Manual | 30.09.2017

PARTICIPATORY ACTION RESEARCH & CITIZEN SCIENCE

EDUCATING FOR SUSTAINABILITY WORKSHOP

DEVELOPED FOR

en.v

FUNDED BY

KFAS
مـؤسسة الـكويت للـتقدم العلمي
Kuwait Foundation for the Advancement of Sciences

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INTRODUCTION

WHY THIS WORKSHOP?

Kuwait is currently facing a number of important threats to the environment including in areas of waste management, biodiversity monitoring and assessment, air quality, and climate change. Although an increasing number of actors are trying to tackle these issues, their impact to date has been limited due to a lack of coordination, collaboration and knowledge sharing among key stakeholders. Specifically, there is not enough data available to civil society leaders and educators aiming to help them address these issues.

Considering the above, the "Educating for Sustainability" program, developed and implemented by en.v and funded by the Kuwait Foundation for the Advancement of Sciences (KFAS), aims to build the capacity of local educators and civil society leaders to engage Kuwait's youth in participatory research/conservation projects promoting environmental protection and sustainability. This will be achieved through providing funding and support to the target audience who are interested in developing research projects that would generate the kind of data needed to promote environmental action.

The "Educating for Sustainability" workshop will highlight the use of innovative and community-based methodologies in research efforts, including Citizen Science and Participatory Action Research (PAR).

WORKSHOP METHODOLOGY

This workshop manual includes several modules which cover the different aspects of the tackled topic to fulfill the below-mentioned objectives.

The workshop modules include:
— Definitions: the most relevant definitions based on available literature
— Tools: useful to develop and implement research projects
— Exercises: to practice the tools and get more familiar with the concepts discussed
— Case studies from Kuwait and different countries around the world: to provide examples that participants can relate to

This workshop will be highly interactive and engaging and will focus on creating a comforting and enabling learning environment.

It will primarily be based on experiential learning, providing comprehensive learning techniques to ensure the most effective transfer of knowledge to all participants. This workshop places heavy emphasis on practice, and case studies allowing high participation and interactivity.

OBJECTIVES & AGENDA

WORKSHOP OBJECTIVES

This three-day workshop will focus on providing educators with an overall understanding of citizen science and action research, as well as their relevant approaches and tools. Additionally, this workshop will help them in mobilizing students and activists to collect data and conduct research on environmental issues in Kuwait to properly inform campaigns, adopt potential solutions and advocate in the right directions.
More specifically, the workshop will allow participants to:

— Have a preliminary understanding of Action Research and Citizen Science.
— Understand the relevance and importance of Action Research for environmental awareness and action.
— Acquire practical tools that will help them in the implementation of Action Research in their respective communities and academic research.

WORKSHOP AGENDA

Day One: 30-Sept-2017	
Time	**Session**
09:30am - 10:00am	Opening — Getting to know each other — Introduction to the workshop: Objectives and Agenda
10:00am - 11:00am	A brief introduction to the concepts of Citizen Science and Participatory Action Research: — What is Citizen Science and Participatory Action Research? — How is this approach beneficial for our environmental issues?
11:00am - 11:15am	Coffee and Tea Break
11:15am - 01:00pm	Approaches to Participatory Action Research — What is the process of action research? — What are the principles of action research?
01:00pm - 02:00pm	Lunch Break
02:00pm - 03:30pm	Steps of Participatory Action Research — Issue identification — Team formation and community engagement — Research methodology development
03:00pm - 03:15pm	Coffee and Tea Break
03:15pm - 04:15pm	Steps of Participatory Action Research (Cont'd) — Data Collection

	— Data Analysis

Day Two: 01-Oct-2017	
Time	**Session**
04:00pm - 05:30pm	Participatory Action Research in Practice Case Study analysis
05:30pm - 05:45pm	Coffee and Tea Break
05:45pm - 07:00pm	Preparing our Participatory Action Research Plan Using practical tools and real cases from Kuwait, the participants will put a plan for their initiatives

Day Three: 02-Oct-2017	
Time	**Session**
04:00pm - 05:30pm	Presentation of PAR plan Feedback and input from participants
05:30pm - 05:45pm	Coffee and Tea Break
05:45pm - 06:30pm	Presentation of PAR plan (cont'd) — Revise PAR plans based on feedback
06:30pm - 07:00pm	Closing — Next steps — Evaluation of workshop

INTRODUCTION TO CITIZEN RESEARCH & PARTICIPATORY ACTION RESEARCH

DEFINITIONS

The following section presents definitions for the concepts that will be used throughout the chapter.

Citizen Science

"Citizen science is the practice of public participation and collaboration in scientific research to increase scientific knowledge. Through citizen science, people share and contribute to data monitoring and collection programs. Usually this participation is done as an unpaid volunteer."[1]

"Citizen science" is used to describe a variety of ideas, from a school of thought related to public engagement in scientific projects to scientific methodology inspired by community principles. Citizen science projects are often ones in which volunteers partner with scientists to answer real-world questions.[2]

Citizen science can mean anything from citizens observing natural events and characteristics to a genuine revolution in 'science' that democratizes the important social role of learning about the world around us. Citizen science can be seen as a way 'real scientists' leverage the labor of large numbers of people distributed widely, or a way to leverage the brains, experience, and insights of the world's people to advance understanding.[3]

Citizen science is scientific research carried out by non-professional scientists (whether part of it or whole). Other common references to citizen science are "crowd science, crowd-sourced science, civic science, volunteer monitoring or networked science." It can also be described as "public participation in scientific research," participatory monitoring and participatory action research[4].

The term first came up in the 1990s[5], but became an official word recognized in the Oxford English dictionary in 2014[6].

There are multiple approaches in citizen science, employed all over the world. Some of those examples include the following:

Cooperative Inquiry[7]

The idea behind cooperative inquiry is to "research 'with' rather than 'on' people." It focuses on the fact that all active participants are fully involved in research decisions as co-researchers. Cooperative inquiry creates a research cycle among four different types of knowledge: propositional knowing

(contemporary science), practical knowing (the knowledge that comes with actually doing what is proposed), experiential knowing (the feedback received in real time about the interaction with the larger world) and presentational knowing (the artistic rehearsal process through which new practices are crafted). The research process iterates these four stages at each cycle with deepening experience and knowledge of the initial proposition, or of new propositions, at every cycle.[8]

Participatory Rural Appraisal (PRA)

Participatory Rural Appraisal (PRA) is a methodology of learning rural life and their environment from the rural people. It requires researchers and field workers to act as facilitators to help local people conduct their own analysis, plan and take action accordingly. It is based on the principle that local people are creative and capable of conducting their own investigations, analysis, and planning. The basic concept of PRA is to learn from rural people. Chambers (1992) defined PRA as an approach and methods for learning about rural life and conditions from, with and by rural people. He further stated that PRA extends into analysis, planning and action. PRA closely involves villagers and local officials in the process.[9]

PRA has sources in activist participatory research, agro-ecosystem analysis, applied anthropology, field research on farming systems, and rapid rural appraisal (RRA). Participatory methods include mapping and modeling, transect walks, matrix scoring, seasonal calendars, trend and change analysis, well-being and wealth ranking and grouping, and analytical diagramming. PRA applications include natural resources management, agriculture, poverty and social programs, and health and food security.[10]

Participatory Learning and Action (PLA)

Participatory Learning and Action (PLA) is an approach for learning about and engaging with communities. It combines an ever-growing toolkit of participatory and visual methods with natural interviewing techniques and is intended to facilitate a process of collective analysis and learning.

The approach can be used in identifying needs, planning, monitoring or evaluating projects and programmes. Whilst a powerful consultation tool, it offers the opportunity to go beyond mere consultation and promote the active participation of communities in the issues and interventions that shape their lives.

PLA helps community members unlock their ideas not only on the nature and causes of the issues that affect them, but also on realistic solutions. Additionally, it enables them to share their perceptions and identify, prioritize and appraise issues from their knowledge of local conditions. More traditional, extractive research tends to 'consult' communities and then take away the findings for analysis, with no assurance that they will be acted on.

In contrast, PLA tools combine the sharing of insights with analysis and, as such, provide a catalyst for the community themselves to act on what is uncovered.[11]

Participatory Action Research

Participatory Action Research (PAR) is a broad tradition of collective self-experimentation set up by evidential reasoning, fact-finding and learning. All formulations of PAR have in common the idea that research and action must be done 'with' people and not 'on' or 'for' people. Inquiry based on PAR principles makes sense of the world through collective efforts to transform it, as opposed to simply observing and studying human behavior and people's views about reality, in the hope that meaningful change will eventually emerge.

PAR has emerged as one of the most common terms for this type of research. It is a qualitative inquiry that is considered democratic, equitable, liberating, and life-enhancing and which remains distinct from other qualitative methodologies, particularly concerning the roles played by the researcher and the participants.

Participatory action research is variously termed as a dynamic educative process, an approach to social investigation, and an approach to take action to address a problem or to engage in sociopolitical action (Gillis & Jackson, 2002; Koch & Kralik, 2006; Marshall & Rossman, 2006; McTaggart, 1989; Morris, 2002; Selener, 1997)

> The participatory action research approach of Freire was concerned with empowering the poor and marginalized members of society about issues pertaining to literacy, land reform analysis, and the community (Freire, 1970)

PRINCIPLES OF PARTICIPATORY ACTION RESEARCH

Participatory action research (PAR) varies in methods and definitions. Nonetheless, the approach revolves around the following 3 major principles:

— **Participation:** PAR tackles complex social issues and unravels perspectives of all different stakeholders involved. The approach involves an action researcher and community members. Unlike traditional sciences, PAR seeks full and active collaboration by all participants, who are often engaging in social, political or environmental changes. Participants are not subjects of research, but rather, are active contributors who participate in all phases of the research process.

— **Aiming at social change:** PAR is a subset of action research which is defined as a generation of practical knowledge through a systematic collection and analysis of data in order to take action and make change.

It embodies the belief of pooling knowledge to define a problem in order for it to be resolved.

— **Practical aspect:** PAR merges science and practice; it bases its methods on empirical data. It requires that participants put the practices, ideas, and assumptions about institutions to the test. PAR involves record-keeping, requires participants to objectify their own experiences, involves making critical analysis, and is a political process.

PAR STRENGTHS AND CHALLENGES

Participatory action research has been celebrated as a research method given its following strengths:[12]

— **Authentic and context-specific:** PAR is more than a scientific method, in that community participation in the research process facilitates a more accurate and authentic analysis of social reality. It moves the research approach from a linear cause and effect perspective, to a participatory framework that considers the contexts of people's lives. This allows for a more critical understanding and reflection of social issues, while maintaining a commitment to the local specificities.

— **Inclusive:** The process typically engages the less-powerful groups in a certain community; the poor, the oppressed, and the marginalized have the opportunity to take the lead on changing their own situation. It relays the voices of those who are typically excluded from scientific research. This approach builds ownership of information, and demystifies the research process, creating space for trust to be developed.

— **Empowers the community:** PAR increases a community's awareness of its own resources. It increases the visibility of environmental issues in a certain community and helps mobilize it for self-reliant development. Additionally, the process involves capacity building for community members to be creative actors and participants in meaningful decision-making. Individuals also learn by doing, which strengthens their belief in their abilities and resources, as well as further develops their skills in collecting, analyzing, and utilizing information.

— **Effective at implementing change:** PAR is a process in which solutions are not being brought-in by institutes, but co-created from scratch by local people. It helps devising policy solutions that rely directly on collective input from people. The community gets the opportunity to expose its local talents and small-scale solutions that are adapted to the particular context. Furthermore, the approach allows the researcher to be a committed participant, facilitator, and learner in the research process, which fosters militancy, rather than detachment

— **Less costly than traditional research:** PAR is less costly in terms of resources than traditional research methods; especially that most of the

data is collected by volunteering community members. Many crucial issues, such as environmental ones, do not receive substantial funding or government attention as they are not seen as a priority. PAR gives researchers the opportunity to conduct research in crucial issues that have limited or no government funding.

Nonetheless, participatory action research faces the below challenges:

— **Little participants' homogeneity:** A substantial challenge for PAR is the inclusion of community members in the research team. Moreover, community members may vary in values, perspectives and abilities. The difficulty in reaching consensus on the social issue to tackle makes it challenging to anticipate the project's timeframe for instance (Gillis & Jackson, 2002; McNiff & Whitehead, 2006). Additionally, there may be misunderstandings regarding the participants' perceptions of the social issue to be addressed, or regarding the direction and overall purpose of the inquiry, resulting in irrelevant data. Therefore, the process requires sensitivity on the part of the researcher to participants' agendas.

— **Time-consuming:** Participatory action research requires time and knowledge from the community. Community members may struggle to maintain their commitment to the research project over time. Community capacity building is another time-consuming element as education is required for all to participate and for the process to proceed as intended.

— **Cultural sensitivity:** The researcher must gain access to the community of interest. This may present a cultural sensitivity challenge, especially if the researcher is not familiar with the community or is from a different cultural background.

— **Soft-research method:** Participatory action research is often considered as a soft research method from a scientific perspective. The research is sometimes seen more as a voice on everyday experiences and less as hard data.

WHY PARTICIPATORY ACTION RESEARCH?

Why would this approach be useful to us as instructors and teachers?

This approach can provide students with:

— An enriching reflective learning experience
— An enhanced sense of empathy
— A more engaged attitude for social change and community development

PAR is not only considered beneficial as a research approach, it also:

— Gives communities more stake in deciding issues to be tackled- social and environmental
— Helps in devising policy solutions that relies directly on collective input from people
— Provides opportunities for the underprivileged to take lead and play an instrumental role in changing their situation
— Is linked directly to action, which means shedding light on issues that are considered by government as less priority (such as environmental issues)
— Requires less budget as it is done through crowdsourcing efforts through volunteers. This gives the opportunity to study topics that are not allocated with enough budgets for research.

PREREQUISITES FOR PARTICIPATORY ACTION RESEARCH

To design, plan and conduct PAR, it is important to pay attention to the following prerequisites:

— Understanding the context of the community
— Limiting prejudices to the extent possible as well as assumptions about the capability of people from different educational, social, religious or ethnic class to contribute to the research
— Engaging all communities within the geography of research without any discrimination
— Focus on the process as much as the result! The research objective should not in any means deprive people or concerned communities from having a say or participating
— Mobilizing communities and volunteers to be part of the research

STEPS OF PARTICIPATORY ACTION RESEARCH

Planning for participatory action research is the most important component as it is where you will have to engage researchers, activists, volunteers and beneficiaries.

In this module, you will be designing the whole process of the PAR taking into account multiple factors:
— Major needs and concerns of the community
— Your expertise and resources
— Type of data that will be collected
— The methodology you will employ throughout the research
— Implementation action planning
— Analysis of data collected
— Action steps

PAR is mainly composed of the following steps taking into account its most important principles (mentioned above):
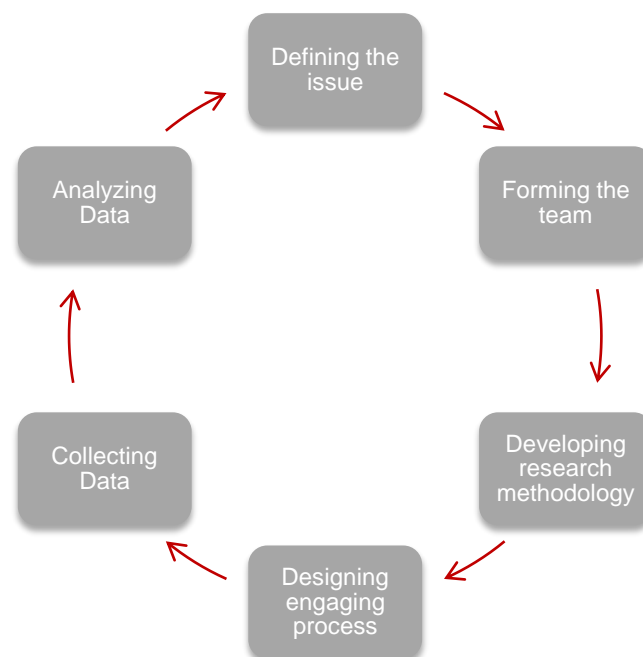
1. DEFINING THE PURPOSE OF THE RESEARCH

In this very first step, the main issue that will be studied should be identified and specified taking into consideration its importance and relevance to the community.
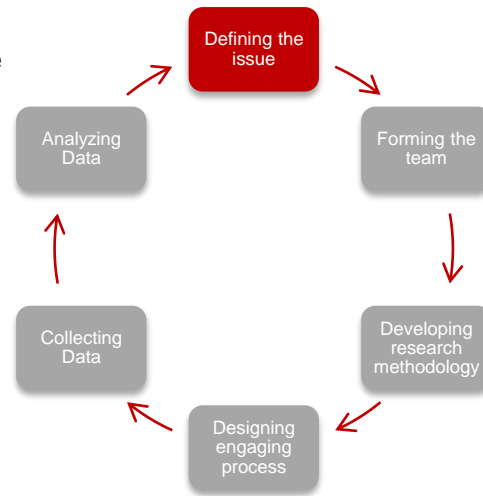
Identifying the Issue

— What is the issue I am mostly concerned about?

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— Does it concern a large population and multiple communities? How?

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— What is the context/history of this issue?

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— What are the reasons behind it?

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— How do I envision change/my role in the change of this issue?

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Science-based projects often begin with a question, which may develop as response to an issue.

— Choose a topic and question of interest to you, but also to the participants. Ask the community you are targeting, "What is needed? What can we help with?"
— Be familiar with the interests, abilities, but also the limitations of your volunteers.
— It is important to remain flexible and responsive, especially when starting the research, based on what you find from the existing literature related to the chosen topic/issue and based on what you learn on the ground.

Source: http://www.birds.cornell.edu/citscitoolkit/toolkit/steps/steps

Defining the Research Question

— What do I need to know to help me understand further the issue?
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— What data/information do I need?
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Example:

If we consider the decrease of a specific plant species as a major environmental issue in Kuwait, we will need to think of:
— *What are the main sources of this decrease?*
— *What do we know about this species?*
— *What are the geographical areas or communities most affected by this issue?*
— *How is this issue harmful to the environment and what are its implications for communities? (contribution to air pollution, irrigation, etc…)*
— *How can we contribute in solving this issue?*
— *What do we need to study so that we're informed and equipped to tackle this issue? (We might simply need to identify the areas where this species is still growing, count them, describe their features, etc…)*

2. FORMING OUR RESEARCH TEAM

In this phase, we will be thinking of the different individuals and groups who will be taking part in the research. Remember, the core of this type of research is to bring about change in a specific issue "with" the people and not "for" the people. The engagement process, and inclusion of largest number of stakeholders will be of benefit to the actual implementation of the research, as well as to the learning of everyone involved.
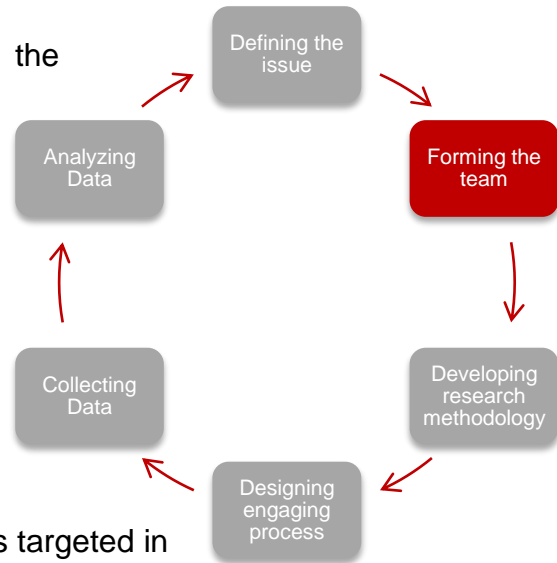
Traditional research deals with individuals targeted in a study, as "subject".

In PAR, subjects are the ones who are the most active in generating, collecting and analyzing the data, as well as taking a significant role in designing the actions following this research.

For this reason, it is very important to select the core team you'll be working with, and individuals and groups who will be taking part in the research carefully.

Forming the Core Team

— What expertise is needed to conduct our research?

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— What are our available resources? (Human resources, financial resources)

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— Are these resources available to be utilized? How?

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— **Communicate** the research goals and needs as clearly as possible, while keeping the question at the foreground.
— **Map** and identify areas where your project can potentially benefit from specific expertise and skills (educators, professional researchers, environmental scientists, etc.)
— **Include** them in the initial stages of the process in order for them to have a complete picture and feel the ownership and their role as part of the research.
— **Listen** to the needs and concerns of other partners, and address them accordingly.

Engaging the Team of Citizen Researchers

— What are the geographical areas we need to study?

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— What are the communities that are mostly concerned (affected) by the issue we are studying?

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— How can they take part in the research? What do we need exactly from them?

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— How can we mobilize them?

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3. OUR RESEARCH METHODOLOGY

At this stage we will start thinking of the ways in which we will collect the data: the approach, the data collection tools, geographical areas, technology, and timeline.

A methodology is a systematic plan for our research in which we need to design the following:
- Type of data that will be collected to address the research question
- The ways for collecting the data
- The tools that will be used for data collection
- Analysis framework to be used after this process.
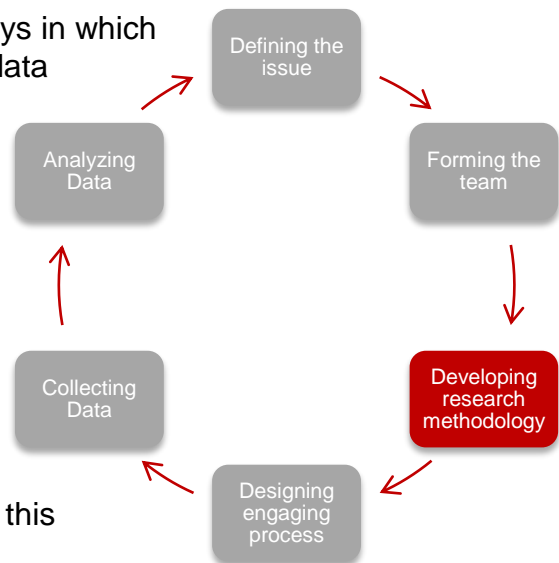
Types of Data to Collect

- What is the available data on the issue we are studying? (other research studies, statistics, reports, etc…)

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- What do I still need to know/data to collect exactly?

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— What is the nature of this data that I need to collect? (quantitative, qualitative, both?)

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— Who are the stakeholders I need to collect this data from?

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— What geographical areas should my research cover?

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Data Collection Methods

Once we know exactly the data we need, we need to start thinking of how we are going to collect it.

— Does the data we need include numbers or statistics? (Quantitative) and what is it exactly that we need?

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— Does the data we need include descriptions? (Qualitative) and what is it exactly that we need?

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— What is the sample size will we need for our research?

> Consult with a statistician and think:
> - Determine the needed sample size for your study
> - Determine the necessary number of study sites
> - Address the potential for sampling bias

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Data Collection Tools

Ways of collecting data should be standardized and unified to ensure that our results are accurate, reliable and sufficient to analyze and design our interventions. Each type of data might require a different tool, so make sure you take this into account. We might need to design more than one data collection tool

— What tools do we need exactly to collect the needed data? (survey, short questionnaire, interview questions, focus group discussion guide)

Data collection methods can include:
- Surveys
- Focus groups
- Interviews
- Observation
- Storytelling

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— Are we capable of designing these tools? Let's think of what expertise is needed.

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In such research initiatives, where volunteers and community members are involved, make sure the tools and the data collection process are:
- Realistic and within capacity of the volunteers to use
- Transparent, straightforward, clear, and accessible (*why* are they being asked to do what they are asked to do)

Source: *Toolkit Steps, Cornell Citizen Science Central* http://www.birds.cornell.edu/citscitoolkit/toolkit/steps/steps

Consider using affordable technology for data collection! It could be simply an application on smart phone, to upload visuals and data, or litmus paper to check the acidity of water. This will help us:
- Minimize errors
- Collect data in an effective manner
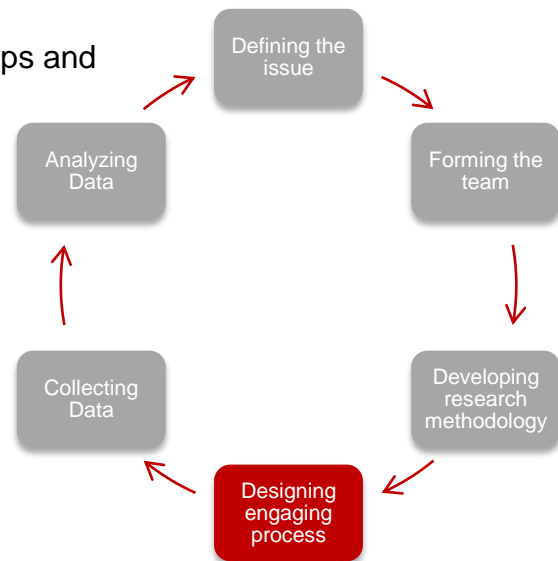- Decrease cost of data collection

Type of data	Sample size	Tools	Equipment	Resources
Example:				
Number of specific plant species spotted in a geographical area	*Specific geographic locations* *+ minimum number of plants/region*	*Checklist to confirm the type of the plant + specs of visual to be taken / documented*	*Camera + an application to upload a picture of the plant*	*Trained volunteers covering all targeted geographic areas*
Visual description of the external features	*Specific geographic locations* *+ minimum number of plants/region*	*Survey to be filled once a plant is spotted and following uploading of the visual. This survey might include questions on location, external features, etc…*	*Online application using a smart phone*	*Trained volunteers covering all targeted geographic areas*

4. ENGAGEMENT PROCESS

In order to have multiple individuals, groups and volunteers participate and take an active role in PAR, it is essential to have a clear recruitment process to have them on board and engage them throughout the whole period of the research.

This phase will include:
— Ways of recruitment
— Required trainings
— Inclusion in different phases of the research

Defining the issue

Forming the team

Developing research methodology

Designing engaging process

Collecting Data

Analyzing Data

Recruiting the Team

— What is the profile of volunteers we need to involve?

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— Where can we find them? (University, NGOs, public institutions, schools, clubs, etc…) and how can we reach them?

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— What are their interests, and how can we get them motivated and engaged about our research?

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The methods of recruitment influence who becomes part of the research team. They can include:

- Recruitment done via emails, texts, social media (Facebook, Twitter, etc.), posting on public forums, professional marketing and recruitment agencies
- Local and national media (radio, TV, etc.)
- Passing out printed materials, like brochures and flyers,
- Word of mouth can also be effective.
- They can be direct reach to academic institutions, individuals (especially those with an accessible network), different businesses, organizations, and groups (particularly environmental groups in this case who would be interested in such research)
- Government agencies

Source: : *Toolkit Steps, Cornell Citizen Science Central*
http://www.birds.cornell.edu/citscitoolkit/toolkit/steps/steps

— What kind of training will they need to be equipped to take part in our research?

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Things to take into account in dealing with volunteers:
- Trust them, and their capabilities
- Ensure they're well driven, committed and willing to take action and be part of making a change
- Make sure the whole team holds a similar set of values
- Hold multiple feedback/reflection sessions with them in every stage of the research
- Ensure that everyone enjoys an enriching learning journey
- Have lots of fun!

After you reach out to the different groups:[13]
— Survey potential participants
— Find out what they know/what they want to know
— Ask what skills (and topics!) they would be interested in contributing to. Capitalize potentially on something that they already like to do, which is something to keep in mind when thinking of the research question

Toolkit Steps, Cornell Citizen Science Central
http://www.birds.cornell.edu/citscitoolkit/toolkit/steps/steps

After recruiting the team of citizen researchers, make sure you communicate with them regularly, using convenient channels such as:
— WhatsApp groups
— Emails
— Online platforms
— Social media groups
— Etc…

Training the Team

Aside from ensuring that the team is willing and committed, it is important to get their feedback on the research methodology and tools. Also it is required that they have the needed skills and knowledge to handle the data. So make sure they are:

— Provided with clear instructions and guidelines for the research
— Well informed about the overall goals of the research
— Provided with the needed training on equipment to be used or data collection tools
— Asked for their feedback regularly

5. DATA COLLECTION

This phase is where the implementation will start!

Once all volunteers and citizen researchers are equipped and ready, we will need to start thinking of a deployment plan, a timeline, and the required technologies to gather, and analyze the data.
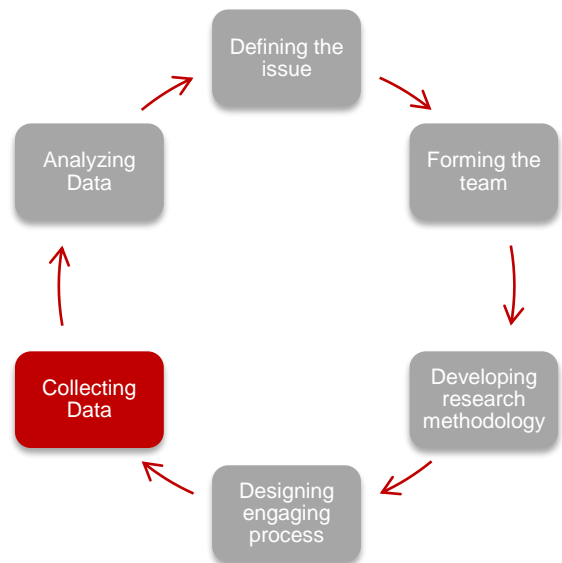
— By when exactly do we need to be done with this research?
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— How do we need to be distributed to collect the data to make sure we're done on time and able to cover all geographic areas/ sample?
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— How and where are we recording and gathering all the data?
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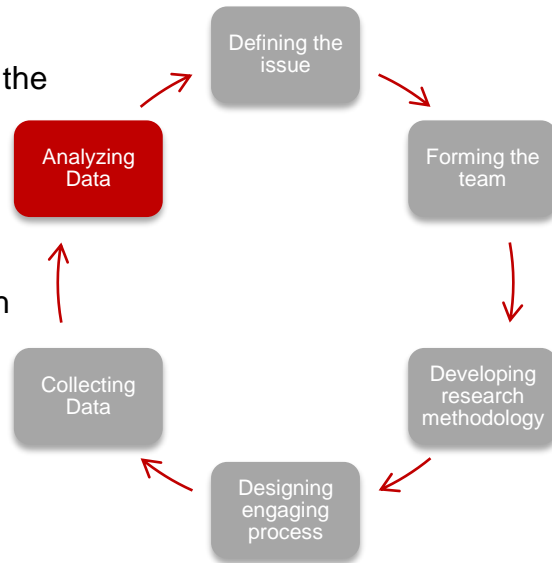……………………………………………………………………………………………

In order to have an effective data collection process, we might need to make sure to:

— Determine technology needs for data collection, analysis, data visualization, archiving (backed up), and delivery
— Plan a strong user interface for entering, accessing, and viewing data
— Consider needs for integrating data management across projects
— Minimize steps and avoiding multiple transfers of data (e.g., from paper to excel spreadsheet to internet...) which can be done by using a smart phone directly.
— Create an easy platform for data entry
— Ensure the usability of data collection/data entry technology
— Provide tech support and customer service for users
— Train all volunteers in use of data entry platform
— Get feedback from volunteers continuously

6. DATA ANALYSIS

At this stage, data is to be analyzed with the participants to try to come up with the needed conclusion for our research and thus inform the action we need to take.

Depending on our initial research question, and the conclusions we need to reach, we will need to start making sense out of the data we have collected.

Defining the issue

Forming the team

Analyzing Data

Developing research methodology

Collecting Data

Designing engaging process

<u>Analyzing the Data</u>

— What are we trying to reach exactly? How do we want to use the data?
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— How are we going to categorize the data?
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— How are we analyzing the data?
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— What are we publishing and announcing as a result of our research?
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Similar to all previous stages, volunteers, participants and other researchers should be involved in this stage of analyzing the data. During this stage, we need to make sure to:

— Provide access to data sets and interpretations for volunteers and scientists
— Find the best way to visualize the data as it allows participants to see trends in clearer way
— Give space for participants to ask questions by looking at data (both their own and previously collected data

— Provide an interface that lets people tell a story in the context of their data

> **Example:**
>
> Data analysis for example might involve putting results on a map to show the presence and number of a species of plants available in a specific geographic location. It could also include the features of the spotted plants, size, etc…
> So analysis of this data can lead us to:
> — Size, external features of the samples is related to a specific location/climate according to trends recognized from the data visualization
> — Number of plants (of this species) is increasing or decreasing in a specific location
> — The surrounding of locations where these plants were spotted show some interesting changes...
> — Etc…

Sharing Results

Sharing preliminary results with diverse groups of people allows us to:
— Have them validated by experts
— Get feedback and input on the results
— Add important information regarding the sample or the context
— Get feedback on the analysis method
— Get suggestions for how to use these results for action

This process can be done with different groups and stakeholders:
— Volunteers and participants of the research
— Experts in the field we are studying
— Community members within the geographic location we are examining
— Researchers and university professors

Another purpose for sharing the data, is to start engaging the community in an action we need to take. As mentioned earlier, PAR is not done for the purpose of coming up with results to publish but rather to:
— Inform a campaign on action or directions to be taken
— Inform decision makers to try to shift their opinion
— Inform a critical mass that will ensure to put pressure for creating change
— Inform a policy suggestion or change
— Informing government or relevant decision makers about the risks or implications of an issue, and how they can avoid it / what decisions or action to take

For this reason, distribution of the results is important for us as activists as it is a powerful tool to bring about change in a specific issue, whether environmental or social.

— Who (stakeholders, groups, entities, etc…) has the ability to make a change in this issue?

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— What is the best way to get their attention?

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— Which is the best medium we can use to reach out to these stakeholders?

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— How can we frame the results in a way to better inform and convince stakeholders to take actions?

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Sharing the results could be done through:

— Reaching out to Media Outlets
— Sharing it on online media platforms.

However, we need to be careful on how to distribute this data in order to properly reach our target audience.

Some steps to take into consideration in this process:

— Know what media outlets need in order to cover your program
— Develop something for media (and viewer!) attention
— Present research in a way to maintain media interest
— Tailor to reach specific audiences

Example:

We might need to share our results with different groups and not only one. Each will require a different framing of the message, and probably a different platform.

So we might be sharing the results with:
— **University professors** specialized in plants: to highlight the issue that the decrease of such plant is leading to negative implications on nature through sharing a detailed **report** of the results
— Relevant **ministry** to inform them about potential intervention they can do, using formal and direct informative **meetings**
— The community affected by the decrease of the plant population and the impact on their environment and thus their health. This can be done through sharing a **visualized** version of the **results**, or a **video** describing the results and their impact
— Wider audience, through sharing the results in an interactive way on social media platforms and asking people to share it and take a specific action.

CASE STUDIES

Case Study 1:
Water Resource Management in Nepal

The Upper Kaligandaki Basin is located in a rain shadow of the Himalayas. The Basin receives very low precipitation, mainly from snowfall, and the water supply has been increasingly unpredictable, which is making farming even more challenging. The locals, particularly the majority involved in agricultural production, are growing increasingly concerned about the changing snowfall in upper mountain areas and its impact on water availability in downstream areas. In addition, the unpredicted glacial melting has also increased the likelihood of water-induced hazards such as landslides, flooding and sedimentation occurring in these areas.

To add to natural causes of water resource uncertainty, land use change has a significant impact on ecosystem services. The development of particular roads, hydroelectric projects and the expansion of construction have also contributed to the change in land use. Increase in population as a result of rapid migration and an increase in eco-tourism businesses also added to the water uncertainty, water quality, and land productivity.

From here, a detailed understanding of water and land resources is crucial in sustaining and improving local livelihoods to contribute to better water resource management and help adapt agricultural practices to changing water availability in the long term.

How can citizen scientists help with the unpredictable access to water?

Source:

Imperial College London, Citizen Science and Web-Based Modelling Tools for Managing Freshwater. Retrieved from: https://www.imperial.ac.uk/media/imperial-college/grantham-institute/public/publications/briefing-papers/Citizen-science-and-web-based-modelling-tools-for-managing-freshwater-Grantham-BN-4.pdf

Case Study 2:
Climate Change and European-African Migratory Birds

As a result of climate change, migratory birds are arriving at their breeding grounds earlier as global temperatures rise. The main reason these birds take flight is due to the change in seasonal temperatures and food availability. The time they reach their summer breeding grounds is important, because if they arrive at the wrong time (even if only by a few days) it may cause them to miss on vital resources like food and nesting places. Consequently, it affects the timing of the offspring hatching and also their chances of survival. Long-distance migrants, which are shown to be less responsive to rising temperatures, may suffer most as other birds gain advantage by arriving at breeding grounds ahead of them.

An example of birds that are facing severe consequences as a result are the birds on the western European-African flyway: southern Spain, Northern Africa and the Sahel region of Africa are important stopover sites on this route and will undergo the most severe changes, like desertification or conversion to drier habitats. This means migratory birds may need to cross more hostile habitat, with staging areas becoming smaller and more spread apart.

How can citizen scientists quantify the impact of climate change on migratory birds? What are the tools that they can use to determine changes in the birds' patterns?

Case Study 3:
Air pollution in Delhi

A study funded by the World Bank was carried out to study air pollution. The study showed that the average total suspended particulate (TSP) level in Delhi was around 5 times the World Health Organization's annual average standard and the total suspended particulate levels during the time period of the study exceeded the World Health Organization's 24-h standard on 97% of all days on which readings were taken. Another report by the Ministry of Environment and Forests in India reviewed the environmental situation in Delhi and they estimated that about 3000 metric tons of air pollutants were emitted every day in the city, with the major contribution from vehicles (67%), followed by coal-based thermal power plants (12%).

With this, the Ministry of Environment and Forests and the Government of National Capital Territory of Delhi has taken several steps to reduce the level of air pollution in the city during the last 10 years, with a Central Pollution Board acting as a watchdog to carry out the implementation of improving air quality programs. Some of the control measures include introducing unleaded petrol, catalytic converter in passenger cars, reduction of sulfur content in diesel, reduction of benzene content in fuels, construction of flyovers and subways for smooth traffic flow, introduction of Metro rail and CNG for commercial transport vehicles (buses, taxis, auto rickshaws), and phasing out old commercial vehicles. Environmental awareness campaigns are also carried out at regular intervals.

From here, how can citizen scientists measure the difference in air quality due to the measures taken?

Source:

Indian Journal of Community Medicine, Air pollution in Delhi.
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3612296/

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