

Steps in the Data Quality Objectives Process

STEP 1: STATE THE PROBLEM

Purpose: The purpose of this step is to clearly define the problem requiring new environmental data to make sure the study's focus will be clear and unambiguous.

Activities

- Identify members of the planning team.
- Identify the primary decision maker.
- Develop a concise description of the problem.
- Specify available resources and relevant deadlines for the study.

Outputs from This Step

- A concise description of the problem
- A list of the planning team members and identification of the decision maker
- A summary of available resources and relevant deadlines for the study

STEP 2: IDENTIFY THE DECISION

Purpose: The purpose of this step is to define the decision that will be resolved using data to address the problem.

Activities

- State the decision.
- Categorize multiple decisions.
- State the actions or outcomes that could result from the resolution of the decision.

Outputs from This Step

- A statement of the decision that must be resolved using data in order to address or solve the problem
- A list of possible actions or outcomes that would result from each resolution of the decision statement

STEP 3: IDENTIFY INPUTS TO THE DECISION

Purpose: The purpose of this step is to identify the informational inputs that will be required to resolve the decision and to determine which inputs require environmental measurements.

Activities

- Identify the information that will be required to resolve the decision.
- Determine the sources for each item of information identified.
- Identify the information that is needed to establish the action level for the study.
- Confirm that appropriate field sampling techniques and analytical methods exist to provide the necessary data.

Outputs from This Step

- A list of informational inputs needed to resolve the decision
- The list of environmental variables or characteristics that will be measured

STEP 4: DEFINE THE STUDY BOUNDARIES

Purpose: The purpose of this step is to specify the spatial and temporal circumstances that are covered by the decision.

Activities

- Define the domain or geographic area within which all decisions must apply.
- Specify the characteristics that define the population of interest.
- When appropriate, divide the population into strata with relatively homogeneous characteristics.
- Define the scale of decision-making.

- Determine when to collect data.
- Determine the time frame to which the study data apply.
- Identify any practical constraints on data collection.

Outputs from This Step

- Characteristics that define the domain of the study
- A detailed description of the spatial and temporal boundaries of the decision
- A list of any practical constraints that may interfere with the study

STEP 5: DEVELOP A DECISION RULE

Purpose: The purpose of this step is to integrate the outputs from previous steps into a single statement that describes the logical basis for choosing among alternative actions.

Activities

- Specify the parameter that characterizes the population of interest.
- Specify the action level for the study.
- Combine the outputs of the previous DQO steps into an "if...then..." decision rule defining the conditions that would cause the decision maker to choose among alternative actions.

Outputs from This Step

- An "if...then..." statement that defines the conditions causing the decision maker to choose among alternative courses of action

STEP 6: SPECIFY LIMITS ON DECISION ERRORS

Purpose: The purpose of this step is to specify the decision maker's acceptable limits on decision

errors which are used to establish appropriate performance goals for limiting uncertainty in the data.

Activities

- Determine the possible range of the parameter of interest.
- Define both types of decision errors and identify the potential consequences of each.
- Specify a range of possible parameter values where the consequences of decision errors are relatively minor (gray region).
- Assign probability values to points above and below the action level that reflect the acceptable possibility for the occurrence of decision errors.
- Check the limits on decision errors to ensure they accurately reflect the decision maker's concern about the relative consequences for each type of decision error.

Outputs from This Step

- The decision maker's acceptable decision error rates based on a consideration of the consequences of making an incorrect decision

STEP 7: OPTIMIZE THE DESIGN FOR OBTAINING DATA

Purpose: The purpose of this step is to identify the most resource-effective sampling and analysis design for generating data that are expected to satisfy the DQOs.

Activities

- Review the DQO outputs and existing environmental data.
- Translate the information from the DQOs into a statistical hypothesis.
- Develop general sampling and analysis design alternatives.

- For each design alternative, formulate the mathematical expressions needed to solve the design problems.
- For each design alternative, select the optimal sample size that satisfies the DQOs.
- Select the most resource-effective design that satisfies all the DQOs.
- Document the operational details and theoretical assumptions of the selected design in the sampling and analysis plan.

Outputs from This Step

- The most resource-effective design for the study that is expected to achieve the DQOs, selected from a group of alternative designs generated during this step

SOURCES

U. S. Environmental Protection Agency. 1993. "Data Quality Objectives process for Superfund: Interim Final Guidance." EPA/540/G-93/071.

U. S. Environmental Protection Agency. 2006. "Guidance on Systematic Planning Using the Data Quality Objectives Process." EPA/240/B-06/001.

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