NIST HURRICANE MARIA STUDY,

HURRICANE MARIA RECOVERY OF INFRASTRUCTURE PROJECT:

INFRASTRUCTURE INTERDEPENDENCY INSTRUMENT:
INTERVIEW GUIDE COMPONENT 2: COMMUNITY WATER

**OMB Control #0693-0078**

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**Introduction**

In this interview, we want your insights into how a community water system recovers from a major hurricane. We are especially interested in understanding how disruptions in other infrastructure systems, such as power and transportation, impact its recovery. We are conducting similar interviews with PREPA/LUMA and DTOP to learn the same for power and transportation systems.

We are specifically interested in the recovery of community water systems from Hurricanes Irma and Maria, which made landfall in September 2017.

We are going to ask you about the time before and the time after Hurricanes Irma and Maria. We recognize that the two events occurred within two weeks of one another and that it may be difficult to remember back that far or to separate the effects of the two storms from one another.

Please answer to the best of your ability.

We use some terms in this survey to keep the questions consistent across interviews with all infrastructure types. We refer, for example, to “your organization.” We recognize that you may more naturally refer to your “department”, “office”, “system”, “agency,” “company,” or “utility.” But for uniformity in conducting interviews for all infrastructure types, we use the generic term “organization”.

**Section A. Confirm screening**

1. Can you confirm the organization on behalf of which you are providing answers:
	* + [Programmer: please fill with the list of contacted Community Water Systems]
		+ Other:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. Can you confirm the municipio in which your community water system is located:
* Adjuntas
* Aguas Buenas
* Aibonito
* Bayamón
* Caguas
* Carolina
* Catano
* Ciales
* Cidra
* Guaynabo
* Gurabo
* Humacao
* Jayuya
* Juncos
* Lares
* Las Piedras
* Maunabo
* Mayagüez
* Naguabo
* Ponce
* San Juan
* San Lorenzo
* Toa Baja
* Trujillo Alto
* Utaudo
* Yabucoa
* Other: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Note: removed paragraph

We will refer to “your system.” By “your system”, we mean the physical assets, systems, and networks, such as water intakes, wells, pipes, pumps, tanks, administrative buildings, etc., of your community water system.

**Section B. Introductory questions**

The first set of questions asks about your system.

1. Does your system serve any major critical buildings? The building type “critical buildings” includes but is not limited to hospitals, fire stations, police stations, emergency operations centers, and public buildings used as shelters, such as schools.
[Open-ended]
2. Does your system serve any major commercial buildings? The building type “commercial buildings” includes but is not limited to buildings in financial and business centers/districts, and manufacturing plants.
[Open-ended]
3. How many residents or households does your system serve?
[Open-ended]
4. What are the sources of water in your system?
[Open-ended]

Next, we ask questions about your professional involvement in the water industry.

1. How many years in the water industry have you worked? (years) \_\_\_\_
2. How many years have you worked in your current organization (in any position)? (years)\_\_\_\_\_
3. Please state your job title and give a brief description of your job.

[Open-ended]

**Section C. Service assessment**

In what follows, we will ask questions about the water service provided by your organization in various periods of time before and after Hurricane Maria.

*[Interviewer: Show (or have them retrieve) Table A]*

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*Table A. Extent to which your organization provides/provided a specific attribute of service to different types of buildings*

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | 4(Completely) | 3 | 2 | 1 | 0(Not at all) | NA |
| All buildings |  |  |  |  |  |  |
| Critical buildings |  |  |  |  |  |  |
| Commercial buildings |  |  |  |  |  |  |
| Residential buildings |  |  |  |  |  |  |

*---*

We want to make sure you become familiar with Table A since we will use this table more than once. In what follows, we are going to ask you the extent to which your organization provided specific attributes of water service to different building types. You’ll be asked to select an extent ranging from “Completely” to “Not at all”. You’ll be asked to do this for “All buildings”, “Critical buildings”, “Commercial buildings”, and “Residential buildings”. Table A should be used to help you to answer the questions.

You will reference Table A more than once because we ask about different attributes of water service and we ask about different periods of time.

**Condition before hurricanes**

1. Before the two hurricanes made landfall, your organization supplied the demanded amount of water for...

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | 4(Completely) | 3 | 2 | 1 | 0(Not at all) | NA |
| All buildings |  |  |  |  |  |  |
| Critical buildings |  |  |  |  |  |  |
| Commercial buildings |  |  |  |  |  |  |
| Residential buildings |  |  |  |  |  |  |

1. Before the two hurricanes made landfall, your organization provided potable water for...

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | 4(Completely) | 3 | 2 | 1 | 0(Not at all) | NA |
| All buildings |  |  |  |  |  |  |
| Critical buildings |  |  |  |  |  |  |
| Commercial buildings |  |  |  |  |  |  |
| Residential buildings |  |  |  |  |  |  |

1. Before the two hurricanes made landfall, your organization provided water at all times of the day for...

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | 4(Completely) | 3 | 2 | 1 | 0(Not at all) | NA |
| All buildings |  |  |  |  |  |  |
| Critical buildings |  |  |  |  |  |  |
| Commercial buildings |  |  |  |  |  |  |
| Residential buildings |  |  |  |  |  |  |

**Condition one week after Hurricane Maria**

We now ask the same questions but now ask about the time one week after Hurricane Maria landfall.

1. One week after Hurricane Maria’s landfall, your organization supplied the demanded amount of water for...

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | 4(Completely) | 3 | 2 | 1 | 0(Not at all) | NA |
| All buildings |  |  |  |  |  |  |
| Critical buildings |  |  |  |  |  |  |
| Commercial buildings |  |  |  |  |  |  |
| Residential buildings |  |  |  |  |  |  |

1. One week after Hurricane Maria’s landfall, your organization provided potable water for...

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | 4(Completely) | 3 | 2 | 1 | 0(Not at all) | NA |
| All buildings |  |  |  |  |  |  |
| Critical buildings |  |  |  |  |  |  |
| Commercial buildings |  |  |  |  |  |  |
| Residential buildings |  |  |  |  |  |  |

1. One week after Hurricane Maria’s landfall, your organization provided water at all times of the day for...

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | 4(Completely) | 3 | 2 | 1 | 0(Not at all) | NA |
| All buildings |  |  |  |  |  |  |
| Critical buildings |  |  |  |  |  |  |
| Commercial buildings |  |  |  |  |  |  |
| Residential buildings |  |  |  |  |  |  |

**Time to return to pre-hurricane level of service after Hurricane Maria**

Now we ask how long it took for your organization to resume service.

*[Interviewer: Show (or have them retrieve) Table B]*

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Table B. Time to return to pre-Hurricane Maria level of service

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Within a month | 1-6 months | 6-12 months | 1-2 years | 2-4 years | 4-7 years | Not yet returned | Not applicable |
| All buildings  |  |  |  |  |  |  |  |  |
| Critical buildings  |  |  |  |  |  |  |  |  |
| Commercial buildings |  |  |  |  |  |  |  |  |
| Residential buildings |  |  |  |  |  |  |  |  |

--------------

We are going to ask you how long it took your organization to resume service to the levels they were before Hurricane Maria. You’ll be asked to select from different periods of time, ranging from “Within a month” to “4-7 years”; “Not yet returned” is also an option. You’ll be asked to do this for each building type. Table B should be used to help you to answer the questions.

You will reference Table B more than once because we ask about the same attributes of water service as we did in the earlier set of questions.

1. Following Hurricane Maria’s landfall, how long did it take before your organization supplied the demanded amount of water at the pre-Hurricane Maria level for...

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Within a month | 1-6 months | 6-12 months | 1-2 years | 2-4 years | 4-7 years | Not yet returned | Not applicable |
| All buildings  |  |  |  |  |  |  |  |  |
| Critical buildings  |  |  |  |  |  |  |  |  |
| Commercial buildings |  |  |  |  |  |  |  |  |
| Residential buildings |  |  |  |  |  |  |  |  |

1. Following Hurricane Maria’s landfall, how long did it take before your organization provided potable water at the pre-Hurricane Maria level for...

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Within a month | 1-6 months | 6-12 months | 1-2 years | 2-4 years | 4-7 years | Not yet returned | Not applicable |
| All buildings  |  |  |  |  |  |  |  |  |
| Critical buildings  |  |  |  |  |  |  |  |  |
| Commercial buildings |  |  |  |  |  |  |  |  |
| Residential buildings |  |  |  |  |  |  |  |  |

1. Following Hurricane Maria’s landfall, how long did it take before your organization provided water at all times of the day at the pre-Hurricane Maria level for...

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Within a month | 1-6 months | 6-12 months | 1-2 years | 2-4 years | 4-7 years | Not yet returned | Not applicable |
| All buildings  |  |  |  |  |  |  |  |  |
| Critical buildings  |  |  |  |  |  |  |  |  |
| Commercial buildings |  |  |  |  |  |  |  |  |
| Residential buildings |  |  |  |  |  |  |  |  |

**Section D. Dependencies on other systems—Effect of disruptions on service recovery**

In this next set of questions, we ask you to identify disruptions that had an impact on your organization’s recovery of service, either by delaying specific steps of recovery, making recovery proceed slower than it otherwise would (“throwing sand in the gears”), presenting obstacles that had to be overcome or gotten around, or in any other way frustrating efforts to recover service. We ask all infrastructure service providers about the extent of impact to service recovery of disruptions in goods and services in six categories: communications, transportation, water, energy, economy, and government. We take them up one category at a time.

*[Interviewer: Show (or have them retrieve) Table C]*

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*Table C. To what extent did disruptions in the following impact service recovery?*

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | *Not at all* | *Very little* | *Somewhat* | *To a great extent* | Not applicable (NA) | Don’t know (DK) |
| *Item 1* |  |  |  |  |  |  |
| *Item 2* |  |  |  |  |  |  |

*In answering, please consider...*

*Impact on recovery of service* ***to pre-Hurricane Maria levels***

***the entire period of service recovery****, from just before landfall through repairs (temporary or permanent) necessary to recover service*

*only* ***direct*** *impacts on service recovery*

*-----*

We’ll ask you to indicate the *extent* to which disruptions in each of a set of items impacted service recovery, with responses ranging from “Not at all” to “To a great extent.”

In answering, please consider the period from the leadup to landfall, landfall, damage assessment, through to completion of the repairs necessary to recover to pre-Hurricane levels all service attributes, including: supplying the demanded amount of water, providing potable water, and providing water at all times of the day.

Further, we ask that you consider only ***direct***impacts. To illustrate what we mean by ***direct***, consider the following example. Suppose that outages of traffic signals impacted your organization’s recovery of service. Even though you may know this resulted from a power outage, in this example, the transportation system directly impacts recovery of service (the power system only indirectly).

**Communications**

First, we will consider the impact of disruptions in *Communications*.

1. To what extent did disruptions in the following impact service recovery?

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Not at all | Very little | Somewhat | To a great extent | NA | DK |
| Wired phone service |  |  |  |  |  |  |
| Wired internet service |  |  |  |  |  |  |
| Wireless texting |  |  |  |  |  |  |
| Wireless phone service |  |  |  |  |  |  |
| Wireless internet |  |  |  |  |  |  |
| Radio |  |  |  |  |  |  |
| Quality of information shared |  |  |  |  |  |  |

**Transportation**

Next, we will consider the impact of disruptions in *Transportation*.

1. To what extent did disruptions in the following impact service recovery?

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Not at all | Very little | Somewhat | To a great extent | NA | DK |
| Primary roads |  |  |  |  |  |  |
| Secondary roads |  |  |  |  |  |  |
| Municipal roads |  |  |  |  |  |  |
| Transportation- other, e.g.s, airports, shipping ports, public transit |  |  |  |  |  |  |

**Water**Next, we will consider the impact of disruptions in the *Water* sector.

Your organization provides a service that matches one or more items within this category. When we encounter such an item, consider disruptions only to include those not under your organization’s control. Items not under your organization’s control may include, for example, water piped in from outside your community water system. If none exist, please indicate ‘Not Applicable’.

1. To what extent did disruptions in the following impact service recovery?

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Not at all | Very little | Somewhat | To a great extent | NA | DK |
| Sewer or stormwater, drainage, or flood control |  |  |  |  |  |  |
| Wastewater system |  |  |  |  |  |  |
| Water supply system |  |  |  |  |  |  |

**Energy**

Next, we will consider the impact of disruptions in the *Energy* sector.

1. To what extent did disruptions in the following impact service recovery?

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Not at all | Very little | Somewhat | To a great extent | NA | DK |
| PREPA (now Luma) electric power |  |  |  |  |  |  |
| Availability of temporary power sources (generators, batteries, etc.) |  |  |  |  |  |  |
| Availability of fuel (diesel, gasoline, ...) |  |  |  |  |  |  |
| Maintenance/repair service for temporary power sources, e.g., generators |  |  |  |  |  |  |

**Economy**

Next, we will consider the impact of disruptions of the broader *Economy*. This includes disruptions in goods and services that were not previously called out.

1. To what extent did disruptions in the following impact service recovery?

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Not at all | Very little | Somewhat | To a great extent | NA | DK |
| Labor hiring pool |  |  |  |  |  |  |
| Financial system |  |  |  |  |  |  |
| Suppliers to the water industry |  |  |  |  |  |  |
| Durable goods suppliers (heavy or light equipment not specific to the water industry) |  |  |  |  |  |  |
| General consumables (not fuel, not specific to the water industry) |  |  |  |  |  |  |
| Services (contracting, engineering, ...) |  |  |  |  |  |  |

**Government**

Finally, we will consider the impact related to disruptions or general functioning of the *Government*.

1. To what extent did disruptions in the following impact service recovery?

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Not at all | Very little | Somewhat | To a great extent | NA | DK |
| General government operations, including law enforcement, permitting, ... |  |  |  |  |  |  |
| Government funding programs |  |  |  |  |  |  |
| Government planning processes |  |  |  |  |  |  |

In this section, we want you to consider when disruptions in each of the six categories we just covered greatly impacted service recovery.

*[Interviewer: Show (or have them retrieve) Table D]*

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Table D. In which periods of time did disruptions in the following ***greatly*** impact service recovery?

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Landfall to 1 week | 1-4 weeks | 5-8 weeks | 9-12 weeks | More than 12 weeks |
| Communications  |  |  |  |  |  |
| Transportation |  |  |  |  |  |
| Water |  |  |  |  |  |
| Energy |  |  |  |  |  |
| Economy |  |  |  |  |  |
| Government |  |  |  |  |  |

Note: OK to indicate more than one period of time in each row.

----------

We are going to ask you to select the periods of time in which disruptions ***greatly*** impacted service recovery. The responses range from “Landfall to 1 week” to “More than 12 weeks”.

1. In which periods of time did disruptions in the following ***greatly*** impact service recovery? Please mark all that apply.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Landfall to 1 week | 1-4 weeks | 5-8 weeks | 9-12 weeks | More than 12 weeks |
| Communications  |  |  |  |  |  |
| Transportation |  |  |  |  |  |
| Water |  |  |  |  |  |
| Energy |  |  |  |  |  |
| Economy |  |  |  |  |  |
| Government |  |  |  |  |  |

Now we ask you to rank each category by how much disruptions within the category impacted service recovery.

1. Please rank the six categories with ‘1’ being the most impactful and ‘6’ being the least impactful on service recovery.
* Communications
* Transportation
* Water
* Energy
* Economy
* Government

[Programmer note: please leave their ranking choices visible when answering 29 and 30

1. Can you describe your reasoning for the ranking? Please use examples.

[Open-ended]

1. How confident are you in the ranking? Why so?

[Open-ended]

1. You ranked disruptions in [Ranked #1 Impact] as the [#1] category impacting service recovery. As of today, what actions, if any, has your organization taken to reduce the extent to which future disruptions in [Ranked #1 Impact] will impact service recovery?

[Open-ended]

1. Did the actions taken help recover service following Hurricane Fiona? *How so?*

[Open-ended]

1. You ranked disruptions in [Ranked #2 Impact] as the [#2] category impacting service recovery.As of today, what actions, if any, has your organization taken to reduce the extent to which future disruptions in [Ranked #2 Impact] will impact service recovery?

[Open-ended]

1. Did the actions taken help recover service following Hurricane Fiona? *How so?*

[Open-ended]

1. You ranked disruptions in [Ranked #3 Impact] as the [#3] category impacting service recovery.As of today, what actions, if any, has your organization taken to reduce the extent to which future disruptions in [Ranked #3 Impact] will impact service recovery?

[Open-ended]

1. Did the actions taken help recover service following Hurricane Fiona? *How so?*

[Open-ended]

[Programmer: re-show their ranking from Q28]

1. [Interviewer: Remind them of their ranking] Would you have ranked the six categories differently for Hurricane Fiona? If so, why?

[Open-ended]

**Section E: Present-day assessment**

Now we turn to conditions as they are today.

We begin by asking how your system and organization have changed since Hurricane Maria.

1. Since Hurricane Maria, how much has your system and your organization improved or worsened with respect to the following?

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Much better now | Slightly better now | Neither better nor worse now | Slightly worse now | Much worse now |
| Hazard resistance of your system |  |  |  |  |  |
| Inventory of input, inventory of replacement parts, product storage |  |  |  |  |  |
| System redundancy (e.g., redundant/new/alternative sources and/or connections/lines) |  |  |  |  |  |
| Technology for monitoring and control |  |  |  |  |  |
| Training of personnel for hurricane season |  |  |  |  |  |
| Plans/protocols for hurricane season |  |  |  |  |  |
| Codes and Standards |  |  |  |  |  |
| Number and Quality of personnel |  |  |  |  |  |

**Condition today**

Now we turn to your organization’s water service today.

*[Interviewer: Once more, please show (or have them retrieve) Table A]*

Again, please refer to Table A to see the range of potential responses.

We will ask similar questions to those asked earlier. We will ask about the extent to which your organization provides various service attributes. Specifically, the extent to which it supplies the demanded amount of water, provides potable water, and provides water at all times of the day.

1. Today, your organization supplies the demanded amount of water for...

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | 4(Completely) | 3 | 2 | 1 | 0(Not at all) | NA |
| All buildings |  |  |  |  |  |  |
| Critical buildings |  |  |  |  |  |  |
| Commercial buildings |  |  |  |  |  |  |
| Residential buildings |  |  |  |  |  |  |

1. Today, your organization provides potable water for...

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | 4(Completely) | 3 | 2 | 1 | 0(Not at all) | NA |
| All buildings |  |  |  |  |  |  |
| Critical buildings |  |  |  |  |  |  |
| Commercial buildings |  |  |  |  |  |  |
| Residential buildings |  |  |  |  |  |  |

1. Today, your organization provides water at all times of the day for...

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | 4(Completely) | 3 | 2 | 1 | 0(Not at all) | NA |
| All buildings |  |  |  |  |  |  |
| Critical buildings |  |  |  |  |  |  |
| Commercial buildings |  |  |  |  |  |  |
| Residential buildings |  |  |  |  |  |  |

1. Had Hurricane Fiona not happened, would today’s level of service have been any different? Can you explain?

[Open-ended]

**Expected condition one week after if a hurricane of a magnitude similar to Hurricane Maria were to make landfall today**

Next, we consider the hypothetical case of another hurricane of a magnitude similar to Hurricane Maria.

1. Today, if a hurricane of a magnitude similar to Hurricane Maria were to make landfall, one week from now, your organization would supply the demanded amount of water for…

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | 4(Completely) | 3 | 2 | 1 | 0(Not at all) | NA |
| All buildings |  |  |  |  |  |  |
| Critical buildings |  |  |  |  |  |  |
| Commercial buildings |  |  |  |  |  |  |
| Residential buildings |  |  |  |  |  |  |

1. Today, if a hurricane of a magnitude similar to Hurricane Maria were to make landfall, one week from now, your organization would provide potable water for…

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | 4(Completely) | 3 | 2 | 1 | 0(Not at all) | NA |
| All buildings |  |  |  |  |  |  |
| Critical buildings |  |  |  |  |  |  |
| Commercial buildings |  |  |  |  |  |  |
| Residential buildings |  |  |  |  |  |  |

1. Today, if a hurricane of a magnitude similar to Hurricane Maria were to make landfall, one week from now, your organization would provide water at all times of the day for...

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | 4(Completely) | 3 | 2 | 1 | 0(Not at all) | NA |
| All buildings |  |  |  |  |  |  |
| Critical buildings |  |  |  |  |  |  |
| Commercial buildings |  |  |  |  |  |  |
| Residential buildings |  |  |  |  |  |  |

1. What factors best explain service levels one week after the landfall of a hurricane? Please give two examples.

[Open-ended]

1. Did these same factors influence service levels one week after Hurricane Fiona? How so?

[Open-ended]

**Expected time to return to pre-hurricane level of service if a hurricane were to strike today**

Next, we continue this hypothetical of another hurricane of a magnitude similar to Hurricane Maria making landfall today, but now asking how long you expect it will take for your organization to return to providing service *to the same extent that it exists today*.

*[Interviewer: we are \*not\* asking about a return to pre-Hurricane Maria but instead to today’s levels]*

*[Interviewer: Please show (or have them retrieve) Table E]*

Please refer to Table E to see the range of potential responses. Responses range from “Within a month” to “More than 7 years”.

------------

Table E. Time to return to today’s levels of service

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Within a month | 1-6 months | 6-12 months | 1-2 years | 2-4 years | 4-7 years | More than 7 yrs | Not applicable |
| All buildings  |  |  |  |  |  |  |  |  |
| Critical buildings  |  |  |  |  |  |  |  |  |
| Commercial buildings |  |  |  |  |  |  |  |  |
| Residential buildings |  |  |  |  |  |  |  |  |

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1. If a hurricane of the same magnitude as Hurricane Maria made landfall today, how long before your organization would return to supplying the demanded amount of water at today’s levels for...

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Within a month | 1-6 months | 6-12 months | 1-2 years | 2-4 years | 4-7 years | More than 7 yrs | Not applicable |
| All buildings  |  |  |  |  |  |  |  |  |
| Critical buildings  |  |  |  |  |  |  |  |  |
| Commercial buildings |  |  |  |  |  |  |  |  |
| Residential buildings |  |  |  |  |  |  |  |  |

1. If a hurricane of the same magnitude as Hurricane Maria were to occur today, how long before your organization would return to providing potable water at today’s levels for...

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Within a month | 1-6 months | 6-12 months | 1-2 years | 2-4 years | 4-7 years | More than 7 yrs | Not applicable |
| All buildings  |  |  |  |  |  |  |  |  |
| Critical buildings  |  |  |  |  |  |  |  |  |
| Commercial buildings |  |  |  |  |  |  |  |  |
| Residential buildings |  |  |  |  |  |  |  |  |

1. If a hurricane of the same magnitude as Hurricane Maria were to occur today, how long before your organization would return to providing water at all times of the day at today’s level for...

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Within a month | 1-6 months | 6-12 months | 1-2 years | 2-4 years | 4-7 years | More than 7 yrs | Not applicable |
| All buildings  |  |  |  |  |  |  |  |  |
| Critical buildings  |  |  |  |  |  |  |  |  |
| Commercial buildings |  |  |  |  |  |  |  |  |
| Residential buildings |  |  |  |  |  |  |  |  |

1. What factors best explain the amount of time to recover service following the landfall of a hurricane? Please give two examples.

[Open-ended]

1. Did these same factors influence the time to recover service following Hurricane Fiona? How so?

[Open-ended]

Now we ask the final question of this interview.

1. What is most needed to increase your organization’s ability to withstand the disruptions brought on by a disaster like Hurricane Maria and to rapidly recover from it?

[Open-ended]