

# Water and Development

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# Objectives

- a quick introduction to engineers and physical scientists on how water appears as a development need,
- its basic scientific and engineering processes and
- the governance and policy context within which it operates

## Audience

Engineers who want to work in the development sectors as entrepreneurs and development professionals such as district coordinators, or within NGOs, or want to pursue the study of the sector as a researcher.

# Resources

- [www.cse.iitb.ac.in/~sohoni/TD603/](http://www.cse.iitb.ac.in/~sohoni/TD603/): The course page. Mostly presentations, notes, maps, reports etc.
- [www.cse.iitb.ac.in/~sohoni/water](http://www.cse.iitb.ac.in/~sohoni/water) Real-life case-studies.
- [www.gise.cse.iitb.ac.in](http://www.gise.cse.iitb.ac.in): several links-GIS, GSDA.
- [www.ctara.iitb.ac.in/tdsc](http://www.ctara.iitb.ac.in/tdsc): TDSC, several projects documents.
- [www.ctara.iitb.ac.in/tdsc/uma](http://www.ctara.iitb.ac.in/tdsc/uma): Unnat Maharashtra Abhiyan, several GRs.
- **Books**: (i) Ralph Heath- Ground Water Hydrology, (ii) K Subramanya, Engineering Hydrology.

# Organization

- Focus largely on drinking water and water for agriculture
- begins by defining the development context and
- ends by concrete case-studies
- **middle part:** provides the science and engineering needed to execute the case-studies.
  - ▶ regional approach
  - ▶ the basic stocks and flows such as ground water,
  - ▶ basic units of analysis such as watersheds.
  - ▶ basic interventions: tanks, bunds, wells, *bandharas*, irrigation and water supply systems.

# Part I: A Development Framework for Water

What is *Development*?

- Tragedies and their causes and prevention.
- Rapid tragedies vs. slow motion tragedies.
- Natural vs. man-made.

# development as the non-tragic

**Development** as the *desire for and pursuit of a predictable, comfortable and cultural life for an individual and her household.*

- **Basic needs:** Food, water, shelter, health, reproduction. **Cultural Needs.**
- Contrast, say with a mughal king. **Social and collective and not individual**
- Liberty, Equality, Fraternity, as a society. **Means to an end.**
- **Modernity:** Efficiency, Equity, Sustainability.
- **Governmentality.** The power of statistics. The ability to prevent and to pay the costs of prevention.

# Millennium development goals

- elimination of extreme poverty and hunger,
- achieve universal primary education,
- promote gender equality,
- reduce child mortality and improve maternal health,
- to combat diseases such as HIV, malaria,
- to ensure environmental sustainability, and finally
- to develop a global partnership for development.

No mention of money, companies or job or cultures. Also, why should education matter?

# OECD

Let us look at OECD, which is a group of rich countries, and their indices for countries.

- We see that they have 11 categories,
- housing, income, jobs, community, education, environment,
- civic engagement, health, life satisfaction,
- safety, and work-life balance.

One must also wonder how these are measured!

An important attribute of development for us will be *sustain-ability*.



# Census Data for India, 2011

- Counting of *every person* in India and her individual attributes,
- the attributes of her household, and finally
- attributes of her village/ward.

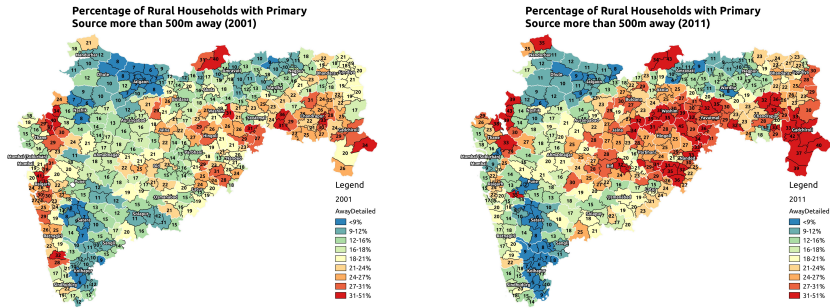
Examples of attributes.

Most graphs of various attributes that you see in the newspapers are *aggregates* of this basic data set, i.e., averages or sums, grouped by district, state, village and so on.

**Attribute related to water:** *distance to source of drinking water.*

**NSSO:** Another *sample* data-set. **Amenities round.**

# Millennium development goals



**Figure:** The fraction of rural persons with drinking water farther than 500m.

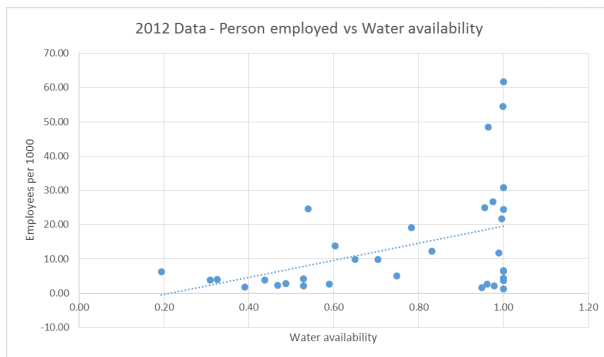
**Causes:** poor planning, higher population pressure, irrigation and drinking water competition, poor engineering.

# Common Picture



**Figure:** Drinking water and cooking energy in villages.

# Urban Water



**Figure:** Employees per 1000 vs. urban drinking water service levels, by districts.

# Sanitation

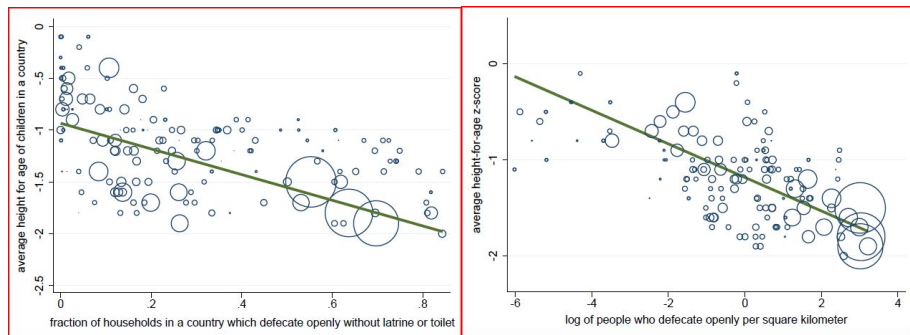


Figure: Health vs. Open Defecation (from World Bank)

- Comparison to highlight causes. Is **density** a better determinant?
- Are toilets the answer?

# DW sources in Pedgaon

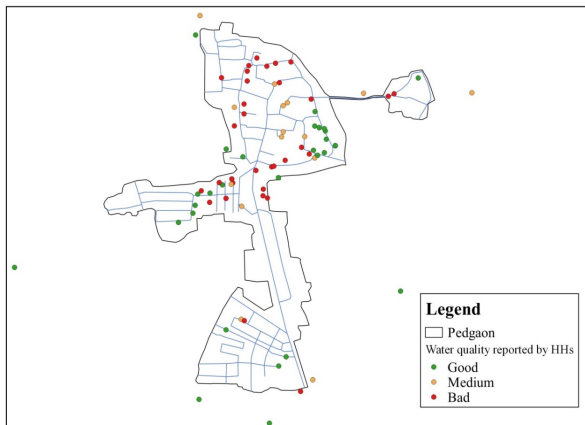


Figure: From Atish Harbhare, SGGS Nanded

All sorts of contamination.

# Nitrate in the ground-water

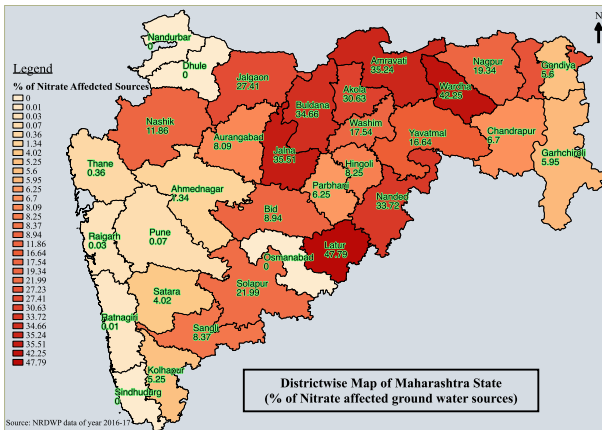


Figure: From NRDWP (Aditya Khebudkar)

Could be due to fertilizer as well!

## Irrigation

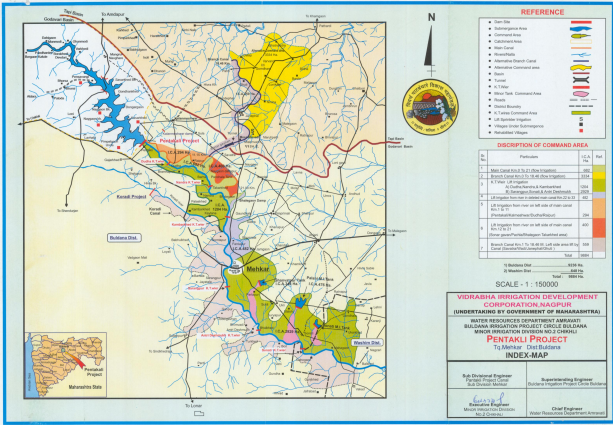


Figure: The Pen-Takli irrigation project.



# Questions

Typical examples of problems which are posed:

- (i) Why did a water supply scheme fail?
- (ii) What is the structure of a water utility of a city and what are typical problems?
- (iii) How do I plan for drinking water security in the district.
- iv) Is the cropping pattern in the district sustainable?
- (v) How does Jalswarajya or some other government scheme, work?

# Exercises

**Exercise** Locate various data-sets on the web and download and study these- Census, NSSO, OECD. **Exercise.** Study the definitions of the census attributes and how they are gathered. Can the MDG attributes be computed from the census data? Do the same for the NSSO data-set.

**Exercise.** Study the various OECD attributes and how they are computed. Compare and contrast between the MDG and the OECD metrics.

**Exercise.** Look at the open-defecation graphs from World Bank. What do you think is the mechanism which connects the attribute of the X-axis and that of the Y-axis?

**Exercise.** Study the irrigation map for Pen-Takli. Understand each attribute in the legend. Locate the scale. What is the area of the project in sq.km.?

# Thanks

