

(How) should we do this?

Assessing whether to implement air monitoring
and
Exploring approaches to community partnerships

Tim Dye and Scott Hersey

Roadmap for today

1. Should we do this?
2. How should we do this?
3. How should we do this together?

Should we do this?

Guiding questions

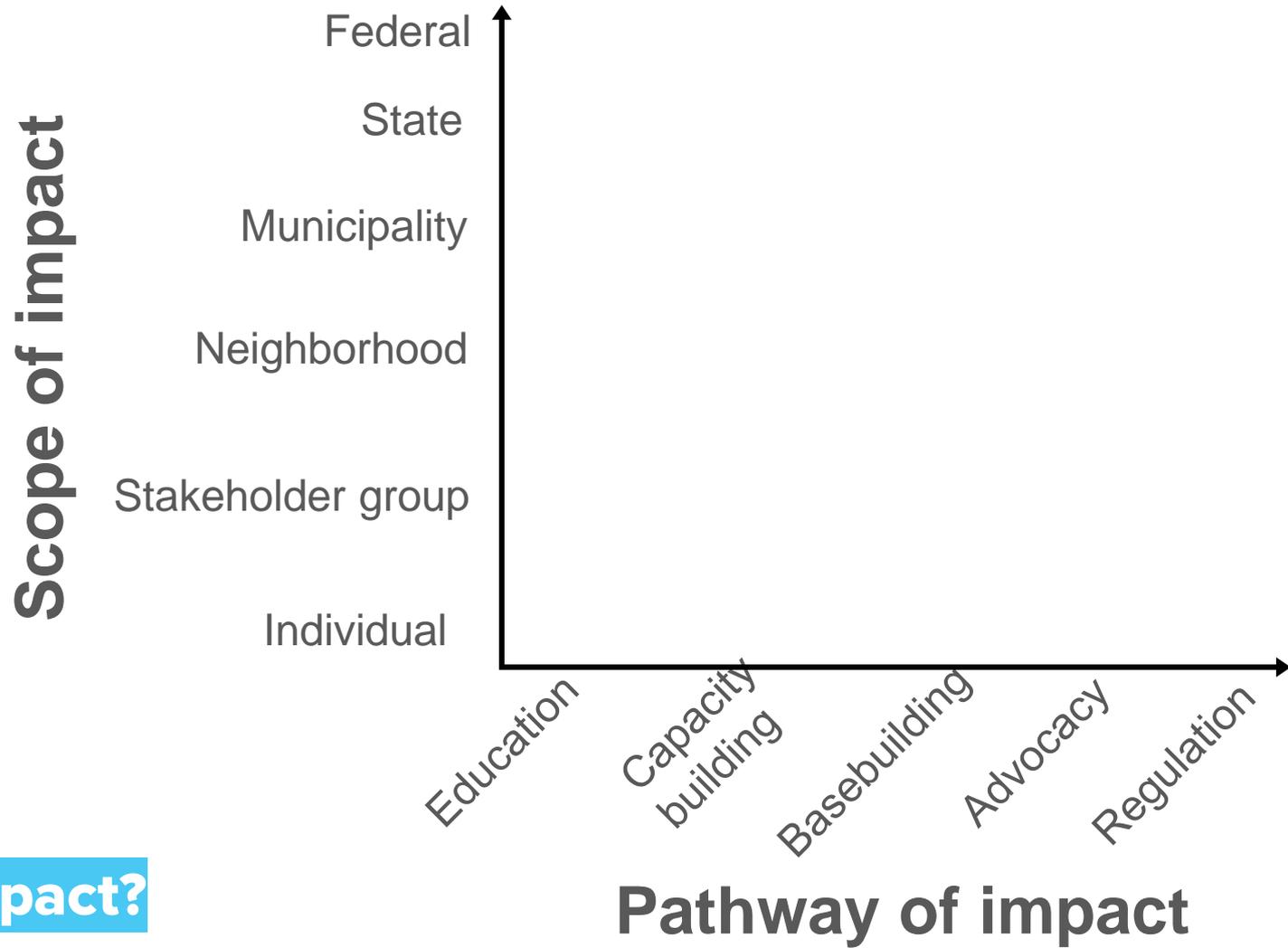
What are your goals? What are the community's goals? Are they aligned?

If you magically had perfect data to support your goals, what would the data be?

What story would the data tell? And what you do next with that data? *Is this feasible?*

Do you have an engaged community partner?

Do you have budget to support the work (engagement, sensors, technical capacity, on the ground work, data and meaning making)?



b) What impact?

Scope of impact

Federal
State
Municipality
Neighborhood
Stakeholder group
Individual

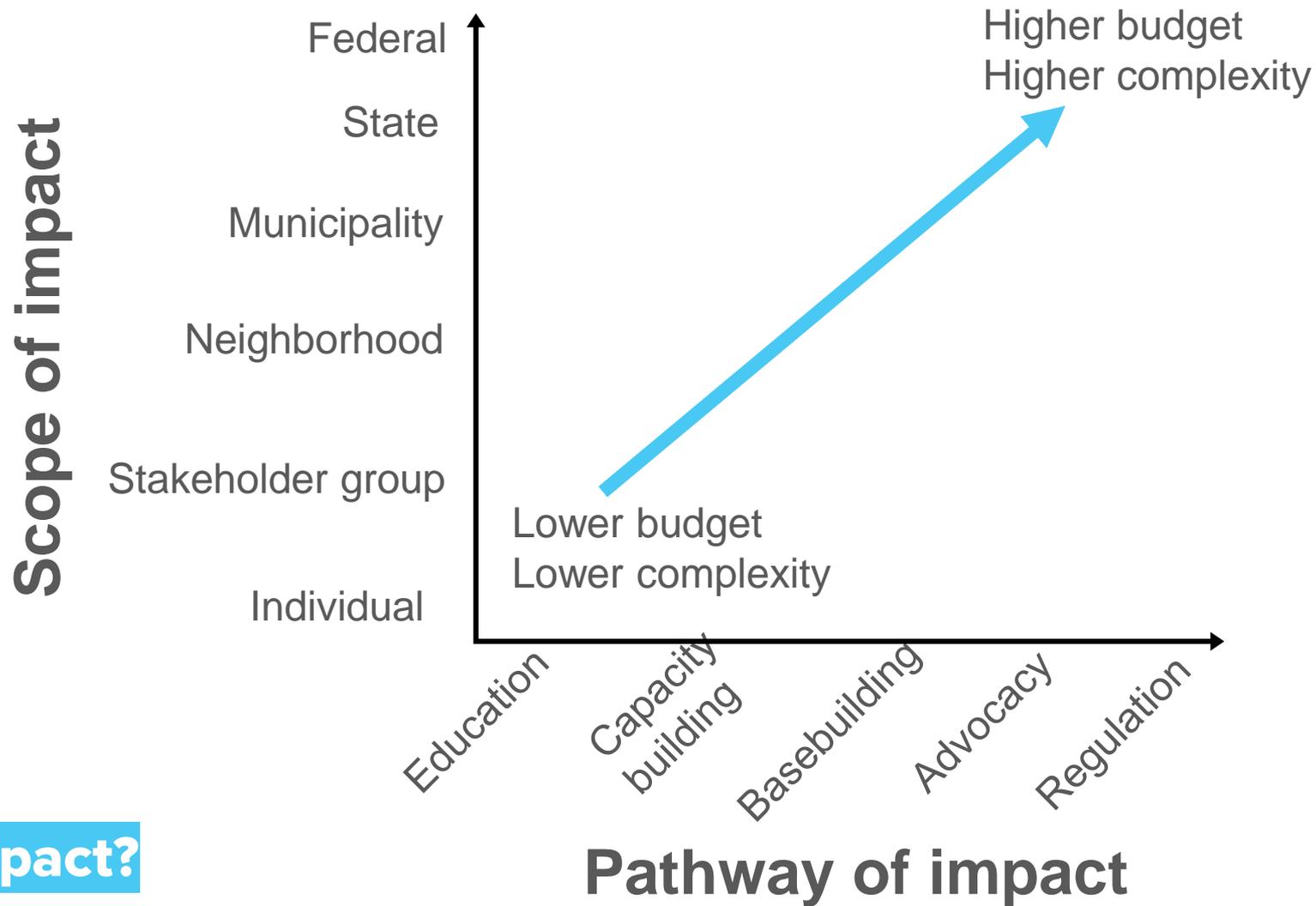
Education
Capacity building
Basebuilding
Advocacy
Regulation

Your desired scope of impact and pathway for achieving impact will dictate:

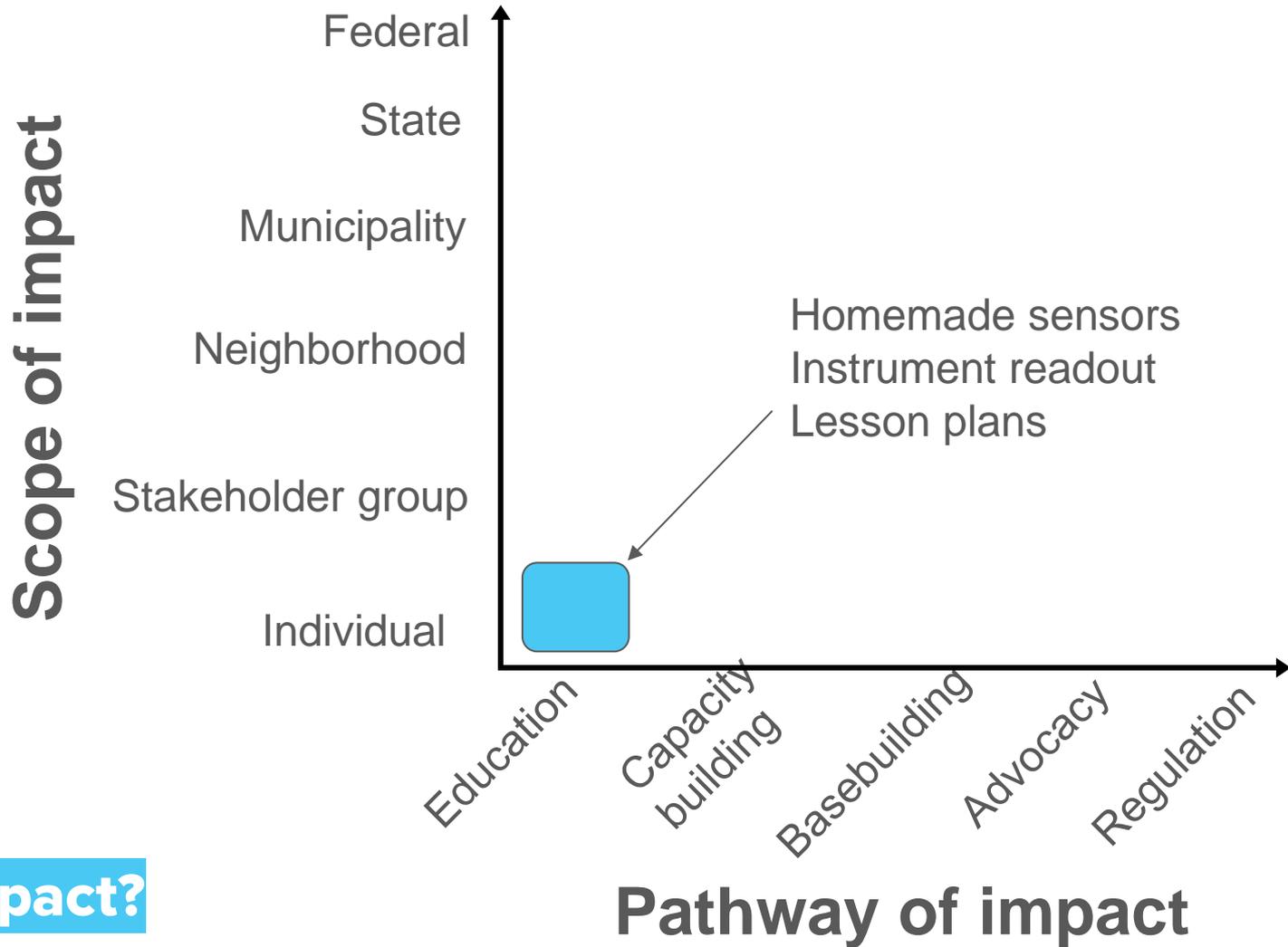
- Sensor choice
- Deployment plan
- Data management
- Data analysis
- Artifact creation
- Artifact use

Pathway of impact

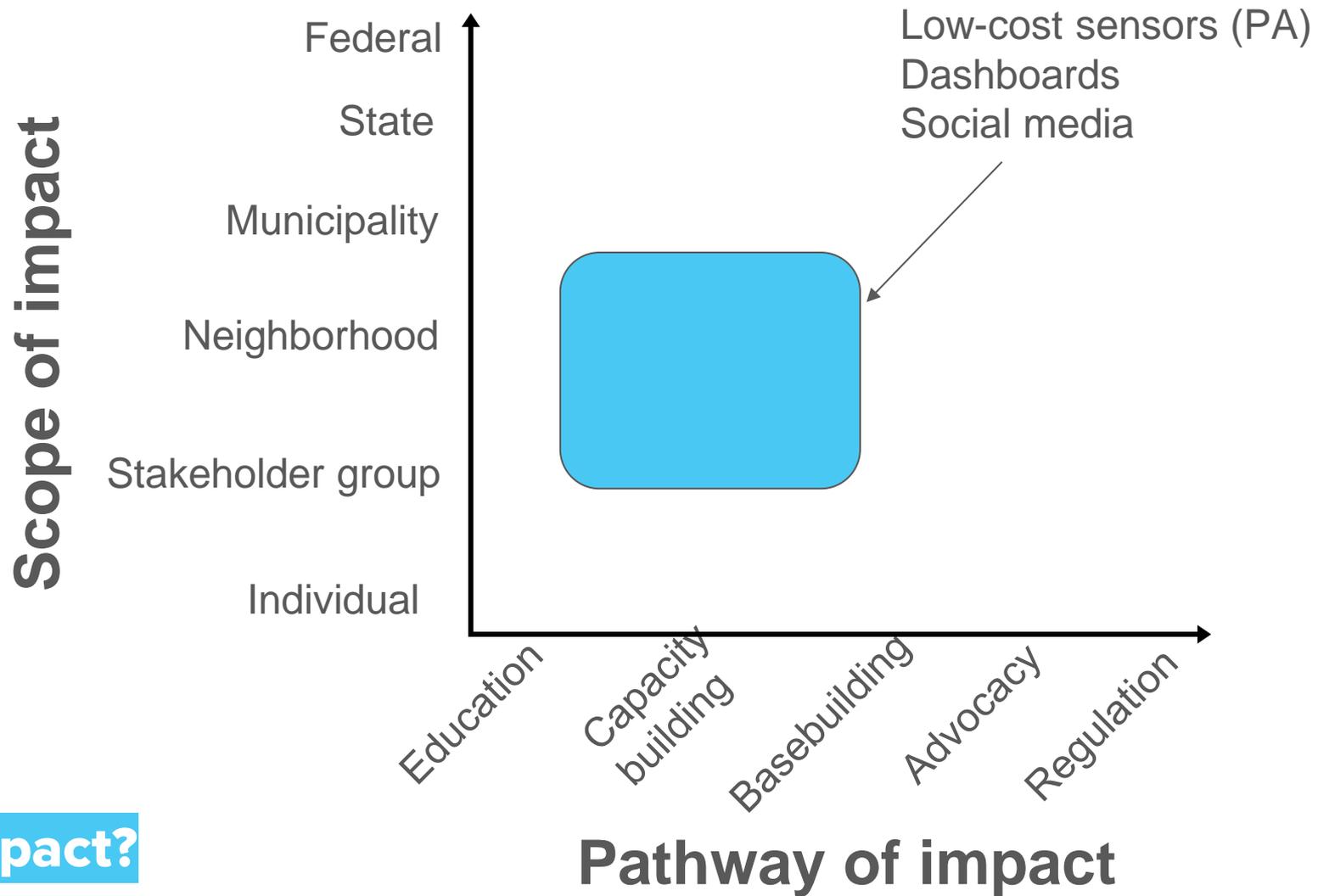
b) What impact?



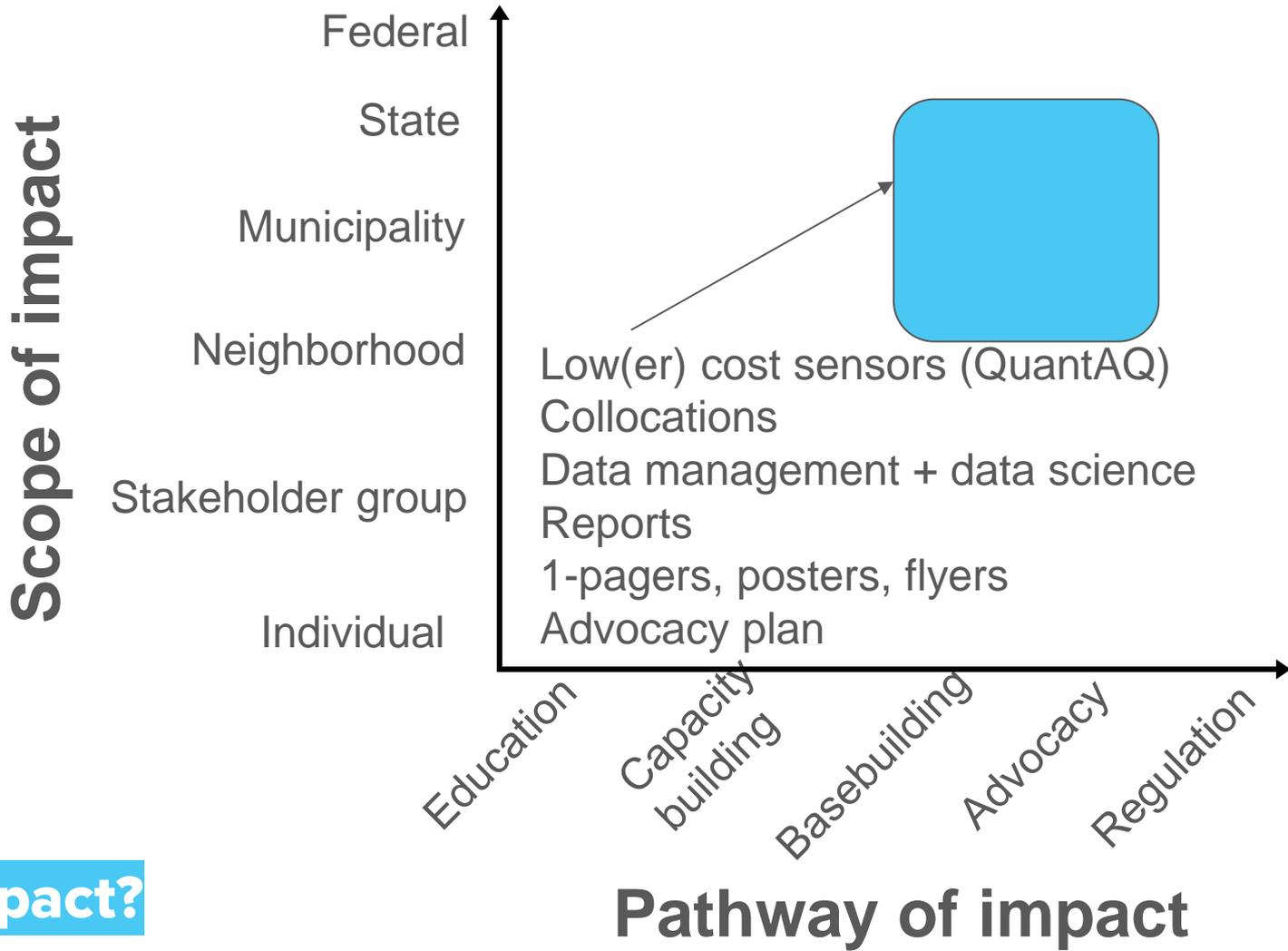
b) What impact?



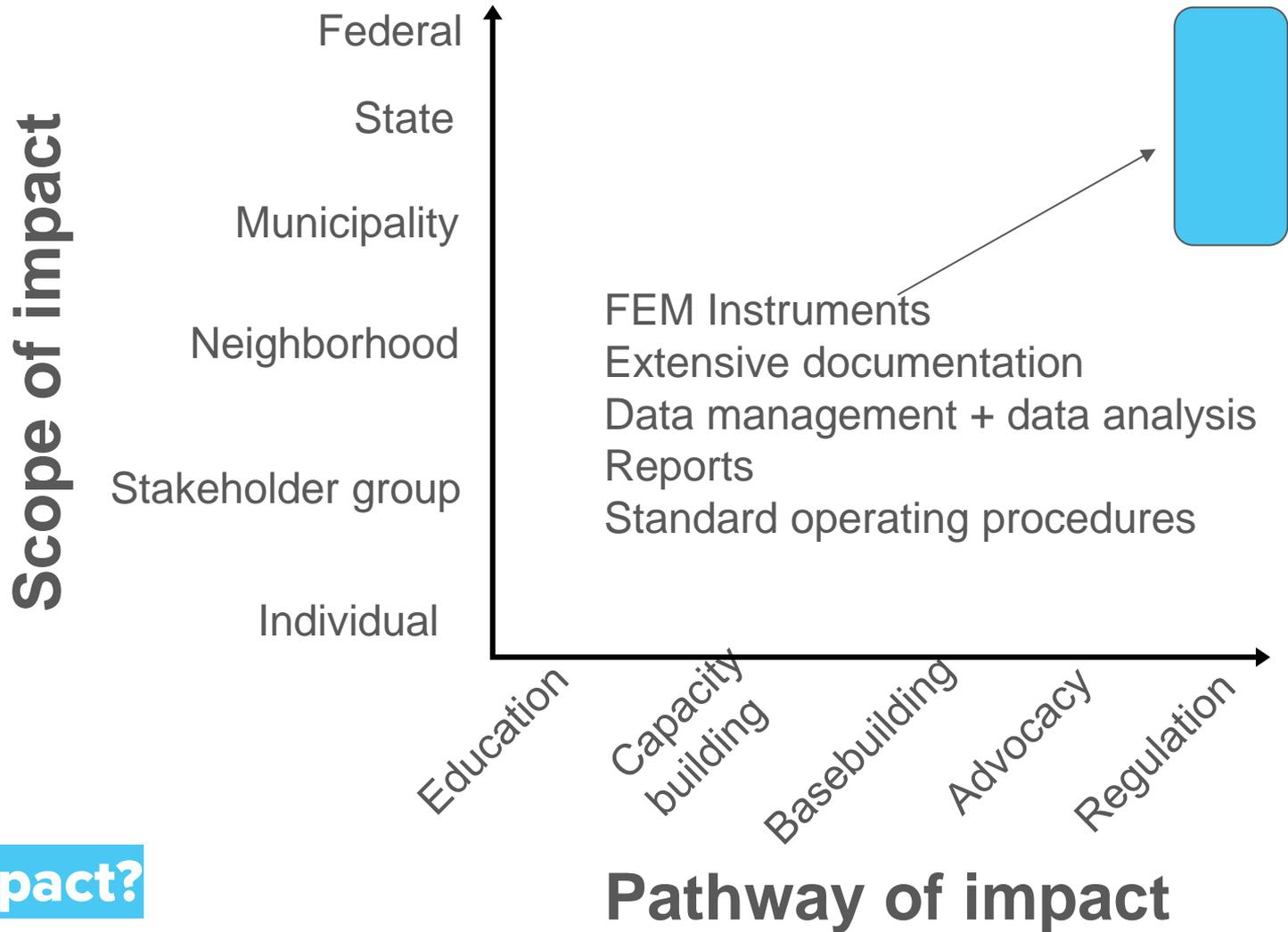
b) What impact?



b) What impact?



b) What impact?



b) What impact?

c) Objectives Worksheet

Steps for Defining Your Air Monitoring Objective



Step 1: Air Quality Questions

1. What is your air quality concern?
2. What do you already know about the air quality concern?
3. What existing information helped identify these concerns?
4. What information, data, or personal observations already exist?
5. Is there a specific pollutant of concern?
6. Is there a specific pollution source of concern?
7. What is not known about your air quality concern?

Source: <https://bayaircenter.org/resource/defining-an-air-monitoring-objective-by-asking-the-right-questions-worksheet/>

Available in: English, Spanish, Tagalog, Vietnamese

c) Objectives

Example:

A neighborhood association in a large metro area wants to monitor the air. Residents are concerned about two major highways intersecting in their neighborhood.

While criteria air pollutants are measured by the state air agency two miles away, residents want to understand when traffic-related pollutants, including black carbon and NO₂, are high throughout the day. The residents want to increase awareness around traffic pollution in the community and use the data to meet with the city to advocate for ways to protect residents.

Instruments will be installed and operated within 200 to 300 feet of the intersection and will collect data for a two-year period. The instruments will measure black carbon and NO₂ and weather parameters, including wind speed and direction.

Let's work through the questions together:

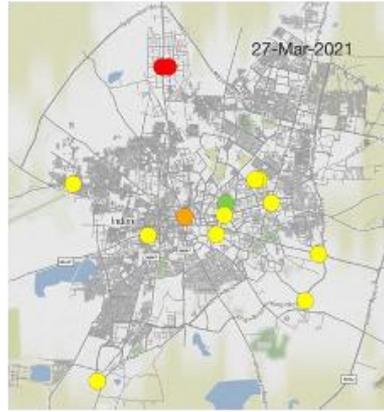
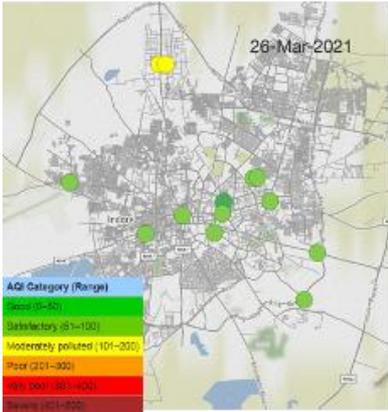
Summarize and define an objective:

1. Why are you monitoring?
2. What do you plan to monitor and do?
3. Where will you do this?
4. How long do you plan to monitor?
5. What equipment will you use?

Source: U.S. EPA Webinar #3

<https://www.epa.gov/amtic/CommunityAirMonitoringWebinars>

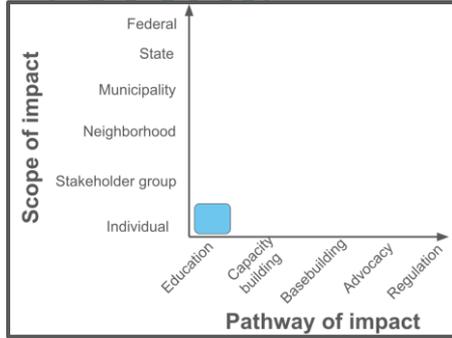
Tim examples



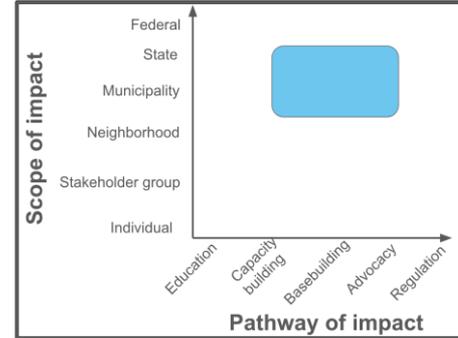
Bay Air Center (www.BayAirCenter.org)

Community-Led Study on Air Quality in Indore, India
<https://www.tdenviron.com/news/indore-building-healthy-cities>

East Boston



Roxbury



What resonates?

2. How should we do this?

01

Identify Stakeholder Priorities

02

Plan Project

03

Collect Data

04

Generate Insights

05

Create Artifacts

06

Leverage Artifacts

07

Conclude Project

GOALS

Find alignment and create trust
Identify questions that need answering

Translate stakeholder priorities into a project plan that can answer key questions

Collect the right data to answer key questions

Analyze data to draw conclusions

Display and package insights to tell stories that support stakeholder priorities

Sharing artifacts to create change

Develop a plan to either sustain or end project

ACTIVITIES

-  Community Partner
-  Technical/academic partner
-  Collaborative role

-  Understand partner expectation
-  Establish roles and define team
-  Understand project endpoints
-  establish goals
-  site (virtual) visits

-  Write a plan (to include maps, timelines, tech specs, budget, etc...)
-  Identify and purchase equipment
-  develop deployment strategy for equipment (locations, duration)
-  provide feedback
-  iterate plans based on feedback

-  Deploy instruments in the field
-  Access, download, organize, backup data

-  Create or obtain existing analysis code
-  Use analysis code to generate statistics and figures
-  Interpret statistics and figures

-  Identify key figures and statistics
-  Incorporate key figures and statistics into formats that community partners can understand and use
-  Provide feedback
-  Iterate

-  Identify avenues for sharing insights and artifacts
-  Create a dissemination plan
-  Implement dissemination plan

-  Decide the future trajectory of project, physical resources and human resources
-  Develop and implement project conclusion plan

PRODUCTS

Curated list of each stakeholder's priorities
Clearly articulated list of key questions for the project
Stakeholder map(s)

Project planning document, including roles, timeline, budget, risk mitigation, and data management
Maps of proposed equipment deployment locations

Network of deployed hardware
Organized, backed up raw data that are accessible to the team

Analysis software and algorithms
List of insights that answer key questions
Curated set of figures, tables, and statistics that support insights

Artifacts that have been packaged for stakeholders

Theory of change for how artifacts lead to impact
Plan for using artifacts in change-making work, including roles, timeline, budget, and risk mitigation

Plan for hardware and artifacts will:
a. continue to be used and sustained in the community, or
b. re- deployed in other communities or meet their end of life

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01 Identify Stakeholder Priorities

Find alignment and create trust

Identify questions that need answering

What are the primary sources of air pollution exposure in Roxbury?

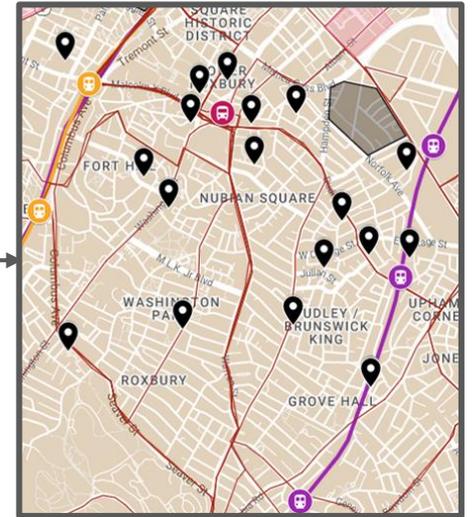
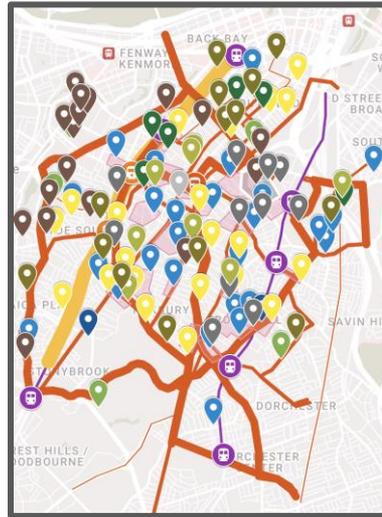
What is the air quality impact of:

- Nubian Station?
- Fairmount Line?
- MBTA diesel bus lines and bus stops?
- Diesel school bus idling?
- Construction?
- Indoor and building-related pollutant sources?

To what extent are HEPA purifiers able to reduce PM exposure indoors?

02 Plan Project

Translate stakeholder priorities into a project plan that can answer key questions



03

Collect Data

Collect the right data to answer key questions

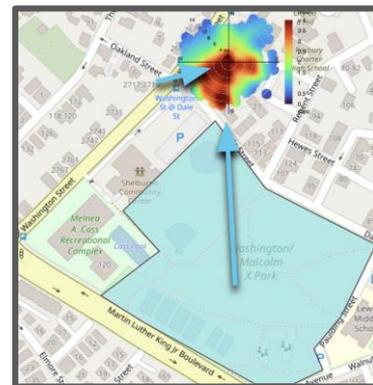


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Generate Insights

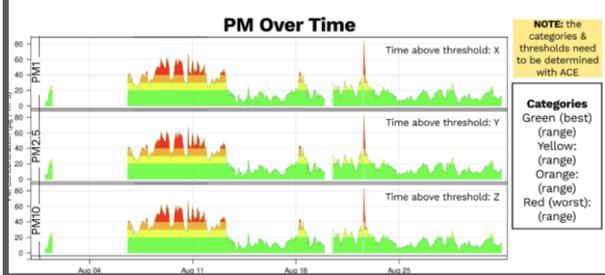
Analyze data to draw conclusions

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## See Plotter Map Explanation
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March 2022: ACE Parking Lot Sensor

This report has data collected from the community owned air sensor network in Roxbury in collaboration with ACE. The sensors are QuantAQ Modular™ PM and measure Particulate Matter (PM) from burning fossil fuels that is harmful to human health. If you have any questions or concerns, please contact <INSERT CONTACT INFO>.



05

Create Artifacts

Display and package insights to tell stories that support stakeholder priorities

1. Determine requirements
(look, ask, try, why)



3. Seek feedback on drafts
(Env. Analysis guest visit from ACE)



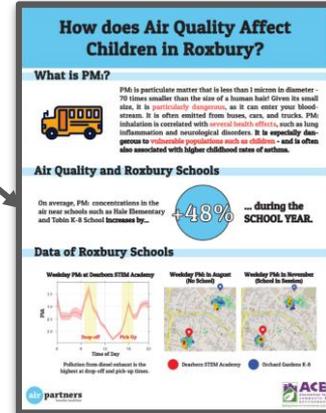
5. Seek feedback on wireframes (Zoom)



2. Generate first drafts
(undergraduate Env. Analysis)



4. Wireframe final versions



6. Create Final One Pager

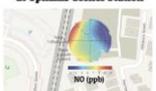
One-pagers and Posters

I Live Near a Commuter Rail... How Does it Affect My Air?



The Fairmount Line

NO Levels by Wind Direction at Uphams Corner Station



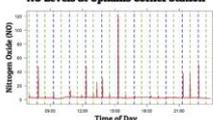
The Fairmount Line Commuter Rail, a **diesel-powered** train, runs through Roxbury. Nearby residents have spoken of **adverse health effects** due to its fumes.

On the left, we see that coming from the direction of the commuter rail tracks (averaged 2023), there are much higher Nitrogen Oxide levels, indicated in **red**.

When is Air Quality the Worst?

In this graph in the right, captured on January 28th, 2023, we see that **Nitrogen Oxide (NO)** levels increase when the commuter train arrives and leaves, and returns to near zero when it's long gone.

NO Levels at Uphams Corner Station



Legend: Nitrogen Oxide (NO) (red), Outbound Train (green), Inbound Train (blue)

What Does this Mean for My Health?

Nitrogen oxide pollution has adverse health effects, and often indicates the presence of ultrafine particles (UFPs), which are tiny particles - less than a thousandth the width of a human hair! UFPs are so small that they can enter the bloodstream from the lungs, which can cause **serious health effects**, such as inflammatory and cardiovascular impacts.



Join the ongoing efforts to electrify the Fairmount Line at www.ficaction.org



Why Is It Hard to Breathe at Nubian Station?



Diesel + NO₂ Emissions

Major Sources of Diesel Pollution in Roxbury



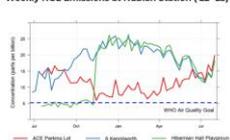
MBTA buses are exclusively diesel, which emits more NO₂ than regular cars.

Nubian Station is surrounded by major roads used by buses, construction equipment, and regular gas vehicles.

Warmer colors = higher concentration of diesel pollution

The Hard Data

Weekly NO₂ Emissions at Nubian Station (7/22-7/23)



The World Health Organization (WHO) annual mean air quality guideline for NO₂ is 5.14 PPB.

Over the one year period from July 2022-2023, sensors around Nubian Station detected record levels of NO₂ that FAR exceed WHO guideline

Health Impacts of NO₂



By breathing in diesel fumes you...

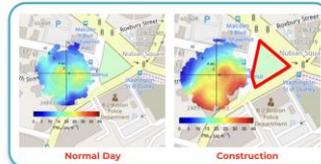
- Increase inflammation of your airways
- Reduce your lung function
- Induce/worsen coughing and wheezing



I live near a Construction Site... Does it affect my air?



Alternatives for Community & Environment (ACE) placed **pollution sensors** near construction sites. Here's what they found:

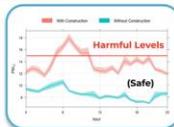


Construction sites cause large particle pollution* which triggers asthma attacks and allergies

*Dust, soot, and smoke, which scientists call PM10 (20 micron particles)

How much worse is it?

Construction days exceed global health standards for PM₁₀ (large particle) pollution.



The red line is the WHO's long term exposure limit

Long-term exposure can cause chronic conditions (primarily Asthma)

Many construction sites can last for months.

What can you do?

- **Get Involved:** ACE organizes for local regulations to reduce pollution and make polluters take responsibility. Scan the QR.
- **Purifiers, windows, and planning:** PM10 levels are lower inside! Closing windows, avoiding playing outside during construction hours, and buying an air purifier greatly decrease exposure.



How does Air Quality Affect Children in Roxbury?

What is PM₁₀?



PM is particulate matter that is less than 1 micron in diameter - 70 times smaller than the size of a human hair! Given its small size, it is **particularly dangerous**, as it can enter your bloodstream. It is often emitted from buses, cars, and trucks. PM₁₀ inhalation is correlated with **several health effects**, such as lung inflammation and neurological disorders. It is especially dangerous to **vulnerable populations such as children** - and is often also associated with higher childhood rates of asthma.

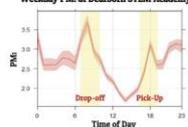
Air Quality and Roxbury Schools

On average, PM₁₀ concentrations in the air near schools such as Hale Elementary and Tobin K-8 School increases by...

+48% ... during the SCHOOL YEAR.

Data of Roxbury Schools

Weekday PM₁₀ at Dearborn STEM Academy



Pollution from diesel exhaust is the highest at drop-off and pick-up times.

Weekday PM₁₀ in August (No School)



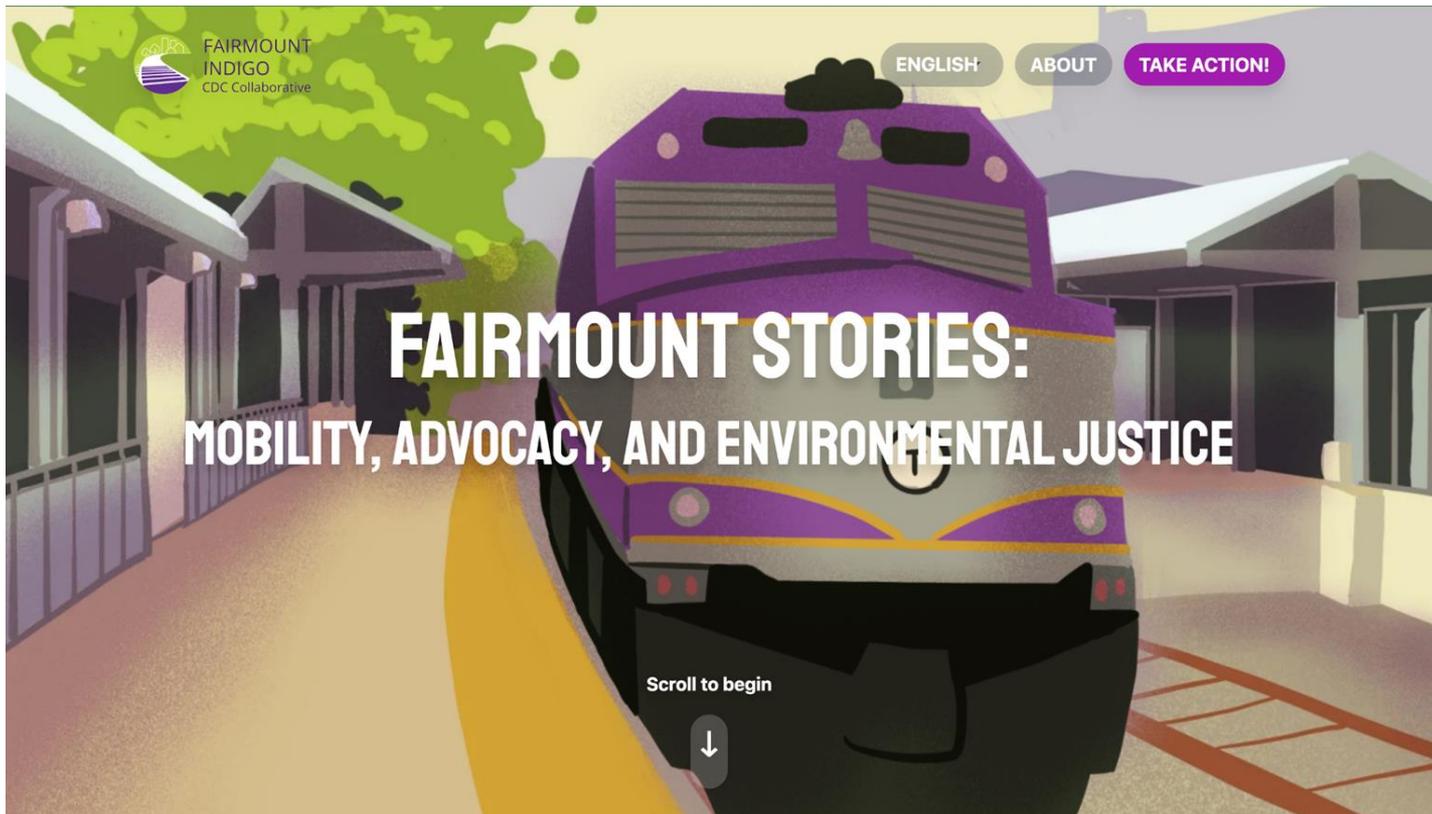
Weekday PM₁₀ in November (School in Session)



Legend: Dearborn STEM Academy (red), Orchard Gardens K-8 (blue)



Web story



Data Walks

There are Sources of Pollutants in Your Air...

ACE **air partners**

- 1 **Building Emissions** - Even the quietest traffic, heating or refrigeration can be a real air-polluting force.
- 2 **Blue Sky Air** - Is a common cause for haze during the warm, which is harmful to the public.
- 3 **Construction** - Dust from the road can be a real air-polluting force that gets into the air and can be a real air-polluting force.
- 4 **Power Plants** - Power plants can be a real air-polluting force that gets into the air and can be a real air-polluting force.

When in Roxbury, your exposure to pollutants is different and depends on how close you are to construction versus the buses, trains, and cars.

Pollutant Levels in a Typical Day

PM2.5 Particulate Matter

Real Time Data!

13 hours daily you are breathing air with high concentration of pollutant

17 hours daily you are breathing healthy polluted air

18 hours daily you are breathing air with high concentration of pollutant

19 hours daily you are breathing healthy polluted air

20 hours daily you are breathing healthy polluted air

21 hours daily you are breathing healthy polluted air

22 hours daily you are breathing healthy polluted air

23 hours daily you are breathing healthy polluted air

24 hours daily you are breathing healthy polluted air

Conclusiones del Data Walk

air partners

- 1 **La contaminación del aire puede tener un impacto negativo en su salud.**
La contaminación del aire causa 7 millones de muertes al año. Eso es 1 en 5 muertes mundacionales.
Todo lo que quema combustibles fósiles, como los coches, buses y trenes que usan diesel, causa contaminación del aire. Otras actividades, como construcción e industria, también pueden generar contaminación.
Las ratas de asma en Roxbury son mucho más altas que el promedio del resto de Boston.
- 2 **Hay fuentes de contaminación del aire en su comunidad.**
La zona del área Fairmount Indigo, también como la mayoría de las zonas del MBTA, usan diesel como combustible y emiten partículas dañinas en el aire de su vecindario. Las construcciones también son fuente de partículas pequeñas y grandes.
Las construcciones de partículas pequeñas son más altas durante el día por el tráfico, mientras que las construcciones de partículas grandes son más altas la noche y la madrugada.
- 3 **Cuando son usados correctamente, los purificadores de aire ayudan a reducir su exposición a la contaminación.**
Los purificadores de aire son compactos, silenciosos, y ayudan a remover alérgenos y partículas del aire.
Comenzamos a la comunidad popular: los purificadores de aire son más fáciles de usar y más baratos que los purificadores de aire que se encuentran en supermercados.
3 horas menos en aire de mala calidad cada día.



Do purifiers help? We have the data!

ACE **air partners**

HEPA Efficiency in Breathing Places

Particulate Concentrations: Before & After

40%
55%

Feedback from Residents Who Use Purifiers

"This program has been a great blessing. It has helped my children to breathe better at bedtime since by purifying the air they don't cough in the night."

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"I have an 8-year-old grandchild who has been having trouble breathing since we got the purifier. She is now sleeping better at night. I have never had such a good night's sleep in my life."

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There is more you can do

ACE Alternatives for Communities and Environment

Send a letter/email to your representative to support the AQ Bill

Sign up to be involved and show up to events

Tell a story of how air pollution affects your life

FICC - The Fairmount Indigo CDC Collaborative

Tell decision makers such as Governor Healy to support the Fairmount line electrification through this tool

Sign up for their newsletter through this link

Takeaway

There is a lot that you can do to voice your concerns and support for initiatives

What is Next?

Complete our post Data Walk questionnaire, and enter the raffle to win your own purifier!

Contaminación tóxica.

En el 2022, reportamos más de 44 purificadores HEPA a residentes de Indigo Block.

Los purificadores de aire son compactos, silenciosos, y ayudan a remover alérgenos y partículas del aire.

Comenzamos a la comunidad popular: los purificadores de aire son más fáciles de usar y más baratos que los purificadores de aire que se encuentran en supermercados.

3 horas menos en aire de mala calidad cada día.

5 Usted puede participar en la mejora de la calidad del aire de su comunidad.

"FICC se esfuerza en brindar justicia climática y equidad de salud a las comunidades que viven por medio de la organización comunitaria y promoción de políticas."
-ace-air.org

Enlaces útiles

Acceda a los datos de calidad del aire en el área de ACE

Levante la evaluación de la calidad del aire en el área de ACE

Mande un correo de apoyo

Contáctenos

ACE partners

ACE



06

Leverage Artifacts

Sharing artifacts to create change

Canvassing and organizing



Community Meetings



Informing, engaging, and supporting elected officials



Resources for Planning and Conducting Air Monitoring

A couple of resources for planning and conducting air monitoring studies:

U.S. EPA

- [Air Sensor Guidebook](#) and [Air Sensor Toolbox](#)
- Webinar Series: [Community Air Monitoring Fundamentals \(Five 2-hr videos\)](#)

Bay Air Center

- [Designing a Community Scale Air Monitoring Project](#)
- [Placement of air monitoring devices](#)

Georgetown's Community Air Monitoring Working Group

- [Framework for Designing and Conducting an Air Monitoring Project](#)

What resonates?

**3. How should we do
this together?**

Sherry Arnstein's Ladder of Citizen Participation

ACTIVE

INCREASED LEVELS OF
DECISION-MAKING POWER



RESPONSIVE

THE 'POWERFUL' HAVE
CONTINUED RIGHT TO
DECIDE, BUT 'POWERLESS'
CAN ADVISE

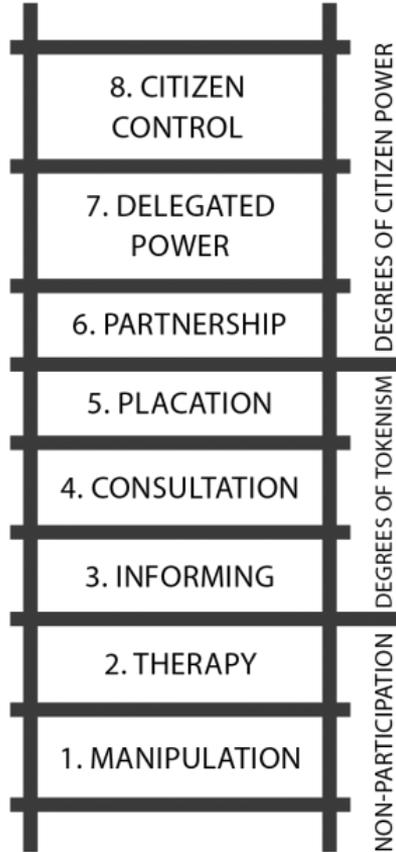


'POWERLESS' CAN HEAR AND
BE HEARD, BUT HAVE NO
ASSURANCE OF BEING
HEEDED BY 'POWERFUL'



PASSIVE

'EDUCATE' OR 'CURE'
THE 'POWERLESS'



Increased responsibility
Increased accountability
Decreased control of outcomes
Decreased control of process

IAP2 Spectrum of Public Participation

INCREASING IMPACT ON THE DECISION

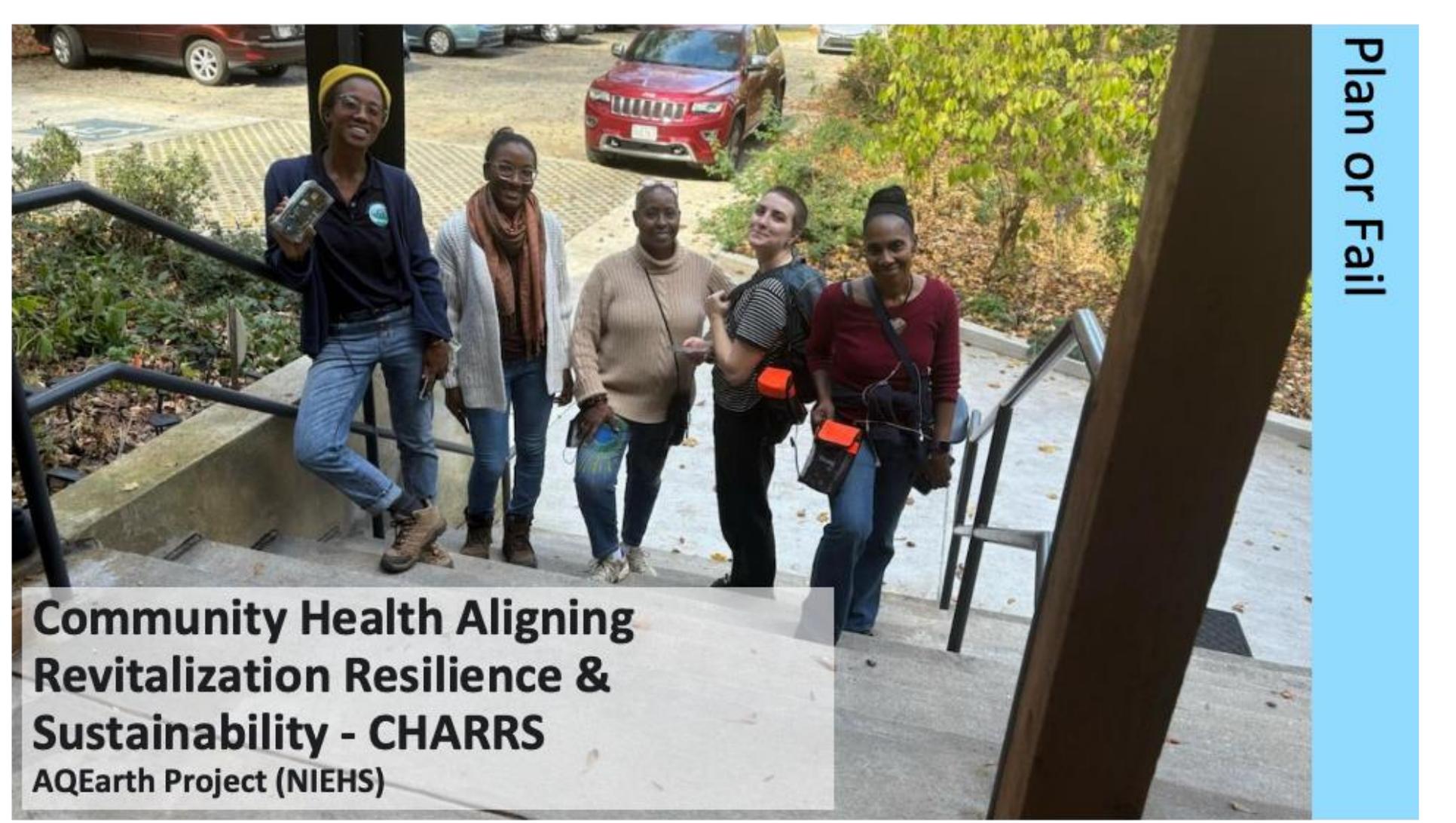
	INFORM	CONSULT	INVOLVE	COLLABORATE	EMPOWER
PUBLIC PARTICIPATION GOAL	To provide the public with balanced and objective information to assist them in understanding the problem, alternatives, opportunities and/or solutions.	To obtain public feedback on analysis, alternatives and/or decisions.	To work directly with the public throughout the process to ensure that public concerns and aspirations are consistently understood and considered.	To partner with the public in each aspect of the decision including the development of alternatives and the identification of the preferred solution.	To place final decision making in the hands of the public.
PROMISE TO THE PUBLIC	We will keep you informed.	We will keep you informed, listen to and acknowledge concerns and aspirations, and provide feedback on how public input influenced the decision.	We will work with you to ensure that your concerns and aspirations are directly reflected in the alternatives developed and provide feedback on how public input influenced the decision.	We will look to you for advice and innovation in formulating solutions and incorporate your advice and recommendations into the decisions to the maximum extent possible.	We will implement what you decide.

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Principles of partnering with integrity

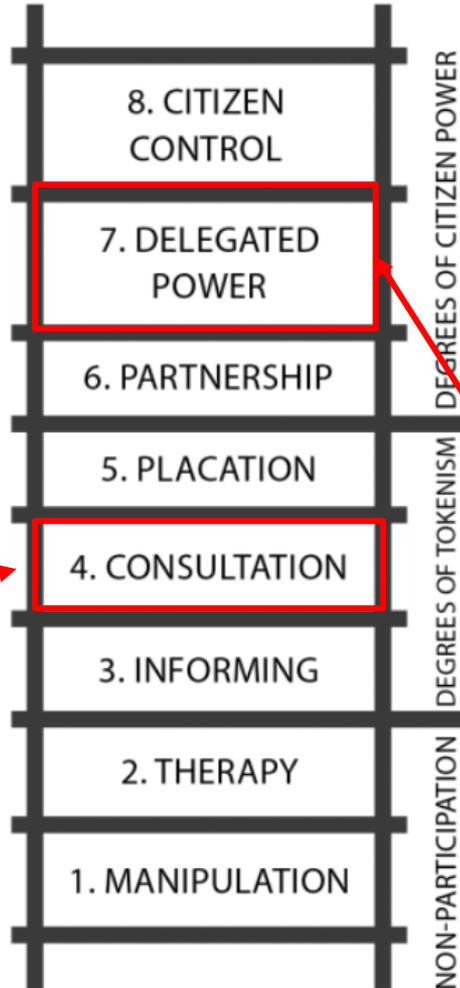
- Relationship first
- Take your time (4X+)
- Transparency (this will happen either proactively or reactively)
- Make “deposits” into the community
- Listen
- Show up
- Meaningfully share decision-making power
- Name and decenter power dynamics

Plan or Fail



**Community Health Aligning
Revitalization Resilience &
Sustainability - CHARRS**
AQEarth Project (NIEHS)

Revere



Roxbury



Conclusions

Clearly define goals

Choose sensors and project plans to support goals

Develop a collaboration plan

Questions

Follow-up



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