineering standards, and ensuring the recognition of civil engineering as a leader in the development of societal values.

It’s time to hit the road.

Supporting Outcomes, Tactics for Vision

Outcome 1— *Master Builders*

- 1.1** Civil engineers facilitate and lead multi-disciplinary, collaborative programs using a systems approach to achieve successful project outcomes.

Tactics

- 1.1.1 Serve as trusted advisers to owners of projects to define project goals and objectives.
- 1.1.2 Identify the roadblocks to facilitating successful collaborative programs, and develop systems-oriented strategies to remove those roadblocks.
- 1.1.3 Promote extensive leadership, program management, and project delivery education and training at all levels of career development.
- 1.1.4 Encourage the education and training of young engineers through mentoring by senior practitioners.

- 1.2** Civil engineering is universally recognized as a “learned profession” characterized by competency and the continued pursuit of knowledge and experience.

Tactics

- 1.2.1 Develop and promote a universally accepted body of knowledge that prepares civil engineers for professional practice.⁵



- 1.2.2 Encourage jurisdictions to require sufficient formal education to fulfill an accepted body of knowledge as a prerequisite for licensure, registration, or chartering.
 - 1.2.3 Encourage jurisdictions to require continuing education as part of licensure, registration, or chartering renewal.
 - 1.2.4 Develop and promulgate comprehensive programs of advanced credentialing.
 - 1.2.5 Include diverse disciplines—including socio-economic, environmental, political, management, and financial knowledge/skills—in life-long learning.
 - 1.2.6 Promote credential mobility for civil engineering practice worldwide.
- 1.3** Civil engineers have the language and cultural skills, competency, and experience necessary to practice globally.

Tactics

- 1.3.1 Articulate the growing need for language and cultural diversity to maintain competitiveness in the global civil engineering community.
 - 1.3.2 Develop and promote opportunities for humanitarian service that enhances civil engineering knowledge, skills, and attitudes as civil engineers improve the global quality of life.
- 1.4** Civil engineers are universally recognized for their high ethical standards of practice.

Tactics

- 1.4.1 Promote responsibility to society, competency, honor, integrity, dignity, impartiality, fairness to others, and the improvement of ethical practice by example, education, and leadership.
- 1.4.2 Advocate transparency in procurement, inspections, and enforcement at all levels and in all environments.
- 1.4.3 Promote zero tolerance of bribery, fraud, and corruption by example and leadership.
- 1.4.4 Encourage recognition programs to highlight examples of high ethical standards exercised by civil engineers.



- 1.5** Civil engineering has adapted to changes in the workforce to effectively include civil engineers, other professionals, and paraprofessionals.

Tactics

- 1.5.1 Identify paraprofessionals involved with engineering design and construction who are relevant to the health, safety, and welfare of the public, and define their competencies and roles.
 - 1.5.2 Encourage wide acceptance of a multi-tiered system to deliver civil engineering services based on a well-defined hierarchy of professional and paraprofessional competencies.
 - 1.5.3 Educate both generalists and specialists to understand how to manage and work with globally distributed engineering service providers.
 - 1.5.4 Define the appropriate role and application of globally distributed civil engineering services.
 - 1.5.5 Determine the appropriate methods to ensure the assignment of responsible charge for globally distributed civil engineering services.
- 1.6** Civil engineering is comprised of a respected and diverse body of dedicated professionals.

Tactics

- 1.6.1 Attract a broad demographic of outstanding individuals to the civil engineering profession.
 - 1.6.2 Retain experienced and dedicated professionals and paraprofessionals within civil engineering.
 - 1.6.3 Attract individuals from all generational segments and integrate the strengths that each segment offers to the civil engineering profession.
 - 1.6.4 Foster a culture of mentoring promising technical, organizational, and societal leaders in the industry.
- 1.7** Civil engineers have enabled worldwide adoption of civil engineering standards—adaptable to local circumstances and environments—to ensure public safety, health, and welfare.

Tactics

- 1.7.1 Evaluate basic human health, safety, and welfare requirements.

- 1.7.2 Identify available civil engineering standards and determine worldwide applicability.
- 1.7.3 Encourage worldwide adoption of appropriate standards by working with international standards organizations.



- 1.8** Civil engineering is widely regarded as a vital profession that creates the infrastructure that drives economic growth and societal development.

Tactics

- 1.8.1 Educate the public on the relationship between the infrastructure created by civil engineers and the ever-changing opportunities and challenges for economic growth.
- 1.8.2 Become knowledgeable and vocal advocates of sustainable economic growth and demonstrate through action that civil engineers can help define the types and features of infrastructure that are essential to that growth.
- 1.8.3 Promote business and contractual relationships and procurement processes that promote lifecycle costing, sustainability, and resilience.



Vision 2025 **Outcome 2** *Stewards of the Environment*

Entrusted by society to create a sustainable world and enhance the global quality of life, civil engineers serve competently, collaboratively, and ethically as master:

- *stewards of the natural environment and its resources.*

The Vision for Civil Engineering in 2025 foresees a reinvention of outlook, image, and service delivery in which “the global civil engineering profession has increasingly recognized the reality of shrinking resources, the desire for sustainable practices and design, and the need for social equity in the consumption of resources.” Further, “civil engineers have helped raise global expectations for sustainability and for environmental stewardship.”

Civil engineers have recognized the reality of shrinking resources and embraced sustainable practices and designs.

Contrary to some popular stereotypes, civil engineers have always interacted with nature. Early definitions of civil engineering practice might be paraphrased like this: the art of directing nature’s great sources of power through the application of physical and scientific principles for the use and convenience of humankind. During the last 150 years, civil engineers have arguably affected the health and life-span of more people than have medical professionals. Civil engineers have done it by providing clean water for our taps, sanitation for our cities, safe transportation for our relationships and trade, and durable shelter that we can call an office or a home. Yet some of that remarkable progress came at a cost. These efforts sometimes resulted in impacts on the environment and natural resources that were not fully understood, evaluated, or regulated. Either in reality or in perception, civil engineers have not always effectively carried the natural environment banner, so it is time for environmental stewardship to become the watchword and the stamp of civil engineers worldwide. Civil engineers must raise the bar in how they help protect the planet.

Civil engineers must strive to convince owners to adopt new environmental technologies and techniques.

To achieve this second Vision outcome, civil engineers must surcharge their education and subsequent practical experience with environmental awareness. They must then channel that energy and perspective to policy-makers and the public, including how civil engineering solutions affect resource consumption and social equity. Civil engineers must break out as leaders and help enact new government and private-sector policies to encourage or require that sustainability and resilient practices be considered in

the planning, design, construction, operation, and maintenance of the built environment. Another key priority is to produce new processes, technologies, and financial approaches for sustainable projects and to encourage investment in research and development to advance that progress. Civil engineering practitioners must also take on new responsibilities—such as convincing owners and other stakeholders to put these new environmental technologies and techniques into play. That means coaching all stakeholders on the payback of these innovations and driving down the cost of sustainable solutions, thereby heightening their attractiveness. It also means laying out incentives to nudge more and more stakeholders to adopt these new advances.



To make this environmental stewardship a reality, the task committee laid out supporting outcomes around four major themes: broadly recognizing and accepting the impact of shrinking resources, impacting policies on resource use, developing and providing tools to deal with the constraints, and serving as a catalyst to bring about the application of these tools.

Supporting Outcomes, Tactics for Vision

Outcome 2— *Stewards of the Environment*

2.1 Through the efforts of the global civil engineering profession, civil engineers and the public have recognized and understood the reality of shrinking resources; the necessity for sustainable practices, design, and life-cycle financial support; and the need for social equity in the consumption of resources.

Tactics

- 2.1.1 Integrate environmental awareness in civil engineering education and practice.
- 2.1.2 Identify and apply approaches to enhance project sustainability by using new practices, technologies, and materials and minimizing life-cycle costs.
- 2.1.3 Educate the profession and the public on how the planning, design, construction, operation, maintenance, and reconstruction of the built environment and sustaining of the natural environment, impacts resource consumption and cross-border environmental effects.
- 2.1.4 Educate the profession and the public about the need to consider social equity in the consumption of resources when planning and executing projects in the built and natural environment.



- 2.2** Policies are in place to encourage or require sustainability and resilient practices supported by sufficient public and private funding for sustainability research and development.

Tactics

- 2.2.1 Convince legislative bodies and public and private stakeholders about the net benefits of using sustainable and resilient practices.
- 2.2.2 Work to create a global environmental sustainability master plan.
- 2.2.3 Collaborate with public officials to identify and promote best practices for sustainability.
- 2.2.4 Urge governments to adopt and enforce more effective and reasonable environmental regulations.
- 2.2.5 Influence the public and policy-makers to commit adequate funds for research and development programs.
- 2.2.6 Encourage the use of incentives to promote the application of sustainable practices and the consideration of social equity in the consumption of resources related to the built and natural environment.

- 2.3** Through collaborative leadership, civil engineers have made available new technology, techniques, and financial approaches for sustainable planning, design, construction, operation, and maintenance.

Tactics

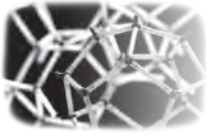
- 2.3.1 Develop planning, design, construction, and maintenance processes that protect the environment.
- 2.3.2 Develop and promulgate guidelines and tools that enable the civil engineering profession to integrate sustainable and resilient design into its work.
- 2.3.3 Expand the practice of ecological engineering for the restoration and enhancement of natural resources in support of ecological goods and services.
- 2.3.4 Make significant use of renewable resources and make progress toward zero net waste.
- 2.3.5 Improve the competence of civil engineers in evaluating the financial impacts of environmental actions.

- 2.4** Civil engineers routinely encourage owners and other stakeholders to use new environmental technologies and techniques to improve the quality of life.



Tactics

- 2.4.1 Educate owners and other stakeholders about innovative environmental technologies and the benefits of their use.
- 2.4.2 Seek cost reduction of sustainable technologies and techniques to encourage widespread, frequent use.
- 2.4.3 Encourage the use of incentives for the implementation of environmental technologies and techniques.



Vision 2025 **Outcome 3** *Innovators*

Entrusted by society to create a sustainable world and enhance the global quality of life, civil engineers serve competently, collaboratively, and ethically as master:

- *innovators and integrators of ideas and technology across the public, private, and academic sectors.*

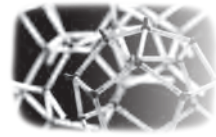
Civil engineers will envision, adapt, and integrate new technologies within and across projects.

The civil engineer of 2025 will envision, adapt, and integrate new technologies within and across projects. That challenge remains crucial, given some common concerns arising in today's profession. For one, civil engineers are sometimes viewed as reluctant to embrace new technologies and approaches. Given the legitimate concern about liability and litigation—especially in the United States—the civil engineer's first impulse may be to follow current regulations and implement what has worked well in the past. That may provide a level of comfort for the practitioner but slights potential performance and life-cycle cost opportunities for the client and the ultimate users. Incorporating systematic risk assessment and management techniques into the evaluation of new technologies and thereby more equitably sharing risk becomes imperative.

To accomplish this, the civil engineering research agenda needs top-notch coordination. Government, academic, and private research initiatives often carry out their work in a context of fragmentation, without resources being focused for greatest impact. Civil engineers must become engaged and serve as leaders across all sectors for advances in research to be achieved, accepted, and implemented. Such cross-sector coordination ties into the civil engineer's goal of integrating a variety of new technologies into their projects: Applied research with clear practical application must receive adequate support. Learning from past engineering failures remains important, as does promoting multi-national exchanges so that civil engineers can learn best practices from around the world. Establishing what makes partnerships among research sectors work becomes part of the hunt for new approaches.

Ultimately, civil engineers must stand front and center in influencing public policy both to shape a strategic engineering and construction research agenda and to secure adequate funding to carry it out. Raising that policy awareness must go hand in hand with removing speed bumps to adoption of new technology. With

such leadership in defining research, coupled with a new freedom and motivation to adopt innovation, the civil engineers of 2025 will have won the public trust as innovators and integrators of critical technologies.



The task committee developed two supporting outcomes to achieve the envisioned innovation. In the first, civil engineers play a key role in finding, adapting, and developing new technologies. In the second, they serve to implement those advances.

Supporting Outcomes, Tactics for Vision Outcome 3—*Innovators*

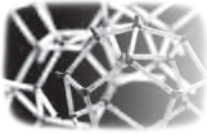
- 3.1** Civil engineers define the strategic research direction for leading-edge technologies in the built and natural environment and serve as influential participants and partners in the research process.

Tactics

- 3.1.1 Identify and prioritize the emerging technologies and innovations that hold the most promise to make an impact.
 - 3.1.2 Foster the input of civil engineers in strategic research planning.
 - 3.1.3 Enhance the effectiveness of research by encouraging integration and collaboration among individual research efforts.
 - 3.1.4 Encourage and facilitate multi-disciplinary research into civil engineering issues.
 - 3.1.5 Promote more applied research and improve technology transfer to civil engineering practice.
 - 3.1.6 Encourage the discussion of failures in the built and natural environment and promote research initiatives emanating from those failures.
 - 3.1.7 Influence public policy to give higher priority and increased resources to civil engineering research.
- 3.2** Civil engineers apply innovative technologies and information management tools to create enhanced solutions in the built and natural environment.

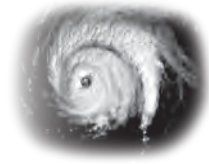
Tactics

- 3.2.1 Encourage civil engineers to more rapidly apply the application of new technologies.



- 3.2.2 Promote multi-national exchanges that help civil engineers actively engage in and understand the benefits of successful innovations applied worldwide.
- 3.2.3 Accelerate the integration of technology through effective partnerships of government, industry, academia, and practitioners in research, learning, leadership, and application.
- 3.2.4 Encourage collaboration between civil engineering researchers and builders to identify and evaluate promising construction techniques.
- 3.2.5 Incorporate systematic risk management techniques into the evaluation of new technologies to equitably share risk and more fully embrace these innovations.
- 3.2.6 Explore ways to enable early and safe adoption of new technologies in codes and standards, including the process used to revise codes and standards.
- 3.2.7 Improve documentation and sharing of innovations.

Vision 2025 **Outcome 4** *Managers of Risk*



Entrusted by society to create a sustainable world and enhance the global quality of life, civil engineers serve competently, collaboratively, and ethically as master:

- *managers of risk and uncertainty caused by natural events, accidents, and other threats.*

Failure to manage risk can produce dire outcomes. With natural and man-made threats abounding today and in the future, civil engineers have the responsibility to properly assess and manage the risk of the unpredictable and the unavoidable.⁶ It is impossible to completely eliminate risk from our daily lives. One just cannot do it. However, one can work to minimize it. That is where civil engineers come in. Envisioning the year 2025, civil engineers will take the lead and make the tough risk management calls for the built and natural environment, with the clear goal of minimizing catastrophic failures and the resulting human tragedy. To get there, the civil engineering industry must throw off the stigma—as painted by some—that the profession focuses on short-term solutions and takes a single-project perspective. Civil engineers have to shed that image—whether perception or reality—and expand their outlook to consider broad enterprises more holistically.

Civil engineers will be leaders in assessing and managing risk.

The facts are clear: Society will unlikely have sufficient resources to fully protect infrastructure and human life against all possible natural and man-made events. Thus, through education and practical experience, civil engineers will assess probabilities and risks for human and property losses. This will make it easier to formulate decisions and alert policy-makers and the public about the trade-offs involved.

On the path to managing risk and uncertainty, civil engineers must develop innovative approaches, tools, techniques, materials, policies, and business relationships to address impacts associated with natural and man-made threats. That work must find a prominent place in civil engineering education and practice. It must become part of the civil engineering research agenda, regulatory and business policies, and an expectation for business and contractual relationships. In addition, civil engineers must learn quantitative risk analysis and decision-making, and then communicate risk and mitigation options to project stakeholders and the public. In 2025, civil engineers will

Civil engineers will develop innovative approaches for addressing risk in all phases of their work.



have assimilated a whole new way of practice. They will address risk in all phases of their work—planning, design, construction, operation, maintenance, and quality control—thereby leading to enterprise-wide risk assessment and management in addition to project-specific risk decisions. Civil engineers will also embrace a new, innovative balancing act—weighing business risk against potential gain and comfortably making the daily, routine tradeoffs between functional quality and costs.

To bring the risk and uncertainty Vision outcome to fruition, the task committee proposed supporting outcomes focusing on five major themes—developing mitigation approaches for natural and man-made disasters, developing risk reduction techniques for the design and construction process, leading efforts to make system-wide risk-based decisions, effectively communicating risk, and developing new ways to balance risk and reward for the benefit of all stakeholders.

Supporting Outcomes, Tactics for Vision

Outcome 4—*Managers of Risk*

4.1 Civil engineers have developed innovative approaches, tools, techniques, materials, policies, and business relationships to mitigate the occurrence and effects of both natural and man-made disasters and their associated risks and uncertainties.

Tactics

- 4.1.1 Embed risk assessment and risk management methodologies as a core knowledge and skill for civil engineers throughout their education and practice.
- 4.1.2 Support and encourage collaborative, integrated research and innovation in technologies and approaches that enhance planning, project management, risk assessment, and project delivery.
- 4.1.3 Develop specialized approaches and guidelines for further safeguarding critical infrastructure systems.
- 4.1.4 Promote regulatory and business policies that encourage constructed resilience.
- 4.1.5 Promote business and contractual relationships that encourage planning, engineering, design, construction, operation, and maintenance for resilience.
- 4.1.6 Promote public awareness of the need to invest in new prevention and mitigation technologies and techniques.

- 4.2** Civil engineers have developed innovative approaches, tools, techniques, materials, policies, and business relationships to mitigate risk in planning, design, construction, operation, maintenance, and quality control.

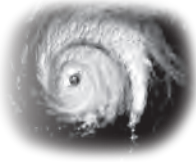


Tactics

- 4.2.1 Identify, improve, and encourage the use of innovative construction technologies during planning and design.
 - 4.2.2 Improve modeling tools to identify planning and design errors before construction.
 - 4.2.3 Develop and implement improved methods to detect quality problems earlier in the construction process while corrective measures are still practical.
 - 4.2.4 Promote business and contractual relationships that encourage increased ongoing cooperation between the engineering and construction teams to minimize errors and omissions.
- 4.3** Civil engineers lead enterprise-wide risk management efforts and routinely make project-specific risk decisions.

Tactics

- 4.3.1 Reinforce civil engineering as a lead discipline for risk assessment and risk management of the built and natural environment.
- 4.3.2 Promote risk assessment and management as a key component of every program and project—a component as necessary as scheduling and budgeting.
- 4.3.3 Promote risk assessment and management as a key element in the operations of planning, design, and construction firms.
- 4.3.4 Promote risk management as a key element in the operations of public agency owners of the built and natural environment.
- 4.3.5 Foster the development and the wide implementation of effective technologies and tools for project risk assessment and management.



- 4.4** Civil engineers effectively communicate risks and mitigation options to project colleagues, clients, regulatory agencies, and the public.

Tactics

- 4.4.1 Promote a general understanding that risk is an inherent part of all programs and projects and requires rational evaluation and effective management.
 - 4.4.2 Implement communication techniques, practices, and methods that facilitate effective risk communication and understanding.
 - 4.4.3 Promote business and contractual relationships that facilitate effective communication of project risks and mitigation options.
- 4.5** Civil engineers have developed innovative approaches to balancing business risk and reward through new technologies, policies, and business relationships.

Tactics

- 4.5.1 Embed business risk management as a core knowledge and skill for civil engineers throughout their education and practice.
- 4.5.2 Support and encourage research and innovation in techniques and technologies that enhance the ability to balance risk and reward in project management and delivery.
- 4.5.3 Promote regulatory policies that encourage effective risk reduction, allocation, and mitigation.
- 4.5.4 Promote business and contractual relationships that serve to reduce risk and balance potential risk and reward.

Vision 2025 **Outcome 5**

Leaders in Public Policy

Entrusted by society to create a sustainable world and enhance the global quality of life, civil engineers serve competently, collaboratively, and ethically as master:

- *leaders in discussions and decisions shaping public environmental and infrastructure policy.*

Because of increased specialization and complexity, today's civil engineers are sometimes steered into jobs with a narrower technical focus and then never venture very far from the comforts of that engineering profile. This runs counter to civil engineering's history—many civil engineers have made star-power contributions as politicians, entrepreneurs, corporate leaders, and high-level public servants. That said, non-engineers increasingly occupy positions of leadership at public and private engineering organizations. For civil engineers to become leaders in shaping public policy, they will have to explode the perception that those drawn to technical and mathematical subjects feel at ease only with questions that have clear-cut, right or wrong answers. Civil engineers must find new comfort zones and tackle issues of social significance, jettisoning a self-proclaimed aversion to “soft” issues. Shaping decisions on environmental and infrastructure policy becomes part of that new portfolio, and that means getting involved in the political and policy processes at the local, regional, national, and international levels. It also means becoming adept at navigating the often lengthy and ambiguous decision-making and negotiation processes that put potholes in the way. All of this requires taking a close look at formal civil engineering education and examining continuing professional development offerings. The profession must determine how these vehicles can build the requisite political and policy involvement knowledge and skills and place the tools, materials, and guidance in the hands of individual civil engineers.

And there is more. Civil engineers have to raise their visibility, becoming proactive within public policy forums and promoting an awareness that their unique background and skills are crucial. Civil engineers cannot just provide engineered solutions; they must define the problems that affect quality-of-life improvements. That translates into increased participation in local meetings, working with the legislature and delivering testimony, and providing civil engineering knowledge and expertise when and where it is needed through lobbying activities. This greater public



Civil engineers must feel comfortable not only with “black and white” quantitative questions but also with the “gray” issues of policy leadership.

Civil engineers have to raise their visibility and become more proactive and sought after within public policy forums.



In 2025, more civil engineers will hold elected and appointed positions within all levels of government.

outreach must also underscore the hard-wired link between the built and natural environment and the quality of life and highlight that public-policy decisions can reach the next level with the insights and actions of civil engineers. Civil engineers will further this role by initiating, leading, and participating in cross-professional efforts to envision societal changes and communicating how the built and natural environment ties in.

On the global stage, civil engineers must keep close ties with nongovernmental organizations so that those entities seek engineering insights when setting their global infrastructure policies. The year 2025 should also see bolstered numbers of civil engineers holding elected and appointed positions within all levels of government, an achievement that will take education, training programs, and encouragement. Finally, civil engineers have to work overtime to ensure that decision-making positions that require a civil engineering background to protect the public are reserved for qualified civil engineers. This is the same as requiring licensed physicians to fill decision-making positions in medicine and health care.

To fortify this public leadership Vision outcome, the task committee developed five specific supporting outcomes. They focus on preparing for this expanded public role, altering the public's view of the civil engineer's role, encouraging other stakeholders to invite participation by civil engineers, increasing the understanding of the relationship between infrastructure and the quality of life, and increasing the active and direct involvement of civil engineers in the public arena.

Supporting Outcomes, Tactics for Vision

Outcome 5—Leaders in Public Policy

5.1 Civil engineers are adequately prepared to be proactively and effectively engaged in broad-based public policy discussions.

Tactics

- 5.1.1 Evaluate the current educational system relative to “proactive problem definition,” including project planning and management, and identify improvements.
- 5.1.2 Provide continuing education, mentoring, and work-place opportunities to improve public policy knowledge and skills.

- 5.1.3 Provide tools, materials, and guidance to enable participation in public discussions on issues relating to the built and natural environment.
- 5.1.4 Expand the opportunities for life-long education in public policy topics so that civil engineers will be better prepared to participate in these discussions.
- 5.1.5 Actively monitor and participate in the activities of regional and global engineering organizations to learn how public policy is influenced elsewhere.



- 5.2 Civil engineers are viewed as problem definers as well as problem solvers and as professionals who find opportunities to make quality-of-life improvements.

Tactics

- 5.2.1 Expand outreach programs that educate policy-makers and the public on the knowledge, skills, attributes, and attitudes of civil engineers that make them qualified advisors on policies regarding the built and natural environment.
 - 5.2.2 Advocate civil engineering as the profession that improves the fundamental quality of life, and demonstrate that civil engineers help define the problems and provide solutions to environmental and infrastructure needs.
 - 5.2.3 Promote awareness through the popular media of the extraordinary, life-changing contributions of civil engineers.
- 5.3 Civil engineers are sought to contribute their skills and insights regarding public policy decisions on the built and natural environment.

Tactics

- 5.3.1 Promote opportunities for civil engineers to initiate, lead, and participate in cross-professional efforts that bring about societal change to improve the quality of life.
- 5.3.2 Expand opportunities for public involvement, such as town hall meetings, testimony, and lobbying, to provide civil engineering knowledge and expertise in a timely manner.
- 5.3.3 Develop and maintain close ties with nongovernmental organizations so that they routinely seek civil engineering insights when setting their global infrastructure policies.



- 5.3.4 Encourage civil engineers to seek positions in multi-national infrastructure development institutions.
- 5.3.5 Expand opportunities for life-long education on public policy topics so that civil engineers will be better prepared to participate in these discussions.

- 5.4** Sound infrastructure has become a quality-of-life priority, and policy-makers and the public understand its crucial link to economic prosperity and public health and safety.

Tactics

- 5.4.1 Educate policy-makers and the public on the ever-changing opportunities and challenges impacting the quality of life.
- 5.4.2 Effectively communicate the consequences of inadequate infrastructure.
- 5.4.3 Expand the profession's influence by developing relationships with non-profit organizations that work in the global marketplace to enhance human life.
- 5.4.4 Influence regulatory and legislative bodies to prioritize infrastructure as a quality-of-life issue.

- 5.5** A significant number of civil engineers have pursued careers in, and hold elected and appointed positions within, all levels of the government.

Tactics

- 5.5.1 Increase civil engineers' understanding of governmental operations.
- 5.5.2 Develop education and training programs to prepare civil engineers to serve in government.
- 5.5.3 Encourage civil engineers to pursue elected and appointed government positions.
- 5.5.4 Advocate that appropriate governmental positions require the appointee to be a civil engineer.

What's Next?



So there you have it—the detailed Roadmap to achieve Vision 2025, with its proposal for specific, action-oriented tactics directed toward critical outcomes, inviting both insight and action. The Vision itself remains broad, involving many aspects of traditional civil engineering practice—plus an expanded role into areas not universally embraced as part of the profession today. The task committee acknowledges that it is difficult for any one group to encompass the full expertise and insight needed to develop such an array of proposed tactics. Others are encouraged to provide their input to the Roadmap presented here.

Moreover, a single group of professionals cannot attain the Vision alone. ASCE, with its large membership and commensurate influence—and the sponsor of the Vision 2025 task committee—represents only one of many civil engineering-related organizations. Many others must join in to undertake this challenge. The reality remains that a much broader group of engineers and other professionals must evaluate, enhance, expand, adopt, support, encourage, passionately pursue, and ultimately achieve the many facets envisioned in this Roadmap. The field of civil engineering has always been broad, and the Vision portends to broaden the profession and widen its influence even further. So how can this move forward? The task committee envisions seven major activity areas:

No single group of professionals can achieve Vision 2025 alone.

1. A compelling, concise, consistent message on the Vision and its Roadmap is developed for delivery to a variety of audiences. For example, from the ASCE perspective, that would include various internal ASCE entities, domestic engineering societies, international engineering societies, corporate leaders, university students and faculty, and K-12 students.
2. Civil engineers and civil engineering-related organizations broadly endorse the Vision and its Roadmap, with the understanding that ongoing evaluation, modification, adaptation, and expansion—as future circumstances dictate—will be required.
3. ASCE assembles a global team of participants to monitor progress on the Roadmap. This team may undertake activities such as maintaining a database of what is already being done to achieve the Vision around the world, developing metrics with short- and long-term goals, and assessing which organizations are best equipped to address specific tactics.

4. The global team of participants identifies possible barriers to achieving the Vision, followed by strategies to overcome these barriers.
5. Civil engineers everywhere are informed, educated, inspired, and recruited to get involved—individually and in coalitions—to help achieve the Vision. From that group must come individuals willing and able to spread the word about the Vision and its Roadmap.
6. The global team of participants reaches out to scores of stakeholders, both individuals and organizations, to bring key issues to the forefront, establish additional partnerships, and make progress on each of the tactics.
7. The whole effort is monitored, evaluated, and measured over the long term, with course corrections to stay on track.

Certain types of organizations stand out as key for involvement in achieving the Vision.

The task committee has tackled preliminary work on a few of these fronts, such as inventorying what is being done to achieve the Vision within ASCE, other societies, and groups around the world; identifying possible barriers to achieving the Vision and potential strategies to overcome the hurdles; and determining the types of organizations that stand out as key for involvement. Those types of organizations include (see Appendix B for some specific examples):

- A) Professional associations and organizations. For example:
 - ASCE
 - Other professional societies
 - Credentialing organizations
 - Multi-national organizations
- B) Educational institutions. For example:
 - Universities and colleges
 - Accreditation organizations
 - Councils of university leaders
 - Continuing education providers
- C) Civil engineering practitioners. For example:
 - Multi-national architecture/engineering/construction (AEC) firms
 - Regional and local consulting engineering firms
 - Individual practitioners
- D) Governmental institutions. For example:
 - Engineering licensing boards
 - National agencies

- Regional agencies
 - Local agencies
 - Research organizations
- E) Non-governmental organizations. For example:
- Codes and standards organizations
 - Humanitarian organizations
- F) Industry. For example:
- Multi-national corporations
 - Construction contractors
 - Infrastructure funding organizations

The Vision for Civil Engineering in 2025, released in June 2007, unleashed enthusiasm and excitement worldwide among civil engineers of all ages. That is a hard act to follow, but the Roadmap will do its part, aiming to both inspire civil engineers everywhere and serve as a call to action. The effort foresees a far-reaching campaign to share the plan globally, bring people together for a common cause, and mobilize individuals, groups, coalitions, and enterprises.

Building consensus around any part of the Roadmap and achieving tangible results will require a comprehensive program to spread the word, seek input, and then catalyze action from many of the groups listed above. Clearly, some efforts already launched by civil engineering organizations worldwide match neatly with tactics listed in the Roadmap. All such efforts should be identified and linked to the appropriate Roadmap elements. Some of these efforts will need to be expanded, extended, or merged with the efforts of other groups. It will also be necessary to launch some major new initiatives, find champions, formulate detailed plans, and garner support.

Such a broad and diverse collection of activities cannot be centrally controlled. It will require oversight and coordination, communication, and cooperation among many groups to ensure that everyone is traveling down the right roads to achieve the Vision. The effort will inevitably hit some dead ends and require course corrections, but many of the paths will reach their ultimate goals. ASCE will do its part to stimulate and facilitate coordination, but the common, unifying driver will be the Vision.

Such a broad collection of activities cannot be centrally controlled, but overall monitoring will be necessary.

Get on the **Road**, Get **Moving**

Those intimately involved in creating the Roadmap cycled through a host of emotions in creating the plan: Is it pie in the sky? Is it too daunting a challenge? Will the naysayers come out in force? Yet at the end of the day, the task committee saw the Vision/Roadmap package as life changing and inspirational, with the basic faith that hard work, leadership, and heart—not to mention a dogged, long-haul staying power—remain the foundations for success.

Rallying the forces and the energy to take on this wide array of initiatives is not for the faint of heart. In many cases you, the civil engineer, must content yourself to keep efforts at manageable, measurable levels, where bits and pieces can be checked off along the way. The key is to do your part and to marshal others, be they organizations or individuals, so that the sum of all your energy, over time, will add up to a new future. You will then have reshaped your professional stature and remained the force behind your destiny, discovering a practical reality in what was once just imagined, and achieving the Vision.

It is time to roll up your sleeves, embrace the Roadmap, and put your passion and expertise into play. Ask yourself, “If not me, who, and if not now, when?”



You, the civil engineer, will have reshaped your professional stature and remained the force behind your destiny.

Notes

1. *The Vision for Civil Engineering in 2025* (3 MB download from www.asce.org), produced by the ASCE Steering Committee to Plan a Summit on the Future of the Civil Engineering Profession in 2025 (2007). The steering committee used the input from a major summit involving some 60 participants from around the globe to present a projected scenario of the civil engineers world in the year 2025 and an aspirational vision for how civil engineers and the civil engineering profession should be positioned in that year.
2. *The Vision for Civil Engineering in 2025* explains the use of “master” as follows: “As used in the Vision, ‘master’ means to possess widely recognized and valued knowledge and skills and other attributes acquired as a result of education, experience, and achievement. Individuals, within a profession, who have these characteristics are often willing and able to serve society by orchestrating solutions to society’s most pressing current needs while helping to create a more viable future.” While Vision 2025 does not necessarily expect every individual civil engineer to be a master of all Vision aspects, the Vision foresees the public viewing civil engineers, as a group, as embodying these characteristics.
3. In the task committee deliberations, the goal was to craft a number of supporting outcomes for each Vision outcome. The task committee first developed lengthy lists of specific and succinct outcome statements, using the “2025: The Civil Engineer’s World” chapter from the original Vision 2025 report as the primary guide. This sizable list was then winnowed by eliminating repetitive aspects, consolidating concepts, and holding the results to the following criteria: The supporting outcomes should be realistically achievable and within the realm of the civil engineering profession to impact. “Realistically” was not considered synonymous with “easily.” The new supporting outcomes were then categorized under the five Vision outcomes, reworded and molded, and used as a basis for developing an actionable plan.
4. *Civil Engineering Body of Knowledge for the 21st Century, Second Edition* (1.1 MB download from www.asce.org), produced by the ASCE Body of Knowledge Committee. The body of knowledge prompts thought about how civil engineers

ought to be prepared for entry into the practice of civil engineering as viewed by an increasing number of educators and practitioners.

5. It is understood that a “universally accepted body of knowledge that prepares civil engineers for professional practice” will vary somewhat from country to country, given the differing nuances of the various education systems.
6. On a fundamental level, risk exists because of uncertainty. If there was no uncertainty, there would be no risk. Uncertainty is present in available data and information (data based), as well as in the engineer’s inability to accurately predict reality (knowledge based). Therefore, the proper tools for the quantitative assessment of risk require the principles and concepts of probability and statistics for properly modeling uncertainties and analyzing their effects. To be effective masters of risk, civil engineers must be able to quantitatively assess the pertinent risks and generate the necessary risk-based information for sound risk management decisions.

Appendix A

Some **Potential Actions** for the Roadmap Tactics



During the development of the tactics, the task committee discussions often yielded action steps that were more detailed than the tactics. These detailed steps were retained in this appendix as “potential actions” and are listed beneath the supporting outcome and tactic that they support (supporting outcomes and tactics without actions are not included in the following pages). The task committee did not pursue action development as a specific charge. That step will be assumed by the parties who take responsibility for executing a tactic.



Vision 2025 **Outcome 1**

Master Builders

- 1.1** Civil engineers facilitate and lead multi-disciplinary, collaborative programs using a systems approach to achieve successful project outcomes.

Tactic

- 1.1.3 Promote extensive leadership, program management, and project delivery education and training at all levels of career development.

Some Potential Actions

- 1.1.3.a Identify the attributes of successful leaders of collaborative teams.
- 1.1.3.b Develop appropriate tools, education and training, and resources to enable civil engineers to assume this role successfully.
- 1.1.3.c Facilitate the mastery of innovative project management and project delivery tools and techniques by civil engineers to most effectively lead and manage large, diverse, multi-disciplinary programs.
- 1.1.3.d Gather and share examples of prominent civil engineering figures illustrating strong leadership attributes.

- 1.2** Civil engineering is universally recognized as a “learned profession” characterized by competency and the continued pursuit of knowledge and experience.

Tactics

- 1.2.1 Develop and promote a universally accepted body of knowledge that prepares civil engineers for professional practice.

A Potential Action

- 1.2.1.a Encourage academia, industry, and the professional organizations to jointly adopt a body of knowledge.
- 1.2.6 Promote credential mobility for civil engineering practice worldwide.

A Potential Action

- 1.2.6.a Develop an international credential-reciprocity program based on a universally accepted body of knowledge.



- 1.3** Civil engineers have the language and cultural skills, competency, and experience necessary to practice globally.

Tactics

- 1.3.1 Articulate the growing need for language and cultural diversity to maintain competitiveness in the global civil engineering community.

Some Potential Actions

- 1.3.1.a Encourage those pursuing a career in civil engineering to learn a foreign language.
- 1.3.1.b Ensure that civil engineers are introduced to differing cultures so that they have appreciation for and understand that differences exist.
- 1.3.2 Develop and promote opportunities for humanitarian service that enhances civil engineering knowledge, skills, and attitudes as civil engineers improve the global quality of life.

Some Potential Actions

- 1.3.2.a Collaborate with organizations that provide these opportunities.
- 1.3.2.b Encourage international experience as part of a civil engineering education.
- 1.4** Civil engineers are universally recognized for their high ethical standards of practice.

Tactics

- 1.4.1 Promote responsibility to society, competency, honor, integrity, dignity, impartiality, fairness to others, and the improvement of ethical practice by example, education, and leadership.

Some Potential Actions

- 1.4.1.a Publish and promote the discussion of ethics case studies.
- 1.4.1.b Encourage development of codes of ethics where they do not exist.



1.4.1.c Promote ethics education as a required part of civil engineering curricula.

1.4.3 Promote zero tolerance of bribery, fraud, and corruption by example and leadership.

Some Potential Actions

1.4.3.a Create minimum universal guidelines aimed at eliminating bribery, fraud, and corruption.

1.4.3.b Encourage monitoring and enforcement.

1.4.3.c Engage multi-national corporations to assist with the reduction of bribery, fraud, and corruption by identifying the negative impacts of these practices on the corporations' global competitiveness.

1.4.3.d Establish outreach programs to educate the engineering and construction industry on both the negative impacts of bribery, fraud, and corruption and how to improve practices.

1.5 Civil engineering has adapted to changes in the workforce to effectively include civil engineers, other professionals, and paraprofessionals.

Tactic

1.5.2 Encourage wide acceptance of a multi-tiered system to deliver civil engineering services based on a well-defined hierarchy of professional and paraprofessional competencies.

A Potential Action

1.5.2.a Educate owners and clients on the increasing role of paraprofessionals in the civil engineering workplace.

1.6 Civil engineering is comprised of a respected and diverse body of dedicated professionals.

Tactics

1.6.1 Attract a broad demographic of outstanding individuals to the civil engineering profession.

Some Potential Actions

1.6.1.a Develop strategies for removing key barriers to attracting those individuals to civil engineering.

- 1.6.1.b Expand the outreach efforts to students to provide more role models, more information, and more enthusiasm about the profession.
- 1.6.1.c Develop and integrate programs that “educate the educators” within the K-12 educational system, giving teachers a better understanding of the engineering and science professions.



- 1.6.2 Retain experienced and dedicated professionals and paraprofessionals within civil engineering.

Some Potential Actions

- 1.6.2.a Identify and evaluate the factors that cause civil engineers, technicians, technologists, and other paraprofessionals to leave the profession and develop a plan to reduce those factors that have significant impact.
 - 1.6.2.b Encourage increased mentoring and coaching of young civil engineers and paraprofessionals.
- 1.7** Civil engineers have enabled worldwide adoption of civil engineering standards—adaptable to local circumstances and environments—to ensure public safety, health, and welfare.

Tactics

- 1.7.1 Evaluate basic human health, safety, and welfare requirements.

A Potential Action

- 1.7.1.a Develop a list of the components for appropriate minimum, fundamental standards.
- 1.7.2 Identify available civil engineering standards and determine worldwide applicability.

A Potential Action

- 1.7.2.a Encourage existing standards development organizations to collaborate on the development of unified standards



- 1.8** Civil engineering is widely regarded as a vital profession that creates the infrastructure that drives economic growth and societal development.

Tactics

- 1.8.1 Educate the public on the relationship between the infrastructure created by civil engineers and the ever-changing opportunities and challenges for economic growth.

Some Potential Actions

- 1.8.1.a Seek leadership roles in organizations such as chambers of commerce, local business associations, regional planning organizations, trade associations, economic development agencies, and others in order to be part of local, regional, and national plans for economic development.
- 1.8.1.b Facilitate opportunities for service on commissions and task forces responsible for recommending or promoting economic development initiatives.

- 1.8.2 Become knowledgeable and vocal advocates of sustainable economic growth and demonstrate through action that civil engineers can help define the types and features of infrastructure that are essential to that growth.

Some Potential Actions

- 1.8.2.a Become educated and trained in economic development principles, innovative financing, and sustainable development by taking academic courses, participating in business leadership workshops, and partnering with other organizations that have this expertise.
- 1.8.2.b Aggressively encourage incorporation of economic and sustainability concepts in day-to-day civil engineering practice.
- 1.8.2.c Find opportunities to interact with politicians, financiers, and business interests to provide insights, advice, and counsel about the long-term viability of infrastructure and its impact on economic development.
- 1.8.2.d Develop a certification program for sustainable design of civil infrastructure.

Vision 2025 **Outcome 2**

Stewards of the Environment



- 2.1** Through the efforts of the global civil engineering profession, civil engineers and the public have recognized and understood the reality of shrinking resources; the necessity for sustainable practices, design, and life-cycle financial support; and the need for social equity in the consumption of resources.

Tactics

- 2.1.1 Integrate environmental awareness in civil engineering education and practice.

Some Potential Actions

- 2.1.1.a Encourage the inclusion of environmental awareness and resource consumption issues in the civil engineering body of knowledge.
- 2.1.1.b Develop additional continuing education materials focused on resource consumption issues and tools, and promote their broad use.
- 2.1.3 Educate the profession and the public on how the planning, design, construction, operation, maintenance, and reconstruction of the built environment and sustaining of the natural environment, impacts resource consumption and cross-border environmental effects.

Some Potential Actions

- 2.1.3.a Perform or compile evaluations of resource consumption in the built and natural environment, specifically focused on water quality and supply, energy, air quality, management of the waste stream, and the reuse of materials.
- 2.1.3.b Publicly report the findings of the resource consumption evaluations.
- 2.1.3.c Develop and provide educational information on the potential impacts of a non-sustainable world.
- 2.1.3.d Collaborate with stakeholders who are actively involved with natural resource decisions and policies.



- 2.3** Through collaborative leadership, civil engineers have made available new technology, techniques, and financial approaches for sustainable planning, design, construction, operation, and maintenance.

Tactics

- 2.3.2 Develop and promulgate guidelines and tools that enable the civil engineering profession to integrate sustainable and resilient design into its work.

Some Potential Actions

- 2.3.2.a Create guidelines for sustainable design.
- 2.3.2.b Promote discussions, improvement, and adoption of these guidelines.
- 2.3.2.c Publicize case studies that demonstrate the effective application of sustainable and resilient design.
- 2.3.2.d Encourage the broad application of sustainable and resilient design tools.

- 2.3.4 Make significant use of renewable resources and make progress toward zero net waste.

Some Potential Actions

- 2.3.4.a Develop guidelines for the reuse of materials in construction and maintenance operations.
- 2.3.4.b Review standards and specifications language and recommend appropriate changes to allow and promote material reuse.
- 2.3.4.c Sponsor the discussion of proposed guidelines and case histories of successful instances of material reuse.
- 2.3.4.d Encourage the broad application of appropriate material reuse.

- 2.3.5 Improve the competence of civil engineers in evaluating the financial impacts of environmental actions.

A Potential Action

- 2.3.5.a Provide tools to measure and assess the financial impacts of sustainable practice and resilient design.

- 2.4** Civil engineers routinely encourage owners and other stakeholders to use new environmental technologies and techniques to improve the quality of life.

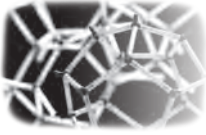


Tactic

- 2.4.1 Educate owners and other stakeholders about innovative environmental technologies and the benefits of their use.

Some Potential Actions

- 2.4.1.a Provide case studies on successful applications of innovative environmental technologies.
- 2.4.1.b Demonstrate the positive economic, public welfare, and public relations benefits of innovative environmental technologies.
- 2.4.1.c Dedicate space in professional and technical publications for stories on the applications of innovative environmental technologies.
- 2.4.1.d Develop a cadre of civil engineer authors who regularly contribute articles on innovative environmental technologies to the popular media.
- 2.4.1.e Collaborate with the major broadcast media to promote and assist in the production of popular programs that highlight innovative environmental technologies.



Vision 2025 **Outcome 3** *Innovators*

- 3.1** Civil engineers define the strategic research direction for leading-edge technologies in the built and natural environment and serve as active participants and partners in the research process.

Tactics

- 3.1.2 Foster the input of civil engineers in strategic research planning.

Some Potential Actions

- 3.1.2.a Organize an effort to evaluate overall research planning and identify research needs.
- 3.1.2.b Develop a strategic research plan.
- 3.1.2.c Promote the expansion of civil engineering research in accordance with the strategic research plan.

- 3.1.3 Enhance the effectiveness of research by encouraging integration and collaboration among individual research efforts.

Some Potential Actions

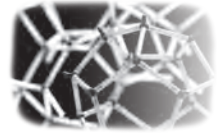
- 3.1.3.a Identify potential impediments, such as risk, time, and budget constraints, and lack of knowledge or experience.
- 3.1.3.b Evaluate the relationships and practices that have been shown to yield rapid and effective implementation of research results.
- 3.1.3.c Develop a plan for the expanded interaction between industry and academia and other influencing partnerships.

- 3.1.7 Influence public policy to give higher priority and increased resources to civil engineering research.

Some Potential Actions

- 3.1.7.a Identify and influence the public policies, attitudes, and incentives that affect research priorities and related resources.
- 3.1.7.b More effectively publicize the impact of research results.
- 3.1.7.c Expand the pool of resources available for civil engineering research.

- 3.2** Civil engineers apply innovative technologies and information management tools to create enhanced solutions in the built and natural environment.



Tactics

- 3.2.1 Encourage civil engineers to more rapidly apply the application of new technologies.

Some Potential Actions

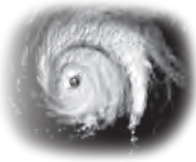
- 3.2.1.a Identify barriers to the rapid adoption of new technologies.
 - 3.2.1.b Address and/or eliminate the barriers identified.
 - 3.2.1.c Identify newly emerging, innovative productivity tools that show major promise for practical application.
 - 3.2.1.d Promote the use of these identified emerging technologies.
- 3.2.3 Accelerate the integration of technology through effective partnerships of government, industry, academia, and practitioners in research, learning, leadership, and application.

Some Potential Actions

- 3.2.3.a Determine the characteristics and benefits of an effective partnership.
 - 3.2.3.b Develop plans to promote the most promising partnership opportunities, including appropriate public relations efforts.
- 3.2.7 Improve documentation and sharing of innovations.

Some Potential Actions

- 3.2.7.a Assess the roles played by each of the stakeholders in effective risk sharing.
- 3.2.7.b Identify whether changes in the role of the insurance and legal industries in effective risk management are needed to bring about more rapid application of new technologies.
- 3.2.7.c Provide tools to help practitioners understand and apply risk management in the use of new technologies.



Vision 2025 **Outcome 4** *Managers of Risk*

4.1 Civil engineers have developed innovative approaches, tools, techniques, materials, policies, and business relationships to mitigate the occurrence and effects of both natural and man-made disasters and their associated risks and uncertainties.

Tactics

4.1.1 Embed risk assessment and risk management methodologies as a core knowledge and skill for civil engineers throughout their education and practice.

Some Potential Actions

4.1.1.a Identify appropriate, broad-based manuals on quantitative risk assessment and risk management that contain best-practices for use in civil engineering education.

4.1.1.b Evaluate the core civil engineering curricula and elements of an accepted body of knowledge to determine the risk assessment and risk management knowledge and skills that are taught and those that are missing.

4.1.1.c Incorporate the concept of resilience as a tool for mitigating the effects of natural and man-made disasters.

4.1.1.d Learn from disasters by disseminating forensic analyses and publicizing innovative mitigating measures to the civil engineering community.

4.1.1.e Incorporate quantitative risk assessments for natural and man-made hazards as the basis for risk/benefit trade-offs and risk-informed decisions for all civil engineering works.

4.1.2 Support and encourage collaborative, integrated research and innovation in technologies and approaches that enhance planning, project management, risk assessment, and project delivery.

Some Potential Actions

4.1.2.a Identify impediments to innovation in project management and project delivery as they relate to risk allocation.

- 4.1.2.b Develop effective technologies for rapid detection, definition, and notification of impending natural and man-made disasters.
- 4.1.2.c Improve the means to acquire real-time data and knowledge to allow civil engineers to better assess and manage immediate and long-term risk and develop new and innovative risk assessment and risk management techniques.
- 4.1.2.d Gather, evaluate, and share best practices.
- 4.1.2.e Develop design guidelines to minimize vulnerabilities to natural and man-made hazards based on quantitative risk information.
- 4.1.2.f Develop advanced modeling techniques that provide for accurate assessments and disaster scenarios and for the analysis of various mitigation options.
- 4.1.2.g Develop effective disaster recovery systems.
- 4.1.2.h Develop a risk management matrix that identifies major/minor risks versus high/low impact as a means of better prioritizing specific areas of focus for developing mitigation strategies.



- 4.1.4 Promote regulatory and business policies that encourage constructed resilience.

Some Potential Actions

- 4.1.4.a Gather, evaluate, and share examples of effective regulatory and business policies.
 - 4.1.4.b Develop and promulgate additional policies and systems to mitigate the effects of natural and man-made disasters.
 - 4.1.4.c Develop and encourage the adoption of performance-based codes and standards that incorporate resilience.
 - 4.1.4.d Develop standards for reviewing failures in constructed projects and encourage dissemination of lessons learned.
 - 4.1.4.e Promote the consideration of resilience in the design and construction procurement process.
- 4.1.5 Promote business and contractual relationships that encourage planning, engineering, design, construction, operation, and maintenance for resilience.



Some Potential Actions

- 4.1.5.a Identify the benefits of business relationships that encourage resilience.
- 4.1.5.b Identify appropriate contractual language that addresses resilience.
- 4.1.5.c Encourage the use of incentives to promote resilience.
- 4.1.5.d Involve the legal profession and the insurance industry in the development of these business and contractual relationships.

- 4.2** Civil engineers have developed innovative approaches, tools, techniques, materials, policies, and business relationships to mitigate risk in planning, design, construction, operation, maintenance, and quality control.

Tactic

- 4.2.4 Promote business and contractual relationships that encourage increased ongoing cooperation between the engineering and construction teams to minimize errors and omissions.

A Potential Action

- 4.2.4.a Consider alternatives for project engineering continuity as a way to retain institutional knowledge throughout a project.

- 4.3** Civil engineers lead enterprise-wide risk management efforts and routinely make project-specific risk decisions.

Tactic

- 4.3.1 Reinforce civil engineering as a lead discipline for risk assessment and risk management of the built and natural environment.

A Potential Action

- 4.3.1.a Support a public relations campaign focused on civil engineers as masters of evaluating and managing risk.

- 4.4** Civil engineers effectively communicate risks and mitigation options to project colleagues, clients, regulatory agencies, and the public.

Tactics

- 4.4.2 Implement communication techniques, practices, and methods that facilitate effective risk communication and understanding.



Some Potential Actions

- 4.4.2.a Ensure that communications knowledge and skills are embedded in every civil engineer's education and encourage their continued enhancement throughout every civil engineer's career.
 - 4.4.2.b Develop tools that assist civil engineers in communicating project and program risk to technical and non-technical audiences.
 - 4.4.2.c Provide forums and networks for civil engineers to develop and apply their skills in communicating with stakeholders.
- 4.4.3 Promote business and contractual relationships that facilitate effective communication of project risks and mitigation options.

Some Potential Actions

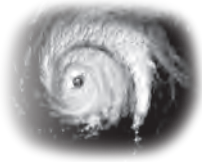
- 4.4.3.a Identify the benefits of effective risk communications within business and contractual relationships.
 - 4.4.3.b Identify and promote appropriate contractual language that facilitates effective communication, risk assessment and management, and risk allocation.
- 4.5** Civil engineers have developed innovative approaches to balancing business risk and reward through new technologies, policies, and business relationships.

Tactic

- 4.5.2 Support and encourage research and innovation in techniques and technologies that enhance the ability to balance risk and reward in project management and delivery.

Some Potential Actions

- 4.5.2.a Identify impediments to innovation in project management and project delivery as they relate to risk allocation.



- 4.5.2.b Improve the means of acquiring data and knowledge concerning successful business risk management techniques.
- 4.5.2.c Gather, evaluate, and share successful applications of balancing risk and reward.

Vision 2025 **Outcome 5**

Leaders in Public Policy



- 5.2** Civil engineers are viewed as problem definers as well as problem solvers and as professionals who find opportunities to make quality-of-life improvements.

Tactic

- 5.2.3 Promote awareness through the popular media of the extraordinary, life-changing contributions of civil engineers.

Some Potential Actions

- 5.2.3.a Assess the current role of civil engineers to determine when they are and when they are not perceived to be proactive problem-solvers and develop recommendations for meaningful changes.
 - 5.2.3.b Recognize and publicize demographic trends and current quality-of-life issues.
 - 5.2.3.c Participate in public policy discussions, contributing insights, technical knowledge, and innovative solutions.
 - 5.2.3.d Undertake public awareness campaigns around national infrastructure assessments and promote needed solutions.
 - 5.2.3.e Publicize specific civil engineering projects that improve the quality of life around the world.
 - 5.2.3.f Publicize situations where individual civil engineers have been involved and had a positive effect on the quality of life.
 - 5.2.3.g Collaborate with and assist humanitarian organizations with programs to enhance the quality of life.
- 5.3** Civil engineers are sought to contribute their skills and insights regarding public policy decisions on the built and natural environment.

Tactics

- 5.3.1 Promote opportunities for civil engineers to initiate, lead, and participate in cross-professional efforts that bring about societal change to improve the quality of life.



A Potential Action

5.3.1.a Team with a variety of organizations to identify changes and strategize broad-based responses.

5.3.2 Expand opportunities for public involvement, such as town hall meetings, testimony, and lobbying, to provide civil engineering knowledge and expertise in a timely manner.

Some Potential Actions

5.3.2.a Identify public entities that are facing critical issues and provide them with information on civil engineers who are able to offer expertise.

5.3.2.b Identify new opportunities for public involvement for civil engineers.

5.3.2.c Develop plans to proactively involve civil engineers in forums where their input can be effective.

5.3.2.d Encourage pro-bono activities by engineering firms, organizations, and individuals.

5.3.5 Expand opportunities for life-long education on public policy topics so that civil engineers will be better prepared to participate in these discussions.

A Potential Action

5.3.5.a Provide tools, education, training, and guidance for civil engineers who wish to participate in public discussions on issues relating to the built and natural environment.

5.4 Sound infrastructure has become a quality-of-life priority, and policy-makers and the public understand its crucial link to economic prosperity and public health and safety.

Tactics

5.4.1 Educate policy-makers and the public on the ever-changing opportunities and challenges impacting the quality of life.

Some Potential Actions

5.4.1.a Collaborate with public relations professionals to effectively communicate identified current and future challenges and potential solutions.

- 5.4.1.b Recognize and publicize demographic trends and current environmental impacts stemming from growth and consumption.
- 5.4.1.c Effectively utilize the popular media to educate and engage policy-makers and the public.
- 5.4.1.d Create plans to respond to media reports over the long term.
- 5.4.1.e Provide critical technical guidance to influence public policy throughout governments and global organizations.



- 5.4.2 Effectively communicate the consequences of inadequate infrastructure.

Some Potential Actions

- 5.4.2.a Expand the reach of national infrastructure assessments to demonstrate the consequences of inadequate infrastructure.
 - 5.4.2.b Cite examples of diminished quality of life resulting from inadequate infrastructure.
 - 5.4.2.c Cite examples of catastrophic failures resulting from inadequate infrastructure.
- 5.4.4 Influence regulatory and legislative bodies to prioritize infrastructure as a quality-of-life issue.

Some Potential Actions

- 5.4.4.a Proactively serve as advisors to governmental and non-governmental organizations in ad-hoc and appointed positions.
- 5.4.4.b Establish groups of advisors to provide insights on environmental and infrastructure policy both worldwide and appropriate to geographic needs.

Appendix B

Types of Organizations



The “What’s Next?” section noted types of organizations (page 38) that might want to be involved in implementing the Roadmap and achieving the Vision. The individual organizations listed below provide some examples as a start. Many additional organizations worldwide fit into these lists, and no judgment on relative importance or intent to participate is implied.

- A) Professional associations and organizations. For example:
 - ASCE
 - Other professional societies such as the American Council of Engineering Companies (ACEC), American Institute of Architects (AIA), American Public Works Association (APWA), American Society for Engineering Education (ASEE), Associated General Contractors (AGC), Engineers Australia (EA), Institution of Civil Engineers–UK (ICE), Japan Society of Civil Engineers (JSCE), National Society of Professional Engineers (NSPE), Society of Women Engineers (SWE), and South African Institution of Civil Engineering (SAICE)
 - Credentialing organizations, such as the American Academy of Environmental Engineers (AAEE), Civil Engineering Certification Inc. (CEC), Institute of Transportation Engineers (ITE), National Council of Examiners for Engineering and Surveying (NCEES), Structural Engineering Credentialing Board (SECB), and U.S. Green Building Council (USGBC)
 - Multi-national organizations, such as the Asian Civil Engineering Coordinating Council (ACECC), International Federation of Consulting Engineers (FIDIC), Pan American Federation of Engineering Societies (UPADI), and World Federation of Engineering Organizations (WFEO)

- B) Educational institutions. For example:
 - Universities and colleges
 - Accreditation organizations, such as the Accreditation Board for Engineering and Technology (ABET), and the European Union’s accreditation group

- Councils of university leaders, such as ASCE’s Department Heads Council and the Engineering Dean’s Council
 - Continuing education providers
- C) Civil engineering practitioners. For example:
- Multi-national architecture/engineering/construction (AEC) firms
 - Regional and local consulting engineering firms
 - Individual practitioners
- D) Governmental institutions. For example:
- Engineering licensing boards
 - National agencies, such as the U.S. Army Corps of Engineers (USACE), U.S. Department of Homeland Security (DHS), U.S. Department of Transportation (USDOT), U.S. Federal Highway Administration (FHWA), and ministries of transportation throughout the world
 - Regional agencies (state, province, county, etc.)
 - Local agencies
 - Research organizations, such as the National Academy of Engineering (NAE), National Research Council, National Science Foundation (NSF), and Transportation Research Board (TRB),
- E) Non-governmental organizations. For example:
- Codes and standards organizations, such as the American Association of State Highway and Transportation Officials (AASHTO), American Concrete Institute (ACI), American Institute of Steel Construction (AISC), International Code Council (ICC), and The Masonry Society (TMS)
 - Humanitarian organizations, such as Engineers Without Borders–USA (EWB-USA), Habitat for Humanity, Partners in Health, and Water for People
 - Global funding organizations, such as the Asian Development Bank, European Investment Bank, Inter-American Development Bank, and The World Bank
- F) Industry. For example:
- Multi-national corporations, such as ExxonMobil and General Electric
 - Construction contractors
 - Infrastructure funding organizations, such as Cintra, Deloitte-Touche, and Macquarie

Appendix C

ASCE **Task Committee** to Achieve the Vision for Civil Engineering in 2025



Blaine D. Leonard, P.E., D.GE, F.ASCE, *Chair* ; ASCE President-Elect, Research Program Manager, Utah Department of Transportation, Salt Lake City, Utah

Stan R. Caldwell, P.E., SECB, F.ASCE, F.AEI, *Vice Chair*; Vice President, Half Associates, Inc., Richardson, Texas

Eric L. Fisher, P.E., M.ASCE; Project Manager, Brown & Gay Engineers Inc., Tyler, Texas

Robert B. Flowers, P.E., M.ASCE; Vice President/General Manager, International Enterprise Solutions, L-3 Communications, EITS, Reston, Virginia

Fletcher H. (Bud) Griffis, Ph.D., P.E., F.ASCE; Professor, Department of Civil Engineering, Polytechnic Institute of NYU, Brooklyn, New York

Eva Lerner-Lam, M.ASCE; President, The Palisades Consulting Group, Inc., Beijing, China

Judith Nitsch, P.E., LEED AP, M.ASCE; President, Nitsch Engineering, Boston, Massachusetts

Deborah A. Snyder, P.E., LEED AP, M.ASCE; Technical Operations Manager, CDM, Denver, Colorado

Corresponding Members

David B. Botha, Aff.M.ASCE; Executive Director, South African Institution of Civil Engineering, Midrand, South Africa

Barry J. Grear, AO, CPEng; President, World Federation of Engineering Organizations, Australia

Richard M. Kunnath, A.M.ASCE; CEO, Charles Pankow Builders, Pasadena, California

David G. Leverenz, P.E., F.ASCE; Senior Technical Director, Parsons Transportation Group, Miami, Florida

Gordon G.T. Masterton, OBE, FEng, FRSE, FICE; Vice President, Jacobs, Glasgow, United Kingdom

Stuart G. Welsh, Ph.D. P.E., D.WRE, Dist.M.ASCE; S.G. Welsh Consulting, Englewood, Florida

Staff Contacts

Stefan Jaeger, CAE; Managing Director, Strategic, Geographic, and International Initiatives, ASCE, Reston, Virginia

Meggan Maughan-Brown, CAE, CMP; Director, International Relations and Strategic Planning, ASCE, Reston, Virginia

Notes

Environmental Benefits Statement

This publication was printed with soy inks on recycled paper that meets the rigorous Sustainable Forestry Initiatives (SFI) standards. It was printed in a facility that is certified by the Forest Stewardship Council, SFI, and the Programme for the Endorsement of Forest Certification Council, and recycles 80 to 90 percent of all post production waste.



SUSTAINABLE FORESTRY INITIATIVE

www.sfiprogram.org





Achieving
The **VISION** for Civil Engineering in 2025
A Roadmap for the Profession

ASCE
AMERICAN SOCIETY OF CIVIL ENGINEERS

1801 Alexander Bell Drive
Reston, Virginia 20191-4400
(800) 548-2723 toll free
(703) 295-6300 international
www.asce.org