

Sustainable Asphalt Pavements: A Practical Guide Sustainability Overview



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Sustainability in Practice Series 101

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Sustainability in Practice 101

Sustainable Asphalt Pavements: A Practical Guide

Sustainability Overview

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Sustainable Asphalt Pavements: A Practical Guide

This is the first of four publications in the *Sustainable Asphalt Pavements: A Practical Guide* series. The series focuses on what an asphalt producer or asphalt project can do now to address sustainability within the confines of good business practice. The four publications in this series are meant to work together and are organized as follows:

1. **SIP 101: Sustainability Overview.** A practical definition of sustainability and the elements of and reasons for a business approach to sustainability.
2. **SIP 102: Sustainability Specifics.** Specific sustainability actions that can be taken in corporate/organizational strategy, project delivery, mix design, materials production, construction activities, and pavement design.
3. **SIP 103: Procuring and Evaluating Sustainability.** How sustainability is included in public project procurement, and how sustainability efforts are evaluated within the industry.
4. **SIP 104: How to Develop a Sustainability Program.** Important components of a company sustainability program including goals, best practices, implementation, and reporting.

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SIP 101: Sustainability Overview

“Sustainability” is a concept that expresses our desire, as humans, for health and happiness within the context of a healthy planet over the long term. In 1987, the United Nations Report of the World Commission on Environment and Development (known as the Brundtland Report) said it like this:

Humanity has the ability to make development sustainable to ensure that it meets the needs of the present without compromising the ability of future generations to meet their own needs. (Brundtland Commission, 1987)

This “sustainability” idea has become common over the last decade. It has made its way into corporate culture, religious teachings, investment strategies, and preschool through college curriculums. Importantly, it is possible and completely reasonable to make it part of good business practice in the asphalt pavement industry. Why would you want to do this? Three reasons: (1) a moral obligation to do the right thing for future generations and the planet, (2) sustainability features are (or will be) required parts of projects, and (3) there is a business opportunity to increase revenue and market share, reduce expenses, improve productivity, and reduce risk.

Practical Sustainability

If you want to “do sustainability” it is hard to figure out what that might mean for a business if you are using the United Nations definition that we started with. Perhaps a more practical shorthand definition is helpful:

In practice, doing “sustainability” means (1) going above-and-beyond standard practice and/or required national regulatory minimums, or (2) showing innovation in meeting these standards and minimums in support of people and the environment.

This is not a common definition of “sustainability,” but it is a convenient way to think about it, and it is a way that relates well to business practice: going above and beyond and being innovative are long standing contributors to business success. The next section presents a few technical details that can help you understand sustainability and make it a part of a successful business.

Sustainability is about more than just doing the right thing and getting good business performance. It’s about looking after our employees, protecting the environment, and engaging our communities — all of which enables us to work safely and effectively and provides us our license to operate.

— James H. Roberts, President & CEO,
Granite Construction Inc.

The Technical Details of “Sustainability”

A Longer Definition

We just presented a practical definition, so in the interest of full disclosure here is the longer, more involved definition from the FHWA’s Sustainable Pavements Program:

The “sustainability” of a human-devised system is its ability to (1) exist and function within a larger system without degrading it, and (2) provide for and meet the human needs for which the system was developed. ... Thus “sustainable” in the context of pavements refers to system characteristics that encompasses a pavement’s ability to (1) achieve the engineering goals for which they were constructed, (2) preserve and (ideally) restore surrounding ecosystems, (3) use financial, human, and environmental resources economically, and (4) meet basic human needs such as health, safety, equity, employment, comfort, and happiness. (Van Dam et al., 2015)

It seems everyone wants to define “sustainability” in a slightly different way, which can be confusing. However, most definitions converge on the idea that “sustainability” is a concept that expresses a desire for human health and happiness within the context of a healthy planet over the long term. They also typically recognize the following:

- **Sustainability can be divided into three main dimensions: human, environmental, and economic.** These represent separate and sometimes competing concerns that are frequently termed the “triple bottom line.”
- **Each dimension should be considered, but you need to set priorities.** While all three dimensions should be considered, sometimes you need to make one more important than the others based on the situation. In other words, when you get down to the nuts-and-bolts, you usually have to prioritize these dimensions rather than making them all equal. Consider what the National Park Services does: consider all three, but in some situations you prioritize ecosystems (think limited permits to raft the Grand Canyon) and in others you prioritize humans (think Old Faithful access).

The End Goal: A Sustainable Society

Our goal in pursuit of sustainability is to achieve a sustainable society: where we are all healthy and happy and living on a healthy planet. It is safe to say we have not achieved this yet. Certainly, in some form, our human activities are disrupting and degrading Earth’s natural processes, and we fall short of meeting every human’s basic needs. In 1989, Dr. Karl-Henrik Robèrt founded The Natural Step and provided a simple framework to define success in our pursuit of sustainability.

In a sustainable society, nature is not subject to systematically increasing ...

1. ... concentrations of substances from the earth’s crust (like fossil CO₂ and heavy metals).

2. ... concentrations of substances produced by society (like antibiotics and endocrine disruptors).
 3. ... degradation by physical means (such as deforestation and draining of groundwater tables).
- ... and in that society ...
4. ... there are no structural obstacles to people's health, influence, competence, impartiality, and meaning. (The Natural Step, n.d.)

That is a lofty, but worthy, set of goals.

Implications

Given its definition and end goals, there are several characteristics of sustainability that are worth mentioning.

Sustainability is a high-level strategy. Based on its definition, sustainability is the highest-level goal of an organization or project. It is not an add-on feature or something you can decide to do at the last minute. A typical starting point is with the business strategy itself (the economic dimension): simply put, a sustainable business strategy is one that allows the business to stay in business over the long term. But that only gets us part of the way there; we still must have happy and healthy people and a healthy planet.

Sustainability elevates the value of human and environmental health, and the long-term. Historically, these ideas have been given lower priorities when compared to first costs. However, evidence suggests there is substantial business value in (1) elevating environmental or social issues above what they used to be, and (2) considering impacts, costs, and benefits over the long term. Thus, while “sustainability” might mean “consider everything,” these ideas (human/environmental health, long-term) are emphasized.

There are priorities and trade-offs within sustainability. There is rarely a perfect solution that addresses every part of sustainability. Therefore, an organization sets goals and strategies (for instance, goals for safety, conservation, employee health) that are an expression of (1) which parts of sustainability that organization particularly values, (2) an order of precedence for those values, and (3) a plan to turn those values into action. In other words, consider everything, study the trade-offs, do what makes good sense.

Sustainability depends on the context. Priorities will vary depending upon a business's or project's context. What makes good sense in one context may not in another. Sustainability needs to be customized; it's not a one-size-fits-all solution.

Sometimes it is necessary to take sustainable actions without immediate payback. Examples we have done include investing in warm-mix asphalt foaming equipment well before it was in specifications. Another is investing in preparing product EPDs well before they are required.

— Dan Gallagher, Executive Vice President,
Gallagher Asphalt Corp.

Sustainability implies improvement. We should not be satisfied with negative impacts from the infrastructure we build, operate, and maintain. While reducing the harm caused by infrastructure is an admirable first step, the ultimate goal is for infrastructure to actually improve society and the environment. We should get better, and the goal should not be to just “do less bad,” the goal should be to “do good.”

Sustainability goes beyond the bare minimum. Regulations and standard practice are the bare minimum. They can be untimely, heavy handed, and impractical, and are generally meant to address problems and laggards. They do not drive innovation. If improvement is the required action, sustainability demands that we do better than the minimum. If an industry can be collectively proactive and go beyond the minimum, sometimes it can avoid cumbersome regulations altogether.

Sustainability constantly evolves. What was once exceptional or innovative ultimately becomes standard practice and regulation. As minimum standards are raised, sustainability actions must improve to stay ahead.

Sustainability must create value. To be a viable approach, sustainability must create value over the long term. If it is only a cost, we will only do it when we can spare the money, time and effort. In short, it will be too low on our list of priorities.

Addressing Sustainability as a Business

Organizations choose to embrace sustainability for reasons ranging from responsibility (for example, a moral obligation to humanity, or a duty to the planet) to a required project feature (for example, a request for quotation (RFQ) that asks for sustainability qualifications), to business opportunity (increase revenue and/or reduce costs or risks). Ideally, they can do them all: improve human and environmental health, meet project requirements, and realize business opportunities.

Sustainability as Charity

Perhaps the most noble approach is to be more sustainable for the greater good of society; the “it’s the right thing to do” argument. Much good has come from this approach, and it should be part of any organization or project. In general, this “greater good” reason, by itself, implies that impacts on humanity or the environment are the driving reason, while business impacts (good or bad) are not considered. Simply put, sustainability is charitable giving.

Sustainability as a Project Requirement

Owner agencies can and do ask for sustainability in asphalt pavement projects. This project sustainability can take several forms:

- **An evaluated “sustainability” or “environment” component on a best-value project.** Often, the pure sustainability portion, if present, of an RFQ is weighted somewhat lightly, or is rather open-ended.

- **Sustainability features required by specifications.** Examples include permeable pavement, minimum recycled content, safety/environmental training, stakeholder engagement, production quality control, and maximum working hours. Specified items are, obviously, mandatory, and are accounted for in contract price.
- **Sustainability features allowed by specification.** Examples include use of RAP and WMA. Generally, these are allowed by the owner and done only if they offer a business advantage to the contractor.

Motivation for the owner agency to ask for or allow sustainability features can be internal or external:

- **Internal: based on an owner's strategies and policies.** These often come from the public and are expressed in comprehensive plans or strategic plans. For instance, the City of Bothell, Washington, has a comprehensive plan (*Imagine Bothell...*) that states its sustainability vision in the introduction. This vision was used as motivation to pursue (and achieve) a Greenroads certification on its \$15.2 million SR 522 Bothell Crossroads project in 2015.
- **External: based on requests/demands from stakeholders.** These often come from public or private organization requests. For example, the Washington State DOT included noise reduction features on its \$1.34 billion SR 520 Floating Bridge and Landings project that went beyond regulatory requirements so that key stakeholders would support the project.

Sustainability as a Business Opportunity

Is sustainability really a business opportunity, or is it just charity? Well, a lot of writers think it is good business practice: a search for “business sustainability” on Amazon.com returns over 8,000 books. But beyond writers, actual businesses, including the best known in the world, address sustainability in a serious and direct way. Did you know:

- Microsoft achieved carbon neutrality in 2012. They claim their internal carbon fee — to hold business units accountable for emissions — saves them more than \$10 million per year. In 2013, they published a free “playbook” to help other businesses do the same.
- Starbucks is committed to hiring 25,000 veterans and military spouses (by 2025), as well as 10,000 refugees (by 2022).
- In 2016 the Ford Rouge Center (factory complex in Dearborn, Michigan) achieved landfill-free status. They do not send *any* waste to landfill from there.
- Walmart’s goal is to operate with 100% renewable energy. Their 2025 goal (18% reduction from 2015 levels) is approved by the Science Based Targets initiative and is in alignment with the Paris Climate Agreement.
- In 2016 and 2017 Apple issued \$2.5 billion in green bonds to further its goal of operating with 100% renewable energy.

Certainly, these are large, global companies. But advocacy for sustainable business practices applies to all business sizes. Fremont Brewing, a local Seattle craft brewery, claims “activism through beer.” For instance, they use a zero-waste production that gives their spent grain (about 10,000 lbs/day) to a farmer for livestock feed. Bob Willard, in his 2012 book, *The New Sustainability Advantage*, identifies the basic business opportunities for sustainability:

1. **Increased revenue and market share.** For instance, Turner construction, the largest green building builder in the U.S., has long stated, “Building green is good for us, good for our clients, and the right thing to do.” According to *ENR*, their 2017 green contracting revenue was \$5.5 billion (47% of their total revenue).
2. **Reduced expenses (energy, waste, materials, water, hiring/attrition).** For instance, Astec Industries (Brock & Richmond, 2007) points out the expense reduction associated with the recovered virgin aggregate and liquid asphalt in RAP, which they show as over \$5.00/ton in 2007 costs at 20% RAP.
3. **Increased employee productivity.** For instance, Pavia Systems and University of Washington research shows using Headlight®, a cloud-based mobile inspection platform, can improve inspector productivity by 25%.
4. **Reduced risks (strategic, operational, compliance, financial).** For instance, Granite Construction uses its Granite Management System (GMS) to manage and reduce compliance, safety, and quality risks. Systems like these have helped Granite to be recognized by the Ethisphere Institute as one of the *World’s Most Ethical Companies* in 2018 for the ninth consecutive year.

Insights on the Business Case for Sustainability

While advocacy is important, evidence is more compelling. Remember Fremont Brewing? They get multiple wins from their sustainability decisions. For instance, they package most of their beer in cans because (1) cans contain more recycled content than bottles, (2) cans weigh less than bottles so transportation costs are less, (3) cans preserve beer better than bottles, and (4) cans cost less than bottles. Looking at business in general, evidence suggests (1) sustainability is more profitable, and (2) to reap the benefits, a business must be committed to sustainability.

Businesses that address sustainability tend to be more successful and more profitable. For example, three authors from the Harvard Business School (Eccles, Ioannou, & Serafeim) in a 2011 paper describe “Low Sustainability” firms as ones that address social and environmental issues primarily by adhering to regulation, while they describe “High Sustainability” firms as ones that pay attention to social and environmental issues beyond regulatory requirements. What they found was that “high sustainability” firms outperformed “low sustainability” ones in terms of both stock market and accounting measures, *but only in the long term* (see Figure 1). Sustainability is an advantage, but businesses and investors must be patient and in it for the long term.

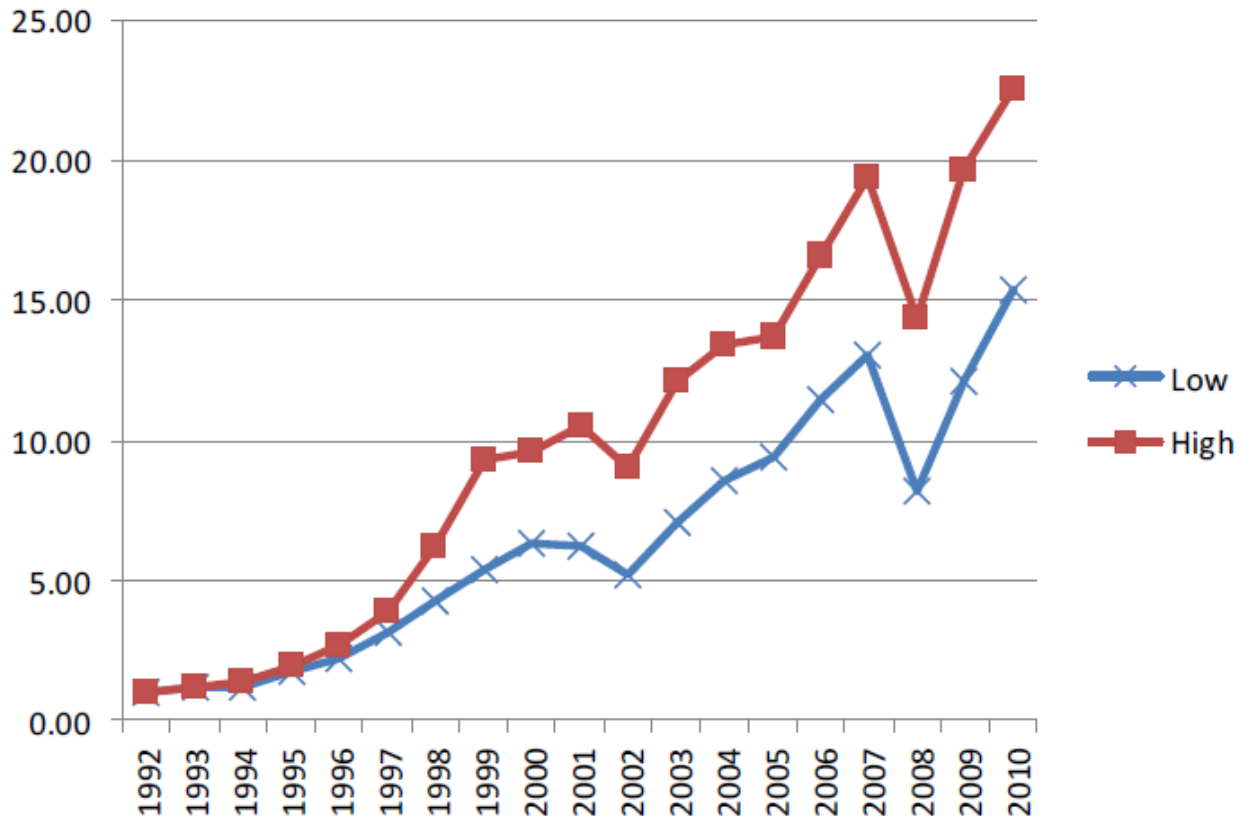


Figure 1. Evolution of \$1 invested in the stock market in value-weighted portfolios (from Eccles, Ioannou & Serafeim, 2011).

Organizational culture is critical for sustainability commitment. Certain aspects of an organization’s culture make a difference in an organization’s commitment to sustainability. An Australian study (Pennington, 2014) found these to be: connectedness, proactive, environmental/social integrity, innovation and creativity, collaboration with stakeholders, and transparency and openness/trust. In other words, commitment to sustainability is rooted in an organization’s culture: their collective values, beliefs, and principles. It is not enough to advertise a commitment to sustainability through procedures and marketing.

Summary

“Sustainability” refers to the idea of meeting human needs while maintaining a healthy planet over the long term. A simple way to translate this idea to your business and/or project actions is that “sustainability” asks you to (1) go above-and-beyond the standard/minimum, or (2) show innovation in meeting standards/minimums. This means sustainability implies improvement, constantly evolves, and its specifics depend on the situation. For a business, sustainability efforts must create value, otherwise we will only do it in the best of times: when we have the money, time, and effort to give.

In the asphalt industry, one may encounter sustainability as charity (doing it for the “greater good” regardless of the bottom line), a project requirement asked for by an owner (asked for in a contract, or required/allowed by specification), or a business opportunity.

As charity, sustainability is essentially a donation. It may be support for a particular non-profit organization, volunteer work, or community involvement. Most view this type of work as rewarding, fulfilling, and an essential component of a business that is a good member of the community.

As a project requirement, sustainability may be asked for by the owner on a specific project. This is often through RFQ language and/or specifications. In these cases, it is beneficial to be current and credentialed with sustainability rating systems, or other third-party standards to lend credibility to your claimed expertise.

As a business opportunity, sustainability can (1) increase revenue and market share, (2) reduce expenses, (3) increase employee productivity, and (4) reduce risks. Addressing sustainability also helps a business align itself with the long-term interests of its stakeholders. There are many examples of the best-known companies in the world dedicating substantial resources to sustainability efforts. There are also many examples of how it can and is being done in the asphalt industry. There is also some pretty compelling evidence that businesses that address sustainability tend to be more successful and profitable over the long term.

In sum, these are compelling arguments for a business or project to address sustainability. But there is a catch in realizing the benefits: you must mean it. It is not enough to advertise a commitment to sustainability if the business or project culture does not embrace it at every level.

In recent years the industry has recognized and made improvements in environmental, safety and business performance by learning more about sustainable concepts. The next step for the industry is to plan a path to a net zero footprint with reasonable expectations in terms of timing. Not long ago I would have thought it may be 50–100 years in the future, but today I believe it will be much sooner because of rapid advancements in technology.

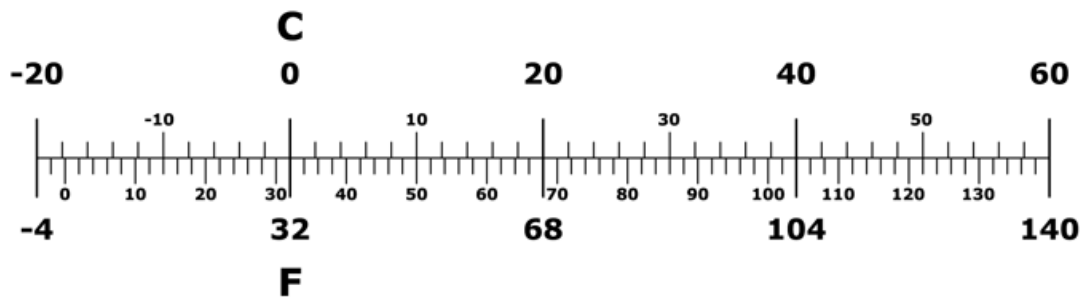
— Craig Parker, Executive VP
Silver Star Construction Co., Inc.

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SI* (MODERN METRIC) CONVERSION FACTORS

APPROXIMATE CONVERSION TO SI UNITS					APPROXIMATE CONVERSION FROM SI UNITS				
Symbol	When You Know	Multiply by	To Find	Symbol	Symbol	When You Know	Multiply by	To Find	Symbol
LENGTH					LENGTH				
in	inches	25.4	millimeters	mm	mm	millimeters	0.039	inches	in
ft	feet	0.305	meters	m	m	meters	3.28	feet	ft
yd	yards	0.914	meters	m	m	meters	1.09	yards	yd
mi	miles	1.61	kilometers	km	km	kilometers	0.621	miles	mi
AREA					AREA				
in ²	square inches	645.2	square millimeters	mm ²	mm ²	square millimeters	0.0016	square inches	in ²
ft ²	square feet	0.093	square meters	m ²	m ²	square meters	10.764	square feet	ft ²
yd ²	square yards	0.836	square meters	m ²	m ²	square meters	1.196	square yards	yd ²
ac	acres	0.405	hectares	ha	ha	hectares	2.47	acres	ac
mi ²	square miles	2.59	square kilometers	km ²	km ²	square kilometers	0.386	square miles	mi ²
VOLUME					VOLUME				
fl oz	fluid ounces	645.2	milliliters	mL	mL	milliliters	0.034	fluid ounces	fl oz
gal	gallons	3.785	liters	L	L	liters	0.264	gallons	gal
ft ³	cubic feet	0.028	cubic meters	m ³	m ³	cubic meters	35.315	cubic feet	ft ³
yd ³	cubic yards	0.765	cubic meters	m ³	m ³	cubic meters	1.308	cubic yards	yd ³
NOTE: Volumes greater than 1000 L should be shown in m ³									
MASS					MASS				
oz	ounces	28.35	grams	g	g	grams	0.035	ounces	oz
lbs	pounds	0.454	kilograms	kg	kg	kilograms	2.205	pounds	lbs
T	short tons	0.907	megagrams	Mg	Mg	megagrams	1.102	short tons	T
T	short tons	0.907	metric tonnes	t	t	metric tonnes	1.102	short tons	T
NOTE: A short ton is equal to 2,000 lbs					NOTE: A short ton is equal to 2,000 lbs				
TEMPERATURE (exact)					TEMPERATURE (exact)				
°F	Fahrenheit	$\frac{5(F-32)}{9}$	Celsius	°C	°C	Celsius	$(1.8 \times C) + 32$	Fahrenheit	°F



*SI is the symbol for the International System of Units

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