

Deliverable C: Survey Results Summary

INTERIM DELIVERABLE

Prepared for
NCHRP
Transportation Research Board
of
The National Academies of Sciences, Engineering, and Medicine

TRANSPORTATION RESEARCH BOARD OF THE NATIONAL ACADEMIES OF SCIENCES,
ENGINEERING, AND MEDICINE
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1 INTRODUCTION

This report summarizes the results of the survey conducted as Task 2.1 for NCHRP Project 10-91A Sustainable Highway Construction. The goals of this survey are to (1) generate leads for potential inclusion in the interview process and/or workshop, and (2) capture some basic information on perceptions of sustainability within the highway construction industry. Since the survey distribution was not random, or purposefully equally distributed amongst categories of respondents, conclusions about the industry based on the survey are limited to very general statements or speculation.

1.1 GENERAL SURVEY DESCRIPTION

Appendix A contains the survey text. The survey is designed to take less than 10 minutes to complete and collect from each participant (1) basic demographics, (2) general views on sustainability, and (3) sustainable construction practices with which they are familiar. Importantly, we wanted to try and capture their particular view of sustainability and whether or not they felt their organization valued sustainability. This meant that we could not impose the definition of sustainability used for this project until after they gave this information. Rather than impose it with a strict definition (which may discourage or alienate respondents who would view such a definition as what we would define as the “correct answer”), we asked respondents about sustainable construction practices (SCPs) they were familiar with and used categorical prompts to get them to think broadly about sustainability.

1.2 SURVEY PLATFORM

The survey was administered using SurveyGizmo (www.surveygizmo.com), an online subscription-based application.

1.3 SURVEY DATA

Complete survey data can be supplied by the project team in Excel format if needed. This report only discusses summary results.

2 DESCRIPTIVE DATA

Table 1. Survey Descriptive Data

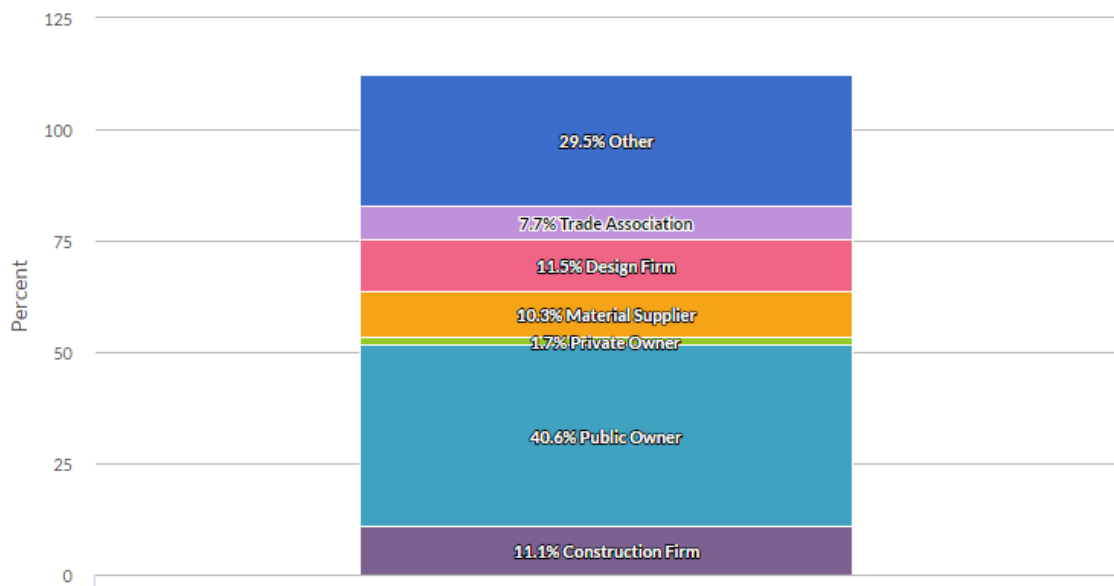
Descriptor	Data
Total Responses (total number of surveys taken, complete or not)	367
Completed surveys (number of surveys completely filled out)	141
Partial completions (number of surveys that were not completely filled out but still used in the analysis of survey results)	226
Availability (when the survey is available to be taken)	3/9/17 - present
Average response rate per day	5.94/day
Agreed to be contacted for interviews and workshop participation	124 (34%)
Mean and Median time to complete survey (367 respondents)	23 min / 5 min
Best estimate of time to take entire survey	8-10 minutes

3 QUESTION RESPONSE SUMMARY DATA

3.1 DEMOGRAPHICS

3.1.1 Respondents' Organizational Roles

Respondents can select more than one category. There is a good mix of survey respondents by industry role (Figure 1). The “other” category contains those in government, academia, research, other consulting, technology/software, and other aspects of engineering. As expected, construction firms are hard to reach. Of note, about 90% of the public owner responses were from state DOTs.



Value	Percent	Responses
Construction Firm	11.1%	26
Public Owner	40.6%	95
Private Owner	1.7%	4
Material Supplier	10.3%	24
Design Firm	11.5%	27
Trade Association	7.7%	18
Other	29.5%	69

Figure 1. Respondents' organization's role in the engineering/construction industry.

3.1.2 Respondent Organizational Size

For those organizations that have annual revenue (i.e., not public owners), all sizes (as defined by the U.S. Small Business Administration) are represented. As expected, the “midsized” definition (\$36.5 million - \$1 billion for contractors/materials suppliers and \$15 million - \$1 billion for designers/consultants) describes most respondent organizations.

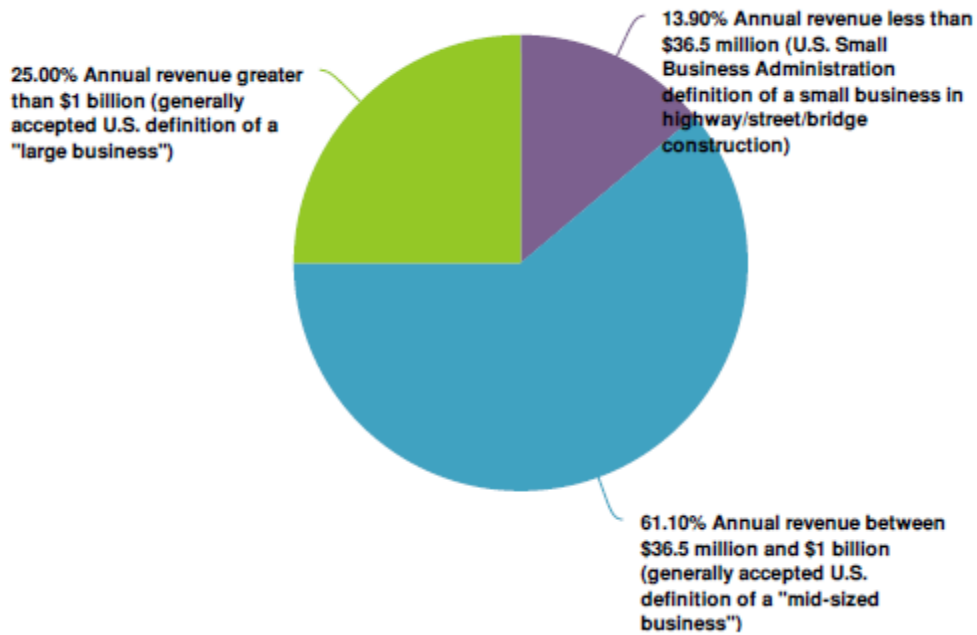


Figure 2. Organization revenue for construction firms/materials supplier respondents.

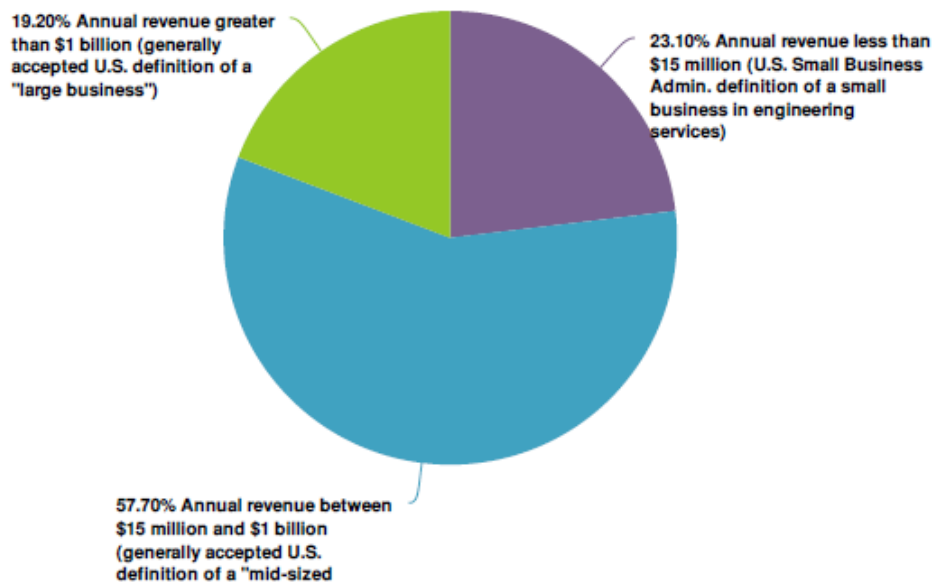


Figure 3. Organization revenue for designer firms and other consultants.

3.1.3 Respondent Job Categories

There was a good mix of respondent job categories (as defined by the Equal Employment Opportunity Commission). We are especially happy about the 64 responses identified as official/executive.

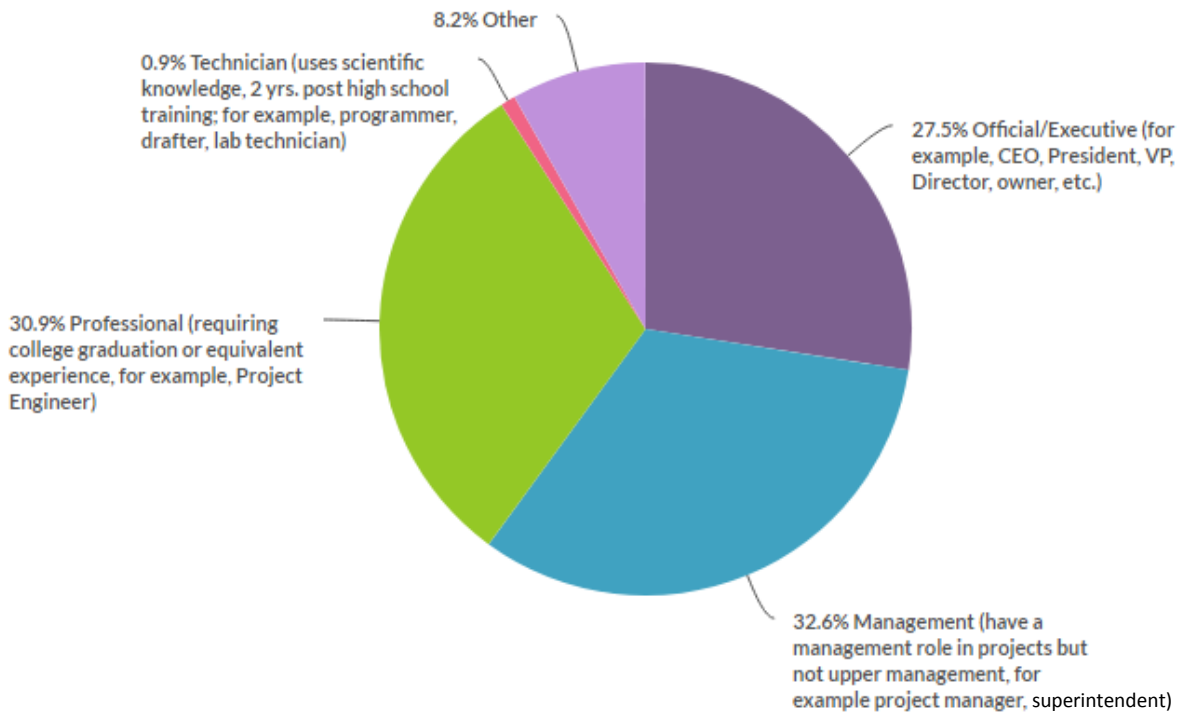


Figure 4. Respondent job categories.

3.1.4 Geographic Diversity

Respondent organizations do work in each of the U.S. DOT regions (Figure 5) as well as 22.9% doing work internationally (Figure 6). Each are represented by at least 50 responses. Many organizations do work in multiple regions.

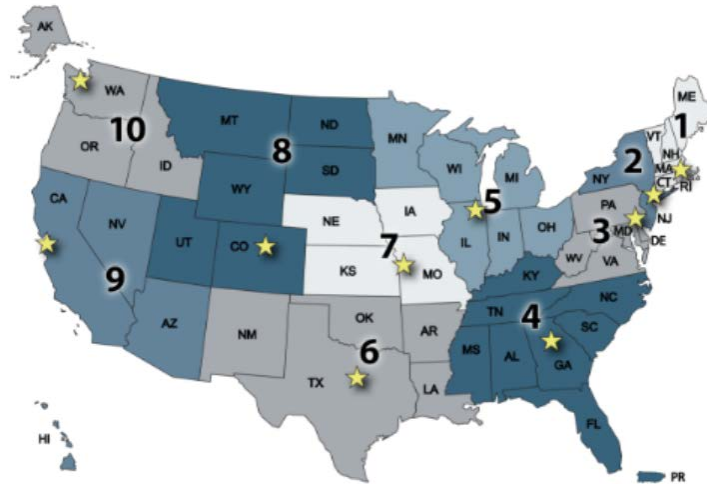


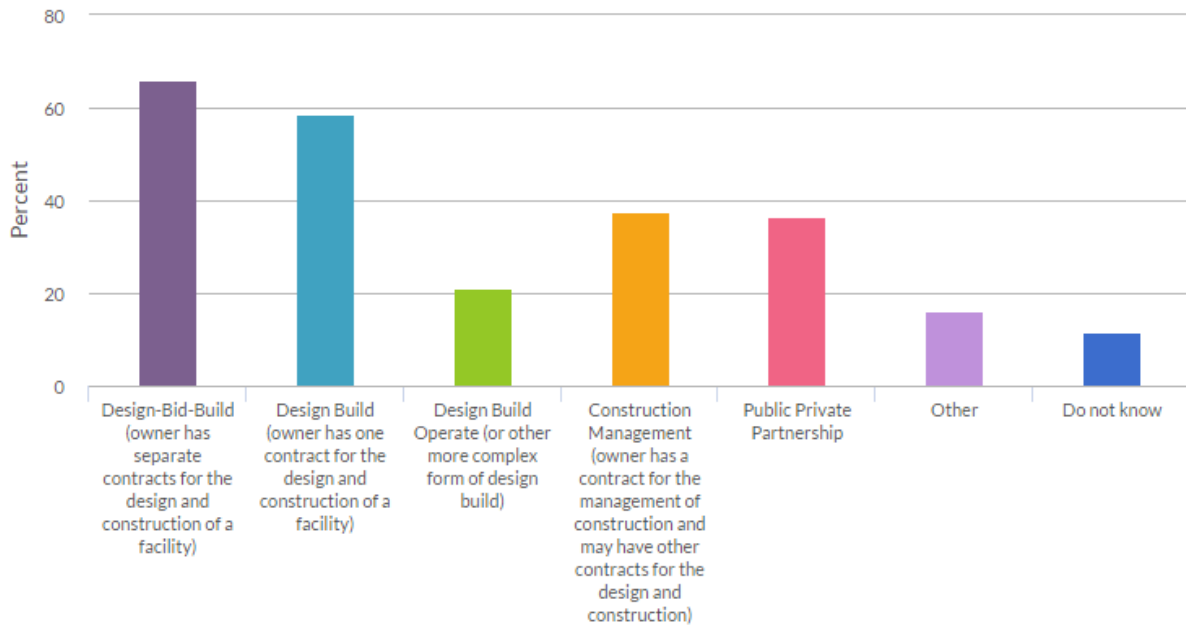
Figure 5. U.S. DOT regions.

Value	Percent	Responses
Region 1- Connecticut, Massachusetts, Maine, New Hampshire, Rhode Island	25.1%	58
Region 2- New York, New Jersey	26.4%	61
Region 3- Delaware, District of Columbia, Maryland, Pennsylvania, Virginia and West Virginia	34.6%	80
Region 4- Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee, The Commonwealth of Puerto Rico and the United States Virgin Islands	33.3%	77
Region 5- Illinois, Indiana, Minnesota, Michigan, Ohio and Wisconsin	35.5%	82
Region 6- Arkansas, Louisiana, New Mexico, Oklahoma and Texas	29.4%	68
Region 7- Iowa, Kansas, Missouri and Nebraska	21.6%	50
Region 8- Colorado, Montana, North Dakota, South Dakota, Utah and Wyoming	25.5%	59
Region 9- Arizona, California, Hawaii, Nevada, Guam, American Samoa and North Marianas	26.8%	62
Region 10- Alaska, Idaho, Oregon and Washington	23.8%	55
International (outside the U.S.)	22.9%	53

Figure 6. Areas where respondents' organization do work.

3.1.5 Project Delivery Systems Involved With

Respondents were involved with a broad range of project delivery systems (Figure 7). As expected, design-bid-build was most popular followed by design-build.



Value	Percent	Responses
Design-Bid-Build (owner has separate contracts for the design and construction of a facility)	66.1%	150
Design Build (owner has one contract for the design and construction of a facility)	58.6%	133
Design Build Operate (or other more complex form of design build)	21.1%	48
Construction Management (owner has a contract for the management of construction and may have other contracts for the design and construction)	37.4%	85
Public Private Partnership	36.6%	83
Other	16.3%	37
Do not know	11.5%	26

Figure 7. Respondent project delivery system use.

Table 2 indicates various other project delivery methods mentioned by the participants apart from the options mentioned above.

Table 2. Other Project Delivery Systems Indicated by Respondents

Count	Project Delivery System
2	Research
1	Bid-Build Contract
1	Construction Manager/General Contractor
1	Consulting Engineer
1	Contracted R&D, services provided
1	Design Evaluation, Public Participation, Environmental Impact
1	Design, specifications, training
1	I do not have experience with project delivery systems
1	IDIQ, D-B-B Best Value
1	Job Order Contracting (ID/IQ)
1	Laboratory
1	Local Assistance
1	Low bid
1	Material supplier of various delivery systems.
1	Perhaps same as Public Private Partnership, which was not defined. Most common type with state DOTs where owner designs project, contractors build the project.
1	Project promotion and technical support
1	Research - no design or construction
1	Research Report
1	Research and Design Services

3.2 VIEWS ON SUSTAINABILITY

We asked respondents some basic questions on their views of sustainability including their definition, how they think their organization values sustainability, and two level-of-importance questions that come from previous studies.

3.2.1 Sustainability Definition

We asked participants to define sustainability in their own words. We received 182 responses. Of note:

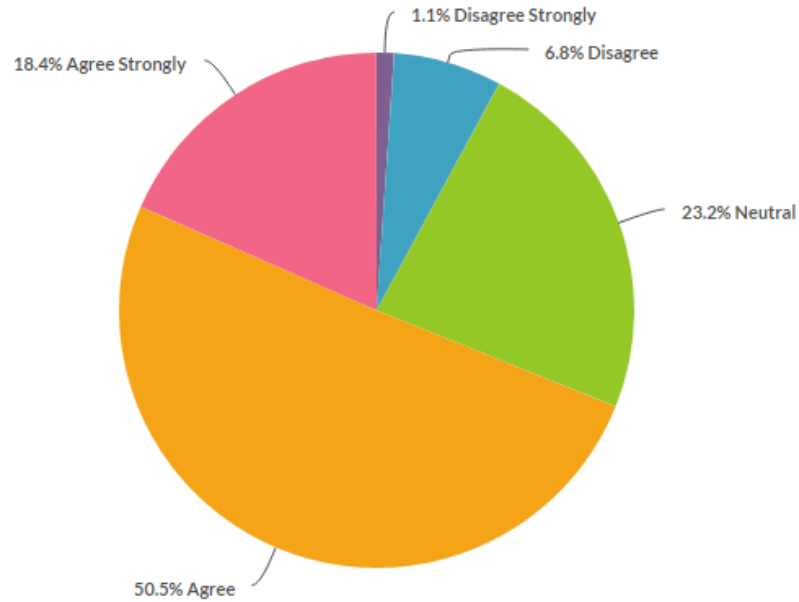
- 38 specifically mentioned some form of human wellbeing
- 85 specifically mentioned some form of environmental wellbeing
- 55 specifically mentioned some form of economic wellbeing
- Many responses implied some combination of human/environmental/economic wellbeing but did not specifically mention them. For example, a Brundtland Commission definition does this.
- 22 presented a version of the standard Brundtland Commission sustainable development definition (“Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.”)
- 5 specifically mentioned “triple bottom line” as a way to refer to three common components of sustainability (human, environment, economic).

We noted several trends that will be useful in targeting the Guidebook to intended industry audience:

- 26 responses specifically mentioned reducing consumption in some way. Many others implied reduced consumption as being part of sustainability. This is a generally recurring theme in sustainability across the infrastructure industry and is not limited to construction or any other sub-category.
- 57 responses directly referred to durability and endurance concepts (long-life, lasts a long time, etc.). This seems to be a strong sentiment amongst the respondents. Several specifically stated durability/long-life issues with minimal maintenance were more important than more popular definitions of sustainability that typically lean towards environmental stewardship.
- 5 responses defined “sustainability” to refer to the sustainability of infrastructure assets specifically. For example, their durability, the ability to maintain them in good condition, their ability to serve their intended purpose. This is a legitimate definition and one that may have more traction with the intended Guidebook audience.
- When responses discussed impacts of highway projects (to humans, environment, economy) they almost unanimously discussed reducing negative impacts. This may be a product of our current technological abilities, but few mentioned highway projects being able to improve much. To some degree the improvement is implied; at least for the intended purpose of the facility.

3.2.2 Sustainability as a Core Value or Participant Organization/Company

We asked participants to indicate their level of agreement with the statement, “Sustainability is a core value of my organization/company.” (Figure 8). A majority agreed, with very few selecting “disagree” or “disagree strongly”.



Value	Percent	Responses
Disagree Strongly	1.1%	2
Disagree	6.8%	13
Neutral	23.2%	44
Agree	50.5%	96
Agree Strongly	18.4%	35
		Total: 190

Figure 8. Respondents' level of agreement with the statement "Sustainability is a core value of my organization/company."

3.2.3 Motivations for Sustainability

We asked participants to rank order five motivations for sustainability as identified in a previous study (Figure 9). "Optimization of life-cycle cost of highway infrastructure" emerged as the clear top rank, and "reduction of waste at all levels of organization in highway construction projects" was the clear lowest rank, while other motivations were quite close together in the middle.

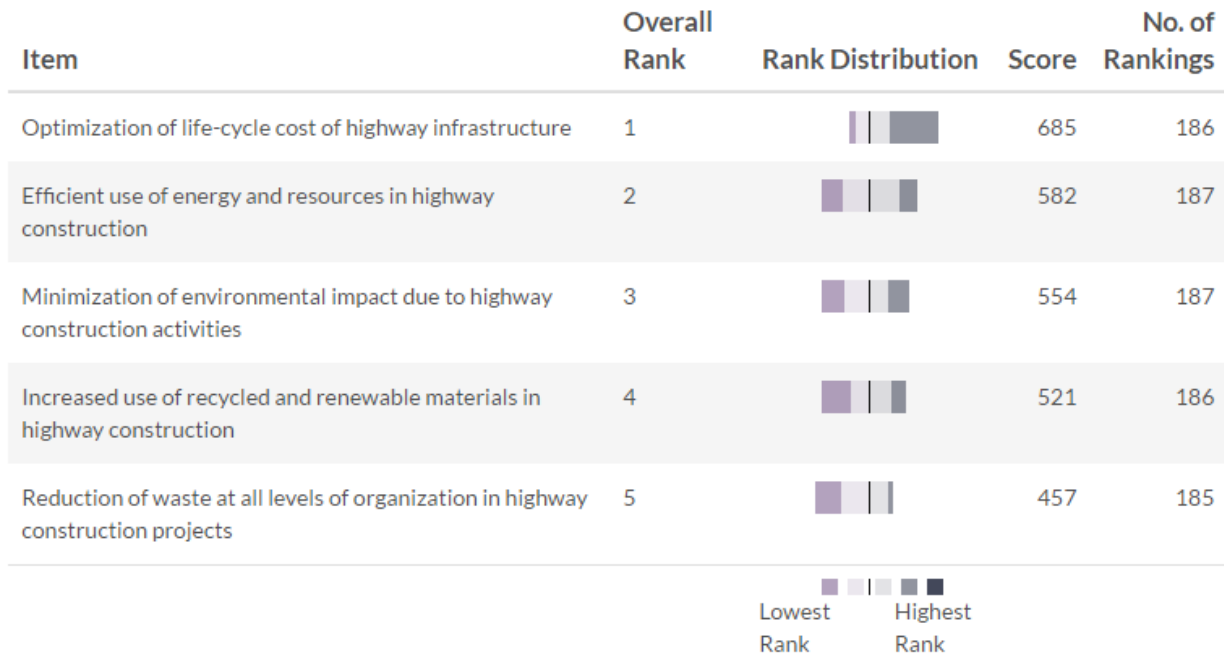


Figure 9. Overall rank order of five different motivations for sustainability.

3.2.4 Negative Impacts from Construction Activities

We asked participants to rank order five negative impacts from construction activities as identified in a previous study (Figure 10). The top three items were ranked very close on aggregate (impact to human health, air pollution, water quality degradation), while the remaining two (impact on biodiversity, impact on human comfort) were ranked substantially lower.

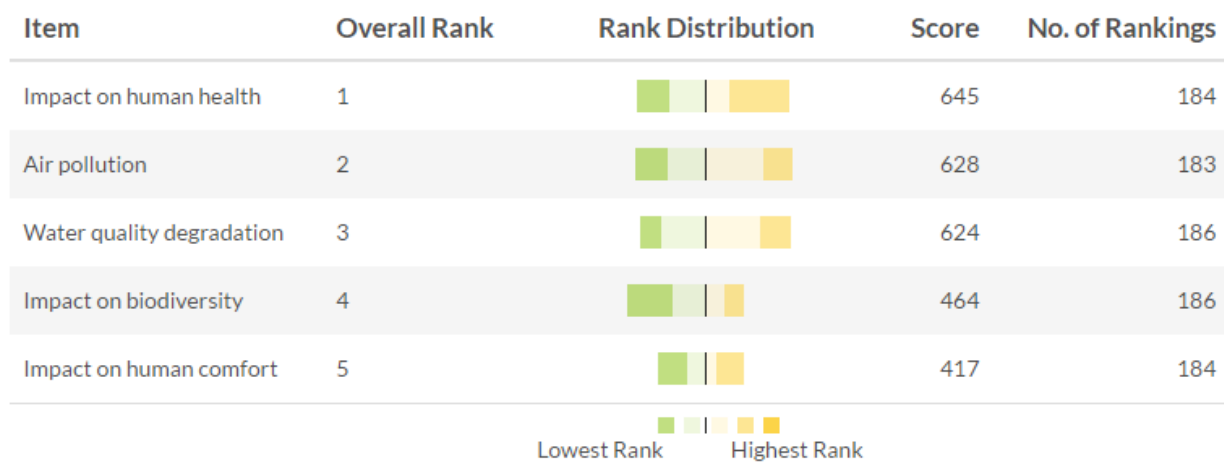


Figure 10. Overall rank order of five different negative impacts from construction activities.

3.3 SUSTAINABLE PRACTICES

Participants were asked to identify sustainable practices in different construction topics. These topics were listed and grouped together to prompt respondents to consider all of these areas, some of which are not traditionally considered to address sustainability. In all, we received 340 meaningful responses (summarized in Table 3). In some cases, a single response was classified in more than one category for Table 3. Groupings presented in the survey are (number in parentheses is the number of responses we received in that grouping):

Sustainable practices in these organizational areas? (58 responses)

Organizational strategy and culture
Policies and programs
Human Resources
Marketing

Sustainable practices in these project delivery areas? (66 responses)

Contract type
Pricing method
Project delivery method
Project selection criteria
Materials and project procurement
Contract provisions

Sustainable practices in these project administration areas? (50 responses)

Project administration
Scheduling
Estimating
Public outreach

Sustainable practices in these project areas? (79 responses)

Earthwork
Drainage/sewer/water
Structures
Paving
Landscaping
Materials/energy

Sustainable practices in these project areas? (45 responses)

Traffic control and signalization
Safety
Constructability

Is there a sustainability-related innovation or practice that does not fit in the previous areas? If so, please describe it here. (25 responses)

We also asked the following questions about SCP outcomes:

Please describe an example where a supposed sustainable solution failed to produce the desired outcome. (53 responses)

Please describe something that your organization did or participated in that you believed to be sustainable, but it was never described or recognized as sustainable. (36 responses)

Please describe a time when your organization was rewarded in any way for doing something sustainable on a project. Some examples might be (39 responses):

- It helped you or your organization get extra points for technical merit on a best value contract
- It contributed to the project receiving an award (for example, from a trade/professional association)
- It contributed to the project being certified by a rating organization/authority (for example, LEED, Greenroads, INVEST, Envision)

We are satisfied with the number and range of responses. We think our choice of how to ask for SCPs (ask the respondents to think about them in six limited subcategories with included examples) helped elicit a broad set of responses than we would have otherwise received. We also believe our method of asking influenced what respondents wrote (at least to some degree) so it is inappropriate to view these responses as unprompted. Because our primary goal was to collect SCPs, and not to conduct a statistically valid sampling poll, we are satisfied with this outcome.

Observations are:

- The range and number of responses was influenced by the respondents' organization's role in the highway construction industry.
- Materials is the most popular SCP category with 31% of the responses. Materials had the most responses regarding SCPs, failures, unrecognized SCPs, and rewarded SCPs.
- The second-highest SCP category was policy/program with 9% of the responses, which is significantly less popular than materials.
- With only 62 total responses, recognition and lack of recognition was not a significant concern for most respondents.
- It is likely that SCPs tend to work when implemented. 340 SCPs were identified by respondents but only 53 failures were identified. While there was no question that specifically asked about failure rate, the relative response numbers are indicative of SCPs tending to work.

Table 3. Summary of SCP Survey Responses

Level ^a	Category ^a	SCPs ^b	Failed ^c	Not recognized ^d	Rewarded ^e	TOTAL ^f
Program	Org. Strategy/Culture/Ex. Support	14		1	1	16
	Policy/Program	31	3	4	5	43
	Human Resources	6				6
	Environmental Management Syst.	18	1	1	3	23
Project Delivery	Project Delivery Method	17			1	18
	Project Procurement	10		1	1	12
	Contracting	7		1		8
Project	Scheduling	4				4
	Estimating	3				3
	Project Controls	7				7
	Contract Administration	15			1	16
	Earthwork	11	2	2		15
	Drainage/Sewer/Water	13	5	1	1	20
	Structures (Aesthetics)	0	1		1	2
	Structures (Bridges)	3		2	3	8
	Structures (Walls)	1	1	1		3
	Pavement	8	4	2	4	18
	Work Zone Traffic Control	24				24
	Materials	98	31	11	8	148
	Safety	10				10
	Employment	10	1		2	13
	Training	6	2			8
	Public Outreach	22				22
	Noise	4	1			5
Light	1			1	2	
Design for Constructability	25	1	2	1	29	

Notes:

- a. Level and category are taken from the “Framework for Highway Construction” as presented in Section 2.4.2 of the Literature Review.
- b. Sustainable Construction Practices (SCPs). This summarizes the number of responses in each category of the Framework for Highway Construction for all questions asking respondents about SCPs in various groupings.
- c. Examples where a supposed sustainable solution failed to produce the desired outcome.
- d. Something done believed to be sustainable, but it was never described or recognized as sustainable.
- e. Instances where an organization was rewarded for doing something sustainable on a project.
- f. The total number of times a category was addressed in all the SCP questions. This is a gross indication of prominence or popularity of categories.

APPENDIX A: SURVEY TEXT

Sustainable Highway Construction Practices

Welcome to the survey

NCHRP

Thank you for taking the time to participate. This survey is being conducted in conjunction with the [National Highway Research Program \(NCHRP\) Project 10-91A, which is titled "Sustainable Highway Construction."](#) We want to ask you a few questions about sustainability and how it relates to construction. We want to know what you think (good or bad), as well as what you have done, seen, or heard about. Even if you have not directly participated in highway/street construction, we still want to hear from you.

The survey should take less than 10 minutes.

The survey will cover the following items:

- Demographics. A little bit of information about you and the organization within which you work.
- Personal and organizational association with sustainability. Describe what "sustainability" means to you.
- Sustainability in highway construction practices. Describe those practices you have done, seen, or heard about that might be considered sustainable.

Informed Consent

This is the official version of what we are required to tell you about your participation in the survey.

Lead Researcher: Dr. Steve Muench,
Civil and Environmental Engineering, University of Washington, Seattle WA
(206) 616-1259
stmuench@uw.edu

Researchers' statement

We are asking you to be in a research study. The purpose of this consent form is to give you the information you will need to help you decide whether to be in the study or not. Please read the form carefully. You may ask questions (send to Dr. Steve Muench at stmuench@uw.edu) about the purpose of the research, what we would ask you to do, the possible risks and benefits, your rights as a volunteer, and anything else about the research or this form that is not clear. When we have answered all your questions, you can decide if you want to be in the study or not. This process is called "informed consent."

PURPOSE OF THE STUDY

The objectives of this research are to (1) identify effective sustainability practices that can be implemented during the construction of highway projects, and (2) prepare a guidebook that can be used by owners, contractors, and designers to aid them in identifying, evaluating, and selecting these sustainable construction practices.

STUDY PROCEDURES

For this research, you are being asked to take an online survey (estimated at

You may refuse to answer any of the questions we ask. You may also decide to stop participating during or after answering questions. Up to one month after providing answers, you may request that any answers you may have provided will be removed from the research database. After this time we will have removed all identifiable information from the data, meaning we will no longer be able to identify which answers you provided. Everything that you say will be confidential, and your identity will never be reported along with any research publications or reports.

RISKS, STRESS, OR DISCOMFORT

We do not anticipate any risks resulting from your participation in this study. However, it is likely that other contractors or agencies will learn about the sustainability practices you describe to us.

BENEFITS OF THE STUDY

There are no individual benefits to you for participating in this study. However, your participation will help define and disseminate best practices in sustainability for highway construction, which may have a significant positive impact on society and the environment.

SOURCE OF FUNDING

The study team is funded by the National Cooperative Highway Research Program (NCHRP) for the conduct of this project.

CONFIDENTIALITY OF RESEARCH INFORMATION

All of the information you provide will be confidential, and any links to your identity will be deleted one month after data collection. However, if we learn that you intend to harm yourself or others, we must report that to the authorities.

OTHER INFORMATION

You may refuse to participate and you are free to withdraw from this study at any time without penalty or loss of benefits to which you are otherwise entitled.

REQUIRED FINANCIAL INTEREST DISCLOSURE

One University of Washington researcher, Dr. Steve Muench, has appropriately disclosed his financial interest in the Greenroads Foundation, a collaborator in this research and a privately held not-for-profit entity formed with Intellectual Property licensed from the University of Washington. Dr. Muench is a Founder and Board Member of the Greenroads Foundation, services for which he has received no compensation since the company's inception in August 2010.

Section 1: Demographics

We want to gather some information about your organization and where/how it works with highway construction.

Logic: Show/hide trigger exists.

1) Which of the following most accurately explains your organization's role in the Engineering/Construction Industry?

You may select more than one if you or your organization has more than one role on the list. For instance, some construction firms are also material suppliers.

- Construction Firm
- Public Owner
- Private Owner
- Material Supplier
- Design Firm
- Trade Association
- Other

Logic: Hidden unless: Question "Which of the following most accurately explains your organization's role in the Engineering/Construction Industry?"

You may select more than one if you or your organization has more than one role on the list. For instance, some construction firms are also material suppliers." #1 is one of the following answers ("Other")

2) You answered "other" in the previous question. Please describe the type of organization you are associated with.

Logic: Hidden unless: Question "Which of the following most accurately explains your organization's role in the Engineering/Construction Industry?"

You may select more than one if you or your organization has more than one role on the list. For instance, some construction firms are also material suppliers." #1 is one of the following answers ("Construction Firm", "Material Supplier")

3) Please indicate the size of your organization:

Annual revenue less than \$36.5 million (U.S. Small Business Administration definition of a small business in highway/street/bridge construction)

Annual revenue between \$36.5 million and \$1 billion (generally accepted U.S. definition of a "mid-sized business")

Annual revenue greater than \$1 billion (generally accepted U.S. definition of a "large business")

Logic: Hidden unless: Question "Which of the following most accurately explains your organization's role in the Engineering/Construction Industry?"

You may select more than one if you or your organization has more than one role on the list. For instance, some construction firms are also material suppliers." #1 is one of the following answers ("Design Firm", "Consultant (but not an Architecture/Engineering Firm)")

4) Please indicate the size of your organization:

Annual revenue less than \$15 million (U.S. Small Business Admin. definition of a small business in engineering services)

Annual revenue between \$15 million and \$1 billion (generally accepted U.S. definition of a "mid-sized business")

Annual revenue greater than \$1 billion (generally accepted U.S. definition of a "large business")

Logic: Hidden unless: Question "Which of the following most accurately explains your organization's role in the Engineering/Construction Industry?"

You may select more than one if you or your organization has more than one role on the list. For instance, some construction firms are also material suppliers." #1 is one of the following answers ("Public Owner")

5) For which type of public owner do you work?

- Federal Government (USDOT, FHWA, FTA, EPA, etc.)
- State Department of Transportation
- City, County, Metropolitan Planning Org. or other local government entity
- Other

Logic: Show/hide trigger exists.

6) What kind of position do you hold in your organization?

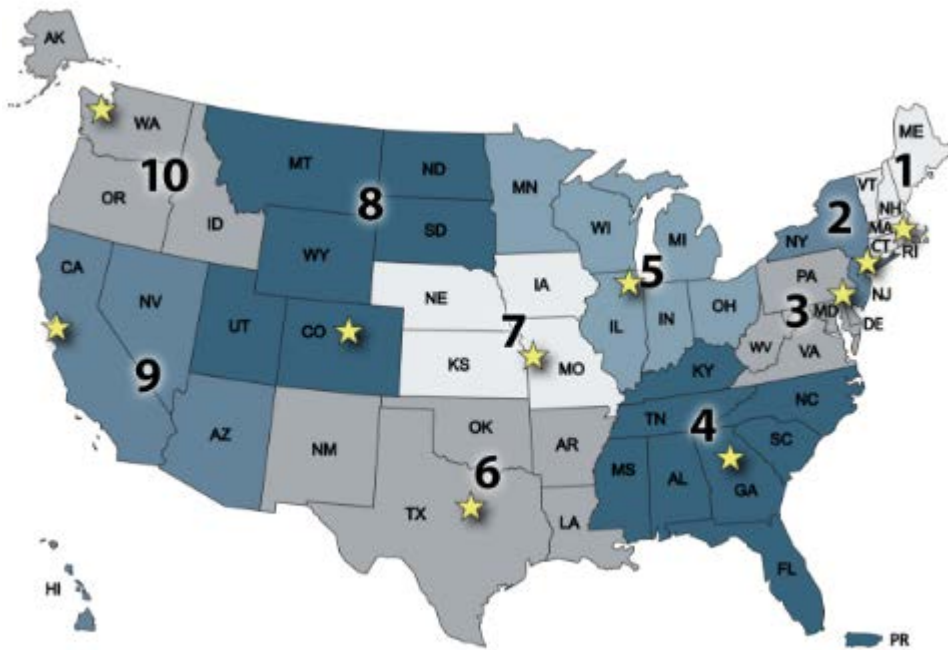
We have listed relevant categories as they are defined by the Equal Employment Opportunity Commission.

- Official/Executive (for example, CEO, President, VP, Director, owner, etc.)
- Management (have a management role in projects but not upper management, for example project manager, superintendent)
- Professional (requiring college graduation or equivalent experience, for example, Project Engineer)
- Craft Worker (manual workers of high skill/knowledge; for example, carpenter, ironworker, equipment operator, etc.)
- Technician (uses scientific knowledge, 2 yrs. post high school training; for example, programmer, drafter, lab technician)
- Other

Logic: Hidden unless: Question "What kind of position do you hold in your organization? We have listed relevant categories as they are defined by the Equal Employment Opportunity Commission." #6 is one of the following answers ("Other")

7) You answered "other" in the previous question. Please describe the position you hold within your organization.

8) Please indicate where your organization does work (choose all that



apply).

- Region 1- Connecticut, Massachusetts, Maine, New Hampshire, Rhode Island
- Region 2- New York, New Jersey
- Region 3- Delaware, District of Columbia, Maryland, Pennsylvania, Virginia and West Virginia
- Region 4- Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee, The Commonwealth of Puerto Rico and the United States Virgin Islands
- Region 5- Illinois, Indiana, Minnesota, Michigan, Ohio and Wisconsin
- Region 6- Arkansas, Louisiana, New Mexico, Oklahoma and Texas
- Region 7- Iowa, Kansas, Missouri and Nebraska
- Region 8- Colorado, Montana, North Dakota, South Dakota, Utah and Wyoming

- Region 9- Arizona, California, Hawaii, Nevada, Guam, American Samoa and North Marianas
- Region 10- Alaska, Idaho, Oregon and Washington
- International (outside the U.S.)

Logic: Show/hide trigger exists.

9) Please select the project delivery systems with which you are involved or have been involved professionally (Check all that apply).

- Design-Bid-Build (owner has separate contracts for the design and construction of a facility)
- Design Build (owner has one contract for the design and construction of a facility)
- Design Build Operate (or other more complex form of design build)
- Construction Management (owner has a contract for the management of construction and may have other contracts for the design and construction)
- Public Private Partnership
- Other
- Do not know

Logic: Hidden unless: Question "Please select the project delivery systems with which you are involved or have been involved professionally (Check all that apply). " #9 is one of the following answers ("Other")

10) You answered "other" for the previous question. Please describe the type of project delivery system you are thinking of that we did not have listed.

Logic: Show/hide trigger exists.

11) May we contact you about your survey results?

One of our chief aims for this survey is to identify people that may be able to contribute further to this research. Specifically, we are looking for individuals that would be willing to:

Be interviewed by the research team (either in-person or remotely) for no more than 30 minutes on the topic of sustainable construction.

Attend a 1-day workshop on sustainable highway construction in Irvine, CA at the [Beckman Center](#) on November 13th, 2017.

Saying that we may contact you in no way commits you to either of these activities.

Yes

No

Logic: Hidden unless: Question "May we contact you about your survey results?"

One of our chief aims for this survey is to identify people that may be able to contribute further to this research. Specifically, we are looking for individuals that would be willing to:

Be interviewed by the research team (either in-person or remotely) for no more than 30 minutes on the topic of sustainable construction.

Attend a 1-day workshop on sustainable highway construction in Irvine, CA at the [Beckman Center](#) on November 13th, 2017.

Saying that we may contact you in no way commits you to either of these activities. " #11 is one of the following answers ("Yes")

12) Please fill out as much of the following as you are comfortable doing.

First Name: _____

Last Name: _____

Title: _____

Company Name: _____

City: _____

State: _____

Email Address: _____

Phone Number: _____

Section 2: Personal and Organizational Association with Sustainability

We want to understand how you view the term "sustainability" and how your organization addresses it.

13) What does sustainability mean to you?

We are looking for your personal interpretation of "sustainability".

14) Using the scale below, indicate your level of agreement with the following statement:
"Sustainability is a core value of my organization/company."

() Disagree Strongly () Disagree () Neutral () Agree () Agree Strongly

15) In another study on sustainability, the following items were identified as the motivation for sustainability. We would like your opinion on these items. Please rank them from (1) highest motivation, through (5) lowest motivation.

- _____ Minimization of environmental impact due to highway construction activities
- _____ Optimization of life-cycle cost of highway infrastructure
- _____ Increased use of recycled and renewable materials in highway construction
- _____ Efficient use of energy and resources in highway construction
- _____ Reduction of waste at all levels of organization in highway construction projects

16) In a previous study on sustainability, the following were identified as negative impacts from construction activities. Just thinking about these items, please rank them from (1) most significant impact, to (5) least significant impact.

_____ Air pollution

_____ Impact on human health

_____ Water quality degradation

_____ Impact on biodiversity

_____ Impact on human comfort

Section 3: Sustainability in Highway Construction Practices

We want to know what you have done or seen that could at all be considered "sustainable". If you are not sure, include it. We want to capture as many ideas as possible.

17) In your experience are you aware of sustainability-related innovations/practices in the following broad areas of construction? If so, please identify them.

Please make sure to especially consider practices that you consider above-and-beyond the regulatory minimum, or normal practice. In other words, things that are not required on all projects.

Sustainable practices in these organizational areas?

Organizational strategy and culture

Policies and programs

Human Resources

Marketing

Sustainable practices in these project delivery areas?

Contract type

Pricing method

Project delivery method

Project selection criteria

Materials and project procurement

Contract provisions

Sustainable practices in these project administration areas?

Project administration

Scheduling

**Estimating
Public outreach**

Sustainable practices in these project areas?

**Earthwork
Drainage/sewer/water
Structures
Paving
Landscaping
Materials/energy**

Sustainable practices in these project areas?

**Traffic control and signalization
Safety
Constructability**

Is there a sustainability-related innovation or practice that does not fit in the previous areas? If so, please describe it here.

This page asks about the consequences of or recognition for sustainable practices.

18) Please describe an example where a supposed sustainable solution failed to produce the desired outcome.

19) Please describe something that your organization did or participated in that you believed to be sustainable, but it was never described or recognized as sustainable.

20) Please describe a time when your organization was rewarded in any way for doing something sustainable on a project. Some examples might be:

It helped you or your organization get extra points for technical merit on a best value contract

It contributed to the project receiving an award (for example, from a trade/professional association)

It contributed to the project being certified by a rating organization/authority (for example, LEED, Greenroads, INVEST, Envision)

Logic: Show/hide trigger exists. Hidden unless: Question "May we contact you about your survey results?"

One of our chief aims for this survey is to identify people that may be able to contribute further to this research. Specifically, we are looking for individuals that would be willing to:

Be interviewed by the research team (either in-person or remotely) for no more than 30 minutes on the topic of sustainable construction.

Attend a 1-day workshop on sustainable highway construction in Irvine, CA at the [Beckman Center](#) on November 13th, 2017.

Saying that we may contact you in no way commits you to either of these activities. " #11 is one of the following answers ("No")

21) One more ask, may we contact you about your survey results? (we know you said "no" earlier but perhaps you have changed your mind?)

Remember, we are looking for individuals that would be willing to:

Be interviewed by the research team (either in-person or remotely) for no more than 30 minutes on the topic of sustainable construction.

Attend a 1-day workshop on sustainable highway construction in Irvine, CA at the [Beckman Center](#) on November 13th, 2017.

Saying that we may contact you in no way commits you to either of these activities.

Yes

No

Logic: Hidden unless: Question "One more ask, May we contact you about your survey results? (we know you said "no" earlier but perhaps you have changed your mind?)

Remember, we are looking for individuals that would be willing to:

Be interviewed by the research team (either in-person or remotely) for no more than 30 minutes on the topic of sustainable construction.

Attend a 1-day workshop on sustainable highway construction in Irvine, CA at the [Beckman Center](#) on November 13th, 2017.

Saying that we may contact you in no way commits you to either of these activities. " #21 is one of the following answers ("Yes")

22) Please fill out as much of the following as you are comfortable doing.

First Name: _____

Last Name: _____

Title: _____

Company Name: _____

City: _____

State: _____

Email Address: _____

Phone Number: _____

23) Please enter any other comments you might have about sustainability or this survey.

Thank You!

**Thank you for taking the survey on sustainable highway construction practices.
We know that your time is valuable, and we appreciate your contribution.**

-The research team

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