

Community science approaches

Part B: Community science & water quality

The material presented here has been prepared by Samuel Addison in April 2021, with input from Dr. Laura Richards and Prof. David Polya of the Department of Earth & Environmental Sciences, The University of Manchester, and other sources as acknowledged. The associated video recordings have been made by Samuel Addison.

The Transformation by Innovation in Distance Education (TIDE) project is enhancing distance learning in Myanmar by building the capacity of Higher Education staff and students, enhancing programmes of study, and strengthening systems that support Higher Educational Institutions in Myanmar. TIDE is part of the UK-Aid-funded Strategic Partnerships for Higher Education Innovation and Reform (SPHEIR) programme (www.spheir.org.uk). SPHEIR is managed on behalf of FCDO by a consortium led by the British Council that includes PwC and Universities UK International. The TIDE project will close in May 2021.



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- Outline
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 - Patna District (Bihar, India) case study
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This lesson will develop from “community science approaches - Part A: Introduction to community science”, where community science will be discussed within the context of water quality. Additionally, a case study example will be given as to show how water quality has been surveyed by a community science approach.

- To be able to discuss reasons as to why community science may be useful within the study of water quality.
- To be able to illustrate an example of water quality community science
- To be able to assess the benefits and limitations of community science for water quality research.

**WATER QUALITY FOCUSED
COMMUNITY SCIENCE: A RECAP**

- There are large gaps in data both spatially and temporally in water resources science[1]
- There is also a water awareness gap between the public and the specialist knowledge of scientists [2]
- Community science provides an efficient method of data collection [1].
- Community science creates a pathway for knowledge exchange between the public and scientists [3]
- Therefore community science may be useful within the context of water resources science

PATNA DISTRICT (BIHAR, INDIA) CASE STUDY

Addison 2021, “Groundwater arsenic hazard in Patna district, Bihar, India; a community science approach”, MPhil thesis submitted March 2021 to the Department of Earth and Environmental Science, University of Manchester.

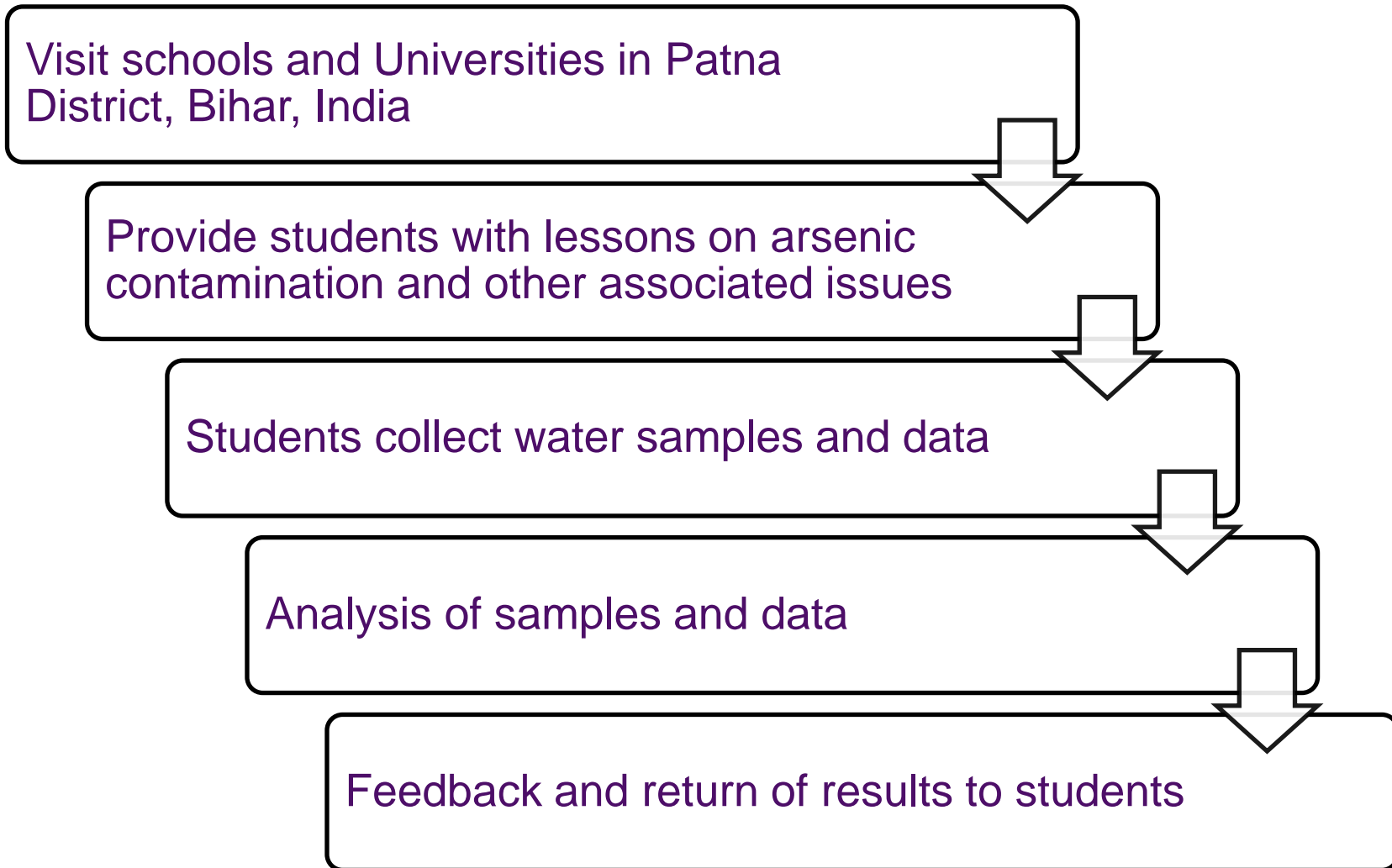
<https://doi.org/10.46427/gold2020.16>

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- Areas of S/SE Asia such as Bihar can have high levels of arsenic contamination in drinking water [1]
- However, studies also suggest that many people place low value on arsenic-free water [2]
- The low value placed on arsenic-free water is consistent with a lack of public awareness [2].

- By involving public members in a scientific study, it aims to raise awareness more effectively, which may increase the value placed on arsenic free water [1].
- Additionally, an aim is to see if community science could lead to improvements in water quality research, by providing an efficient and accurate groundwater survey method [1].

Project description



Sample collection/analysis

Samples were collected at locations volunteers knew were safe and only collected water known to be used for drinking

Samples were transported to the University of Manchester laboratories, with no sample treatment/preservation e.g., no acidification.

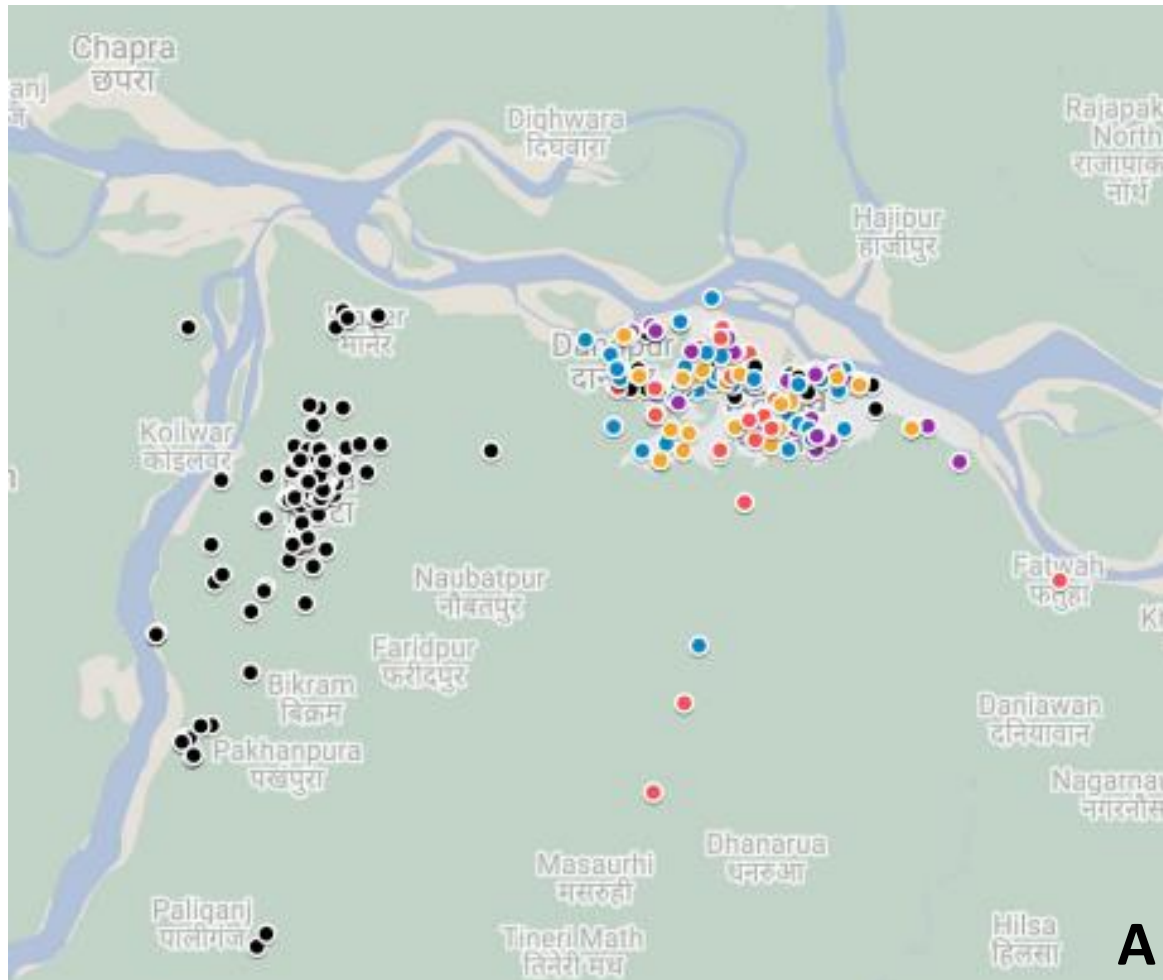
Samples were analysed in lab for chemical contamination e.g. arsenic, fluoride.

Quality checks were made such as duplicate sample analysis, the use of blank samples and the use of certified reference materials.

- 5 schools and universities were visited [1]
- 484 groundwater samples were collected along with information on the depth of the source, if the water was treated and the location of the sample site [1].

Results of study

Distribution of the location of sample sites

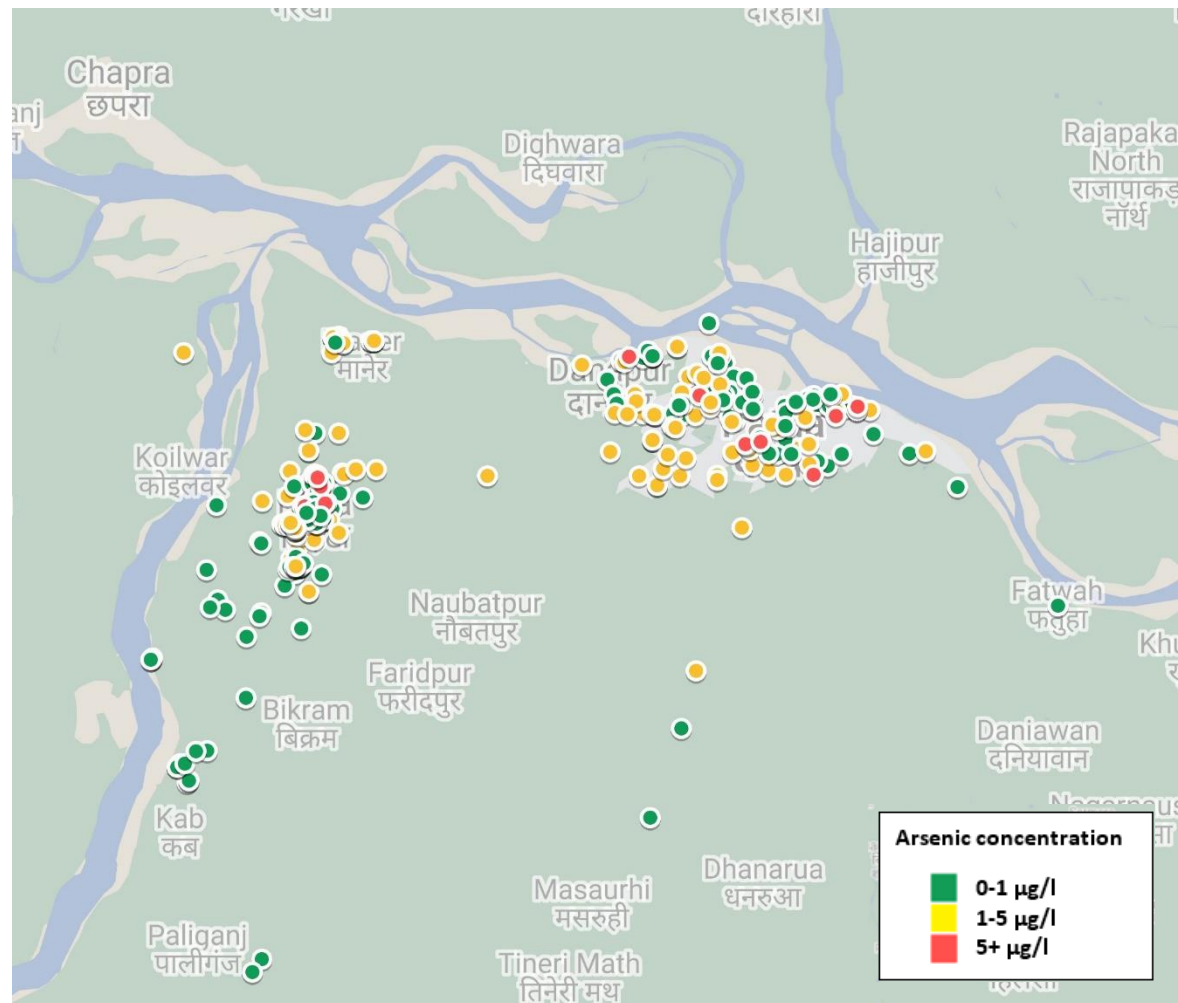


Map B: Location of visited schools and universities (Bihar, India)

Different colours represent the volunteer's schools/ universities.

Maps produced by Addison (2021) in maps.google.com.

Distribution of arsenic concentration



Map produced by Addison (2021) in maps.google.com.

- A concern of community science is data quality, so data is in need of validation.
 - Variability between samples reported at similar locations [1]
 - Verification of reasonable location data (with major outliers removed) [1]
 - Comparison with other studies of water quality in Bihar (e.g., Richards et al. 2020) [1]

- The results gathered will allow for >400 volunteers to be provided with accurate water quality information, regarding the concentration of arsenic and fluoride in the drinking water they collected [1].
- A follow up report is in progress which will provide further information and recommendations based on their water quality data [1].

- The study highlights that community science is a good way of collecting water quality data efficiently through engagement with interested schools/universities [1].
- The study shows that community science has the potential to raise awareness whilst also conducting scientific research [1].
- Further work is needed with regard to comparison to other water quality studies in Bihar [1].
- Future work would aim to monitor and evaluate engagement and impact throughout the project [1].

SUMMARY

- Application of community science approaches to water quality offers substantial potential for future projects
- Community science has been used as an efficient method to survey groundwater arsenic contamination in Patna District, Bihar
- Ongoing work is needed to evaluate and interpret the data, and relative strengths and limitations, including in comparison to other studies in the area.

LEARNING EXERCISE

- Try to design your own community science focused study to investigate water quality.
 1. Think about how you would design a sampling scheme
 2. How would you integrate knowledge exchange as part of the project
 3. How would you evaluate the quality of the data obtained.

REFERENCES & FURTHER RESOURCES

References

Addison 2021, “Groundwater arsenic hazard in Patna district, Bihar, India; a community science approach”, MPhil thesis submitted March 2021 to the Department of Earth and Environmental Science, University of Manchester.

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A study using community science in water quality research

Zheng, H., Hong, Y., Long, D., and Jing, H.: Monitoring surface water quality using social media in the context of citizen science, *Hydrol. Earth Syst. Sci.*, 21, 949–961, <https://doi.org/10.5194/hess-21-949-2017>, 2017. **(OA)**

Two websites with accessible community science projects

<https://www.inaturalist.org/>

<https://www.zooniverse.org/>

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