Supplemental Material S1

Soil management survey coding process

8 pages

Evaluating public and regulatory acceptance for urban soil management approaches

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Survey Coding Process

- Question 1. How would you describe soil?

Physical description

Soil as unconsolidated mixture/matrix of mineral and organic matter on the surface of the earth, containing solid, air, and liquid phases

Functional description

Soil can perform six different functions:

(1) media for plant growth

(2) recycling system for nutrients and organic wastes

(3) modifier of atmosphere

(4) habitat for soil organisms

(5) engineering medium

Importance description

General description which highlights broader themes about soil, including "soils support life" (SSSA slogan), "soils as skin of the earth." These descriptions differentiate from the physical and functional descriptions by invoking broader themes (supporting all life), metaphors (soils as skin), and adjectives such as fragile (treated carefully).

Other

"Dirt" colloquial description of soil

Sources:

These general definition categories are developed through multiple sources, including

• NRCS page, "What is soil?"
  http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/edu/?cid=nrcs142p2_054280
• Hartemink, A.E. 2016, The definition of soil since the early 1800s, Advances in Agronomy 137: 73-125.

• Question 2. How would you describe contaminated soil?

  **Physical description**
  Containing materials which are poisonous, toxic, chemicals, wastes

  **Functional description**
  Soil that can cause harm, or poses a hazard or risk to people or other receptors of interest, contaminated soil can hurt.

  **Concentration description**
  Contaminated soil can be defined as having concentrations above natural background or having concentrations above soil screening levels

  **Sources:**
  • Brady and Weil. 2010. Elements of the nature and properties of soils, 3rd edition.
• Question 3. How would you know if soils were contaminated?

**Laboratory analysis**

Laboratory analysis or other standardized techniques which are used to quantify soil contaminant concentrations

**Sense-based analysis**

Sense-based cues of contamination, such as visible oil, visible barrels or other waste products, odd soil coloration, odors such as gasoline, etc.

**Functional analysis**

Related to the soil functions listed in Question 1, for example, reduced plant growth, or lack of plant growth, no soil organisms present indicating some type of harm is occurring

**Other**

No response/not sure

• Question 4. Are you concerned about any particular soil contaminants?

Yes or No (recorded by survey)

• Question 5. Please list the contaminants that concern you:

Grouped by general categories: inorganics, organics, heavy metals, pesticides, herbicides, fungicides

List all contaminants, and combine similar listings

• Question 6. If contaminated soil is found, what should be done with it?

Analytical, risk-based process following standard risk assessment procedures
Specific management options, such as are described in the survey

Source:


• Question 7. Please rate your agreement with the following treatment options:

  (recorded by survey, and List of four treatments randomized, respondents rank using radio buttons from Strongly Agree to Strongly Disagree)

  Contaminants can be removed from the soil by plants, and the plants can be harvested and taken away.

  Contaminants can be degraded by plants or microorganisms so that they are no longer within the soil.

  Contaminants can be covered with clean soil to cap the contaminants and prevent surface exposure.

  Contaminants can be removed from the site by digging out all the contaminated soil.

• Question 8. Have you heard of bioavailability or biological availability?

  Yes or No (recorded by survey)

• Question 9. Would you like to read a brief description of bioavailability?

  (if No to question 8)

  Yes or No (recorded by survey)

• Question 10. After reading this definition, would you be willing to answer to two questions about bioavailability?
Yes or No (recorded by survey)

(The following definition was provided)

Biological availability is a way to measure how much of something is taken up by a person. For example, when food is eaten, the body can absorb lots of nutrients from the food, but can't take up absolutely all of the nutrients. Some nutrients are taken up more easily than others.

The same situation occurs with contaminants. Let's say I accidentally eat some contaminated soil. The amount of the contaminant that gets taken up into my body is less than the total amount of the contaminant in the soil. Some types of contaminants are taken up more easily than others.

- Question 11. How would you describe biological availability? (if Yes to Question 8)

Anticipated expert definition, including "Bioavailability processes are defined as the individual physical, chemical, and biological interactions that determine the exposure of plants and animals to chemicals associated with soils and sediments." (NRC, 2003, p. 2)

Multiple definitions provided from (NRC, 2003, p. 22), such as "A measure of the fraction of the chemical(s) of concern in environmental media that is accessible to an organism for absorption," or "The fraction of an administered dose that reaches the central (blood) compartment, whether from gastrointestinal tract, skin, or lungs. Bioavailability defined in this manner is commonly referred to as 'absolute bioavailability.'"

Source:

• Question 12. What do you think about using bioavailability assessments to evaluate contaminated soils?

Open-ended question, general categories anticipated

Positive response (good idea, reasonable)

Negative response (bad idea, terrible)

Clarification, follow up question

• Question 13. Please rate your agreement with the following treatment option: Contaminants can remain in place if the soil contaminants have a low bioavailability.

Recorded by survey. (Asked if Yes to question 10 OR if Yes to question 8)

(Respondents rank using radio buttons from Strongly Agree to Strongly Disagree)

• Question 14. Do you have any comments you would like to add?

Note comments for inclusion in document text.

• Question 15. Do you have any questions for me?

Note comments for inclusion in document text or follow up emails.

• Question 16. The following information will help summarize survey responses. What is your zip code?

(Recorded by survey)
• Question 17. The following information will help summarize survey responses. What is your age?

   (Radio buttons for the following age categories: 18-24, 25-34, 35-44, 45-54, 55-64, 65 and older)

• Question 18. The following information will help summarize survey responses. What is your household income per year?

   (Radio buttons for the following age categories: Less than $15,000; $15,000 to $24,999, $25,000 to $34,999; $35,000 to $49,999; $50,000 to $74,999; $75,000 to $99,999; $100,000 to $149,999; $150,000 to $199,999; $200,000 and over)