A Sustainability and Resiliency Education Framework

2026

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Executive Summary

The Sustainability and Resiliency Framework for Public Works emphasizes the critical role of public works and advocates for integrating sustainability and resilience into infrastructure development. This framework moves beyond short-term thinking to consider the long-term impacts of projects on future generations. The framework also emphasizes maintaining flexibility in our thinking and work, avoiding blind adherence to a rigid, checkbox mentality. A core principle is the Future-Think approach, which focuses on the extended consequences of infrastructure projects, well beyond typical design lifespans.

To realize these goals, the framework promotes several key ideas:

- **Breaking down silos** in project planning to ensure a holistic, interconnected approach. This document notes that the complexity and interrelationship of the various public works infrastructures make it difficult to see past the demands of developing new projects.
- **Minimizing environmental impact** by reducing pollution, protecting natural habitats, and conserving resources.
- **Employing life-cycle costing and asset management** to account for long-term maintenance costs and avoid future expenses.
- **Adopting key pillars** such as environmental stewardship, economic viability, and social equity.

To support the implementation of these principles, the framework suggests several actionable steps:

- Integrating sustainability and resilience into all public works activities
- Adopting a Future-Think approach
- Promoting collaboration
- Prioritizing environmental protection
- Implementing life-cycle costing and asset management
- Incorporating the core pillars of sustainability and resilience

The framework also recommends utilizing the **US Climate Resilience Toolkit** and tools such as **ENVISION** to manage risks and enhance community and business resilience.

Introduction

In developing a common voice for APWA on sustainability and resilience, we must first understand the role of modern infrastructure in our world. Public works is a broad discipline that spans the entire realm of public infrastructure. Public works enables human society to survive at its most basic level by providing water and devising safe methods for disposing human waste. Coupled with transportation networks that transport raw and processed foods, infrastructure provides essential life-supporting elements that enable communities to develop and grow.

But beyond these basics, public works enables society to expand and flourish in nearly every aspect of human endeavor, from providing the infrastructure to support individual shelters and buildings to entire communities building and maintaining structures used by the arts and entertainment industry, health care, commercial spaces, industrial development, and more. Without public works, even the most basic human activities would be short-lived.

The complexity and interrelationships among the various public works infrastructure systems make it difficult to develop new projects. If we look at only a few of the many public works' components, we see a minimal intersection of interests among projects.

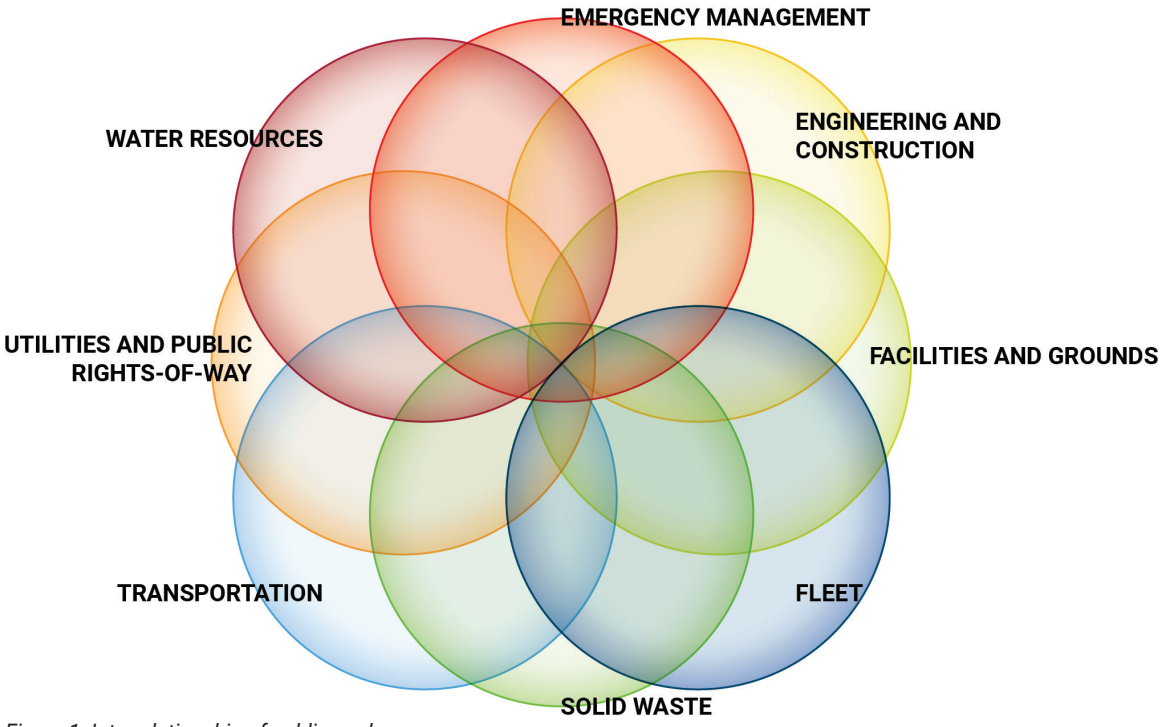

Figure 1. Interrelationship of public works

This siloing effect often means that individual projects may be focused on only one target area, which may result in a superior but very narrowly focused result. This is neither sustainable nor resilient at the broadest possible infrastructure level.

The public works profession and private business must realize that what we build now will serve people for generations. Designers and builders, today's decision-makers, may only enjoy the benefits of their work for 50 or 60 years. Yet properly developed and maintained infrastructure should survive for much longer, and future generations must live with the consequences of the decisions we make today. Many people born today will live the next 80 to 90 years with things we build tomorrow. If we do not think of those people and what they may need to live healthy, safe, and successful lives, then our designs will not be successful by any true measure.

Definitions

Focusing on future generations must be the first step in developing genuinely successful infrastructure. The key to success is the idea that infrastructure must be sustainable and resilient to withstand the ravages of time. Thus, we must understand the basic definitions of the most important terms we will use.

- Sustainable: The ability to meet the needs of the present without compromising the ability of future generations to meet their needs. (https://www.un.org/en/academic-impact/sustainability)
- Resilience: The ability to prepare for and adapt to changing conditions and withstand and recover rapidly from disruptions. (FEMA.gov)
- Social Equity: Social equity is the fair, just, and equitable management of all institutions serving the public directly or by contract, and the fair and equitable distribution of public services, and implementation of public policy, and the commitment to promote fairness, justice, and equity in the formation of public policy. (https://www.aspanet.org/ASPA/ASPA/About-ASPA/Social-Equity-Center/Definitions.aspx)

These simple terms are critical to the future of humankind and the Earth. When we consider further the interplay between the multiple components of infrastructure and the idea of sustainability and resilience, we see how we can bring these ideas together in a unified manner. That is, by focusing on the concepts of sustainability and resilience, we may effectively break down the silos of individual public works infrastructure.

But again, even a focus on sustainability and resilience will not yield truly successful projects if we aim only at immediate targets. Building infrastructure that lasts 50, 100, or even 1,000 years (or more) and is genuinely successful requires considering the people who will use that infrastructure long after we are gone. We must adjust our targets so that, in the end, whatever sustainability and resilience have been achieved extends well beyond our design target lifespan. Thus, we must add another level of understanding to the idea of success: time (in generations).

An orientation toward Future-Think will bring an entirely different (and needed) perspective to how we plan for, design, build, and maintain infrastructure.

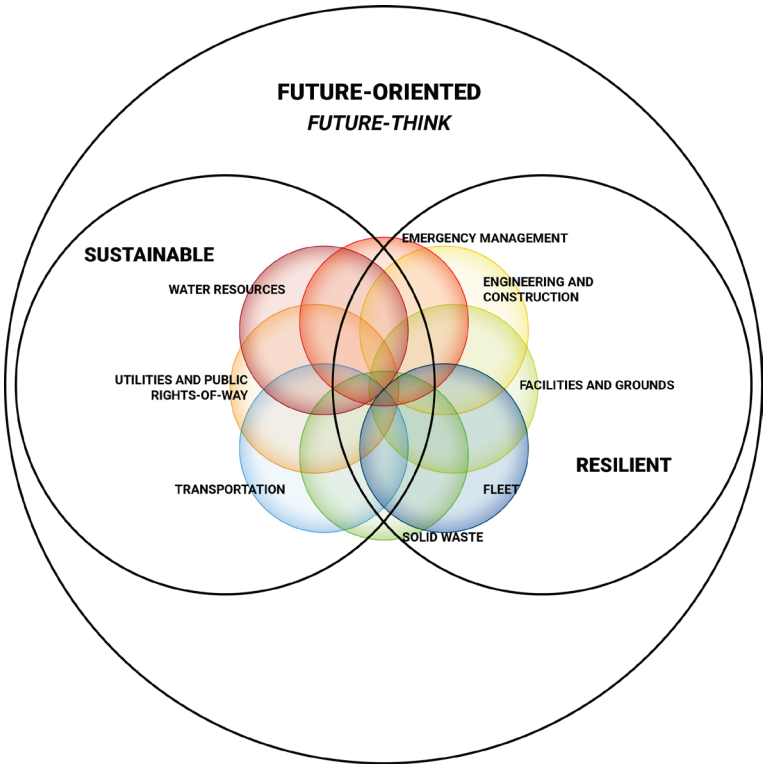

Figure 2. Future-Think and Infrastructure

While the idea of Future-Think many seem to fly in the face of many of the problems we deal with daily in public works (e.g., a tire-eating pothole, a burst water main, or a broken sanitary sewer), the fact is that many of these and other day-to-day problems that we deal with arise because our designs have often considered economics first and then the continued use of "tried and true" (existing practices/outdated standards, rigid checkboxes) methods built into many of the guidelines, rules, and regulations that guide our work.

Taking the long view, we must reconcile ourselves to the fact that many unknown phenomena affect our physical world, and that the Earth changes constantly. This change manifests in many ways, but climate and its daily weather patterns play critical roles in infrastructure, affecting what we build and how we maintain it.

Protecting drivers from snow and icy conditions consumes budgets, introduces chemicals into the natural environment, and introduces wear and tear on road and street surfaces that must be repaired. Sand clogs storm sewers and enters waterways, where it ultimately impacts habitats for many creatures, including humans, who must eventually consume the water to live.

Every project introduces similar chains of actions and reactions that, in the end, affect the environment, people, and other living beings. Little by little, we contribute to the changes brought about by the Earth's natural processes. While we may not be able to change Earth's natural processes, we can minimize actions that amplify them or direct them toward ways that cause the least damage to the environment, other living beings, and people.

As we build and change our infrastructure, we have two opportunities: one to introduce changes that, in some cases, may negatively affect our environment in ways that ultimately make our world a poorer and less safe place to live. The other is to minimize our impact on these natural processes by building sustainably, with resilience in mind, and without accentuating them in ways that may negatively affect the world for future generations.

Clearly, taking a long view during the planning, design, and construction phases of infrastructure projects can be difficult and, at least for the short term, seem more expensive. However, as the idea of life-cycle costing has shown, as we move the horizon further and further for our project's vision, we find that long-term maintenance and upkeep costs far outweigh initial design and construction costs.

A glaring example of the overwhelming conflict between future and initial expenses is the street networks that many communities are increasingly having difficulty maintaining. To address the short-term vision and problems of the automobile age—that is, too many lanes, often too wide for the vehicles they carry—we are left with the nearly inevitable inability to pay for maintenance and upkeep. Worse yet, we find that the excess lanes and lane widths contribute directly to excessive death and injury on our highway network. Failing to see the future or to reconcile the needs of people in the broadest sense means the death and crippling of thousands of people not even born when these transportation networks were designed and built—indeed, an unsustainable situation in terms of the loss of human capability and effort.

Tools and Their Uses

A comprehensive approach to infrastructure, as shown in Figure 3, must be developed and implemented within the public works community to prevent similar situations from occurring and to retrofit existing infrastructure so that it consumes fewer resources and supports life now and in the future.

Based on existing, proven concepts, such as those developed by the Institute of Sustainable Infrastructure (ISI), these techniques can be applied across all functions and aspects of public works. APWA has partnered with the American Society of Civil Engineers (ASCE) and the American Consulting Engineers Council (ACEC) to create ISI, and it would only be most appropriate if, in leading the effort to build a sustainable and resilient future, APWA used the materials and concepts developed by ISI.

While focusing on newly built projects, the concepts of the ISI processes can and should be applied to all aspects of public works, as shown in the following Table 1.

CONCEPT	INTENT/ DIRECTION
Materials	
Low carbon	Increase use of materials with low-carbon footprint.
Recycle	Incorporate recycled materials in all phases of work, including the materials, equipment, and processes used in all building phases.
Manage quantities	Minimize the amount of materials used in all construction with a target of increasing the ratio of recycled materials used.
Equipment	
Low emission	Use equipment with low operating levels of emissions.
Low manufacturing footprint	Use equipment built with low carbon and virgin materials content.
Techniques (Methods)	
Build within nature	Use designs that recognize natural landforms rather than reshape them to incorporate them into the designs. Prioritize Protection>Restoration>Enhancement when considering existing natural assets.

Table 1. Application of ISI to Public Works Planning, Construction, and Maintenance

Besides the tools developed by ISI, public works officials need reliable data and updated climate projections to plan appropriately. To help, the National Oceanic and Atmospheric Administration launched the US Climate Resilience Toolkit (https://toolkit.climate.gov), which provides information from across the US federal government. The goal is to improve people's ability to understand and manage climate-related risks and opportunities, and to help them make their communities and businesses more resilient to extreme events.

Figure 3. Steps to Resilience (US Climate Resilience Toolkit)

Approach to Sustainability and Resilience in Public Works

Most of the concepts needed to enshrine sustainability and resilience in the work of APWA and its members have been known and used for many years: life-cycle costing, recycling and reuse, asset management to manage and control all components of infrastructure, and creative project delivery methods, to name just a few. However, to a great extent, they have been siloed as working concepts, which has limited the benefits that a more synergistic and all-encompassing approach could attain.

Thus, the first and most crucial step in any program to truly incorporate sustainability and resilience in the public works profession is to break down the siloed walls. This isn't easy in a profession that incorporates many ideas and technical specialties, and it is not necessarily desirable given the importance of in-depth expertise in those fields.

However, the idea that sustainability, resilience, and the long-term view that these concepts bring to public works should mean that, at the highest level, these ideas should lead any work involving the planning, designing, building, and maintaining of public works infrastructure. Sustainability and resilience should be the bedrock upon which infrastructure is grounded.

For APWA, this should mean that all policies, procedures, guidelines, and practices should incorporate the ideas of sustainability and resilience, not as an afterthought or checklist item, but as a grounding philosophy. Cornerstone components should include consideration of weather-related impacts, environmental protection, life-cycle costing, and asset management. APWA should take the lead across all its interest areas in promoting resilience and sustainability to benefit diverse populations and natural resources. Asset management, especially, should be emphasized because it is difficult to be sustainable if you do not know what you are sustaining, and it is difficult to build resiliency if you have no systematic understanding of what your infrastructure is, where it is, what condition it is in, and how long it is likely to last.

The Pillars of Sustainability

Conceptual pillars, specifically, environmental stewardship, economic viability, and social equity, combined with the practical decision frameworks that practitioners use in their field, provide long-term support for the overarching ideas of sustainability and resilience. For example, environmental stewardship supports the protection and preservation of critical natural resources, economic viability supports economic welfare and performance, while social equity supports healthy people trained to build sustainable and resilient infrastructure.

- Environmental Stewardship
  - Protect the environment (water and air).
  - Recycle, reduce, and reuse.
  - Minimize negative impacts to the environment.
  - Preserve sensitive habitats.
  - Develop processes that minimize waste.
- Economic Viability
  - Sustainability increases sales and profits.
  - Sustainability improves consumer trust and corporate image.
  - Sustainability reduces long-term costs.
  - Employees prefer to work for firms that demonstrate sustainable practices.
- Social Equity
  - Protect people.
  - Keep people healthy by protecting them from infrastructure failures.
  - Train people to build sustainable and resilient infrastructure.
  - Build and protect communities that accommodate all people.

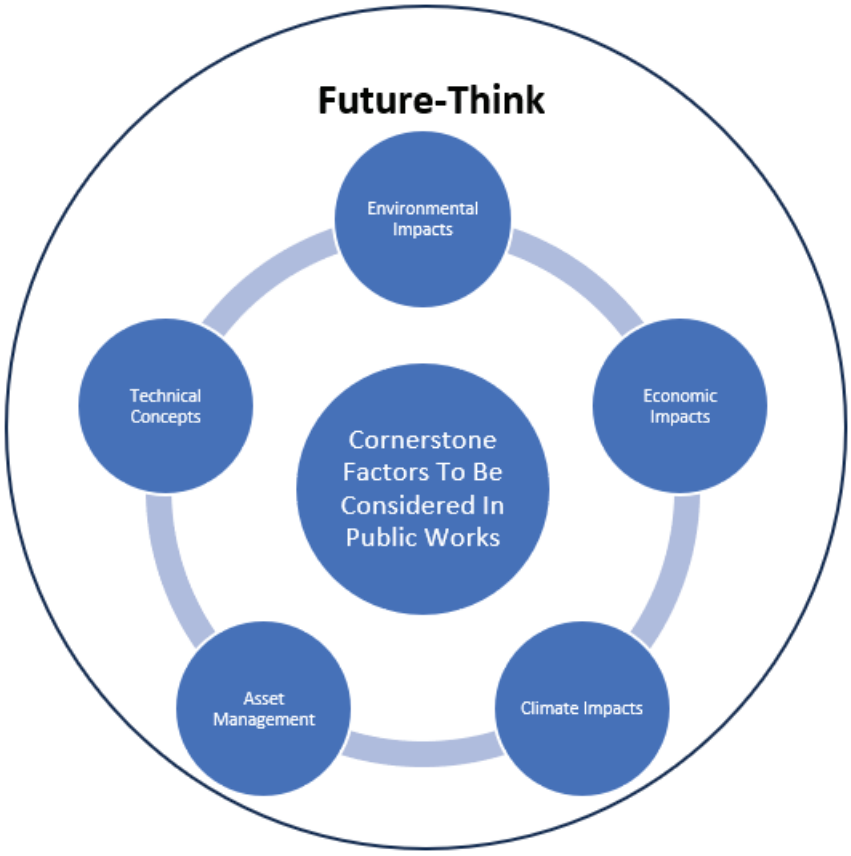

Figure 4. Future-Think

It is only by balancing these pillars that public works can maximize its contribution to human welfare.

Implementation Across Technical Committees

We have discussed the importance of breaking down silos and working holistically across public works to achieve sustainability and resilience. This importance is mirrored in our own organizational structure within APWA: the Sustainability and Resiliency Committee strives to bridge across technical committees.

As an Integrated Strategy Committee, the committee's chief partners are APWA's eight Technical Committees.

To best accomplish that partnership, the Technical Committees have been listed here in two groups, which allows the committee to tailor educational efforts.

1. *Resource Management Committees:* Those that greatly influence the management of key resources (energy, water, air): Transportation, Water Resources Management, Solid Waste Management.
2. *Public Infrastructure Systems Management Committees:* Those that mainly serve to manage our public systems and infrastructure: Facilities and Grounds, Utilities and Public Rights-of-Way, Fleet Management, Emergency Management, Engineering and Construction.

The Sustainability and Resiliency Committee also liaises with APWA's other Integrated Strategy Committees, including Asset Management, Leadership and Management, Technology, and Workforce Development.

All Technical Committee members should consider sustainability and resilience at the beginning of any committee project, and contact the Sustainability and Resiliency Committee and other appropriate Integrated Strategy Committees for input and any additional assistance needed on that project. The Sustainability and Resiliency Committee will also provide any additional training needed on the framework's use.

Examples

The Solid Waste Management Committee wishes to expand its educational and training database to include the latest state-of-the-art information on sustainable waste management strategies. They should:

1. Develop an outline of their proposed project, examples of strategies they may be interested in, types of issues that may come under review, suggested knowledge team participants, etc.
2. Forward the initial draft to the Sustainability and Resiliency Committee for review.
3. Review and incorporate the Sustainability and Resiliency Committee's comments. Coordinate additional discussions/reviews and subsequent drafts as needed before finalization.
4. Complete final draft.

A second example is when a committee experiences significant membership turnover or has gone three to five years without a training or refresher course on sustainability and resilience concepts. The Sustainability and Resilience Committee could:

1. Provide an individualized (for the committee) briefing on the concepts and best practices of sustainability and resilience that apply to that committee.
2. Present a webinar on a three- to five-year cycle that could brief committees as a group on the concepts of sustainability and resilience and current practice related to those concepts.

Through such recurring activities, the idea of sustainability and resilience is kept at the forefront of public works thought, and not just a box to check off as we carry out our day-to-day functions. It emphasizes regularly the fundamental concept that the decisions we make today will have consequences for generations. Thus, we have an opportunity to minimize our negative impacts by adopting technologies and building infrastructure that supports a safer, healthier world long after we are gone.

References

1. Standard Practice for Sustainable Infrastructure, ASCE/COS 73-23:

   Resilience: Ability to prepare for and adapt to changing conditions and withstand and recover rapidly from disruptions (Presidential Policy Directive PPD-21).

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