

AAKASH PROJECT

AN INTERDISCIPLINARY STUDY TOWARD
CLEAN AIR, PUBLIC HEALTH, AND SUSTAINABLE
AGRICULTURE:
*CASE OF CROP RESIDUE BURNING
IN NORTH INDIA*

Project Leader: Sachiko HAYASHIDA





Research Institute for
Humanity and Nature

大学共同利用機関法人 人間文化研究機構

総合地球環境学研究所



Juichi Yamagiwa (Social Ecology /Human Evolution /Anthropology)

2021 - Present

Director-General, Research Institute for Humanity and Nature

2014 – 2020 President, Kyoto University

The Research Institute for Humanity and Nature (RIHN), established in April 2001, is an inter-university research institute promoting comprehensive research in global environmental studies.

RIHN Philosophy and Approach

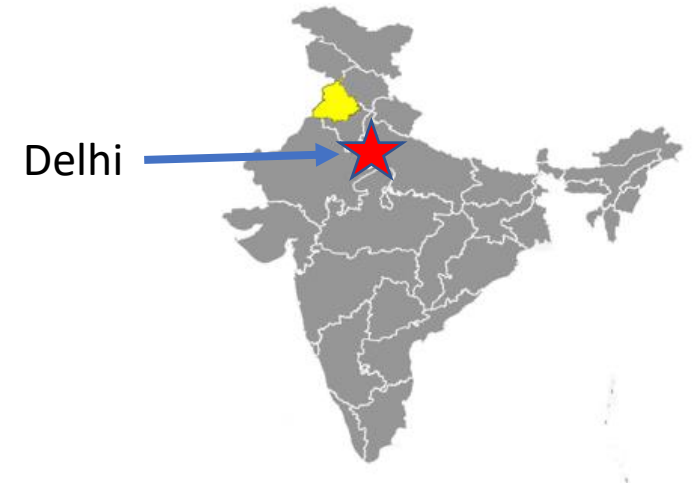
RIHN research starts from the premise that **environmental problems are rooted in human culture and societal values**. RIHN's goal is to seek concepts, theories and mechanisms that enhance human quality of life in direct relation to environmental conditions and ecological processes. RIHN research therefore involves a normative dimension, as it asks what the relationship between humanity and nature ought to be. To this end, RIHN solicits, funds, and hosts integrative research projects investigating environmental change problems in specific settings. Research projects are undertaken by interdisciplinary teams at RIHN, working together with partner institutions and communities in Japan and abroad.

https://www.chikyu.ac.jp/rihn_e/about.html

Air Pollution in Delhi

<https://www3.nhk.or.jp/news/html/20221104/k10013881401000.html>

"In the capital New Delhi, on the Nov. 4th, the concentration of PM2.5, an air pollutant, was 30 times higher than the WHO standard in some places. Some schools are closed.



Since the 2010s, extreme air pollution has repeatedly been reported in Delhi by the mass media.

New Delhi, on the Nov. 4th, 2022



New Delhi, on the Nov. 9th, 2016

What's the reason of the extreme air pollution in this season?

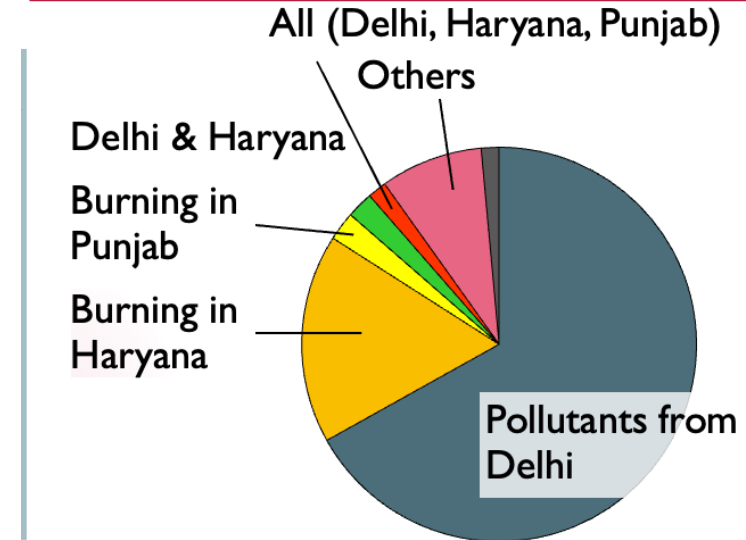
The citizens of Delhi complain “this terrible air pollution is caused by rice straw burning in neighbouring states after the rice harvest”



Kejriwal (Chief Minister of Delhi) has called on neighboring states to enforce laws against **burning agricultural waste**.

It is difficult to quantitatively assess the extent to which rice straw burning has impacted air pollution in Delhi, because most monitoring stations for air pollutants are located in urban areas, with no data available for rural areas.

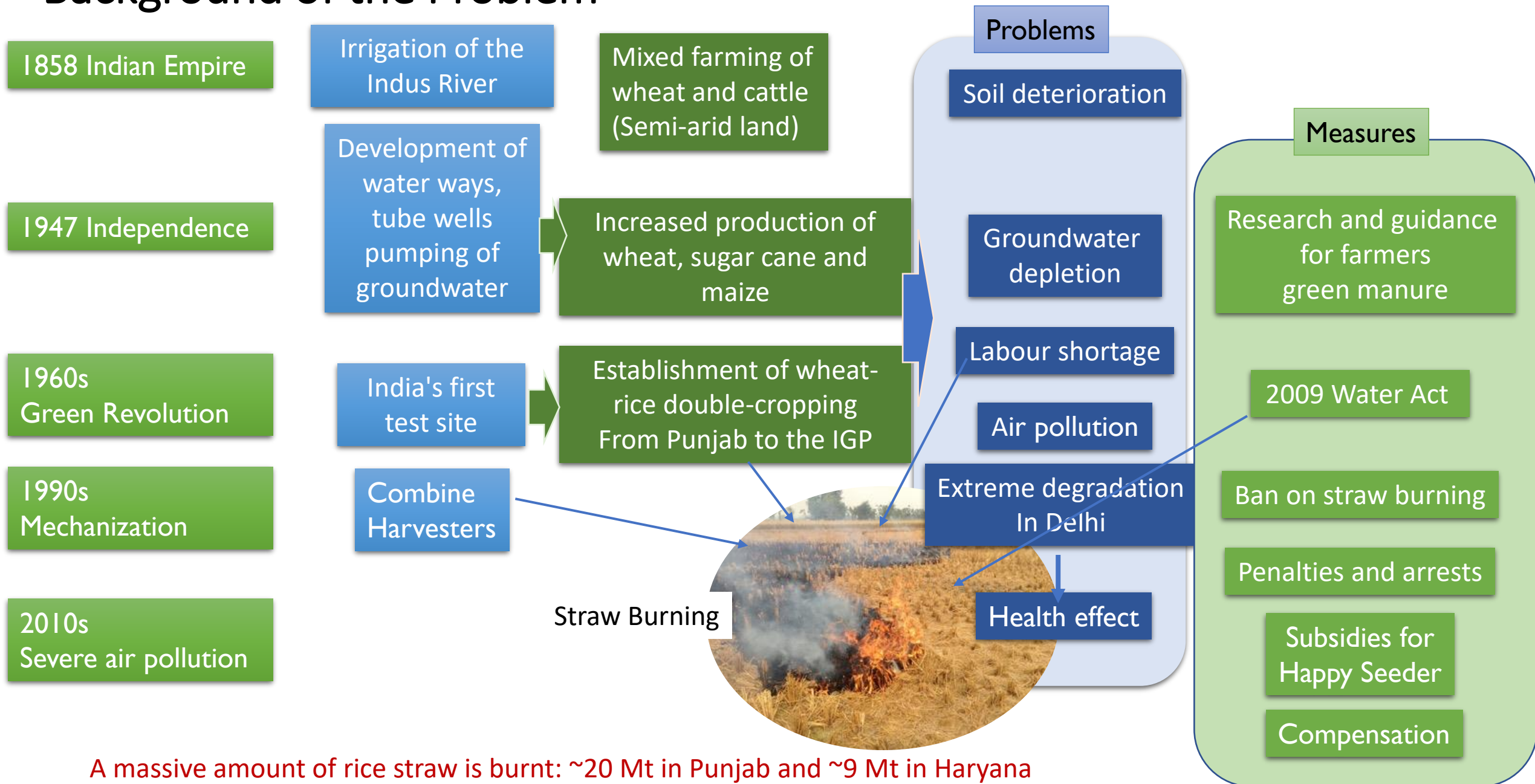
What do you think about the cause of air pollution in Delhi?



After the questionnaire survey by Aakash in 2020 (Yang et al., paper in preparation)

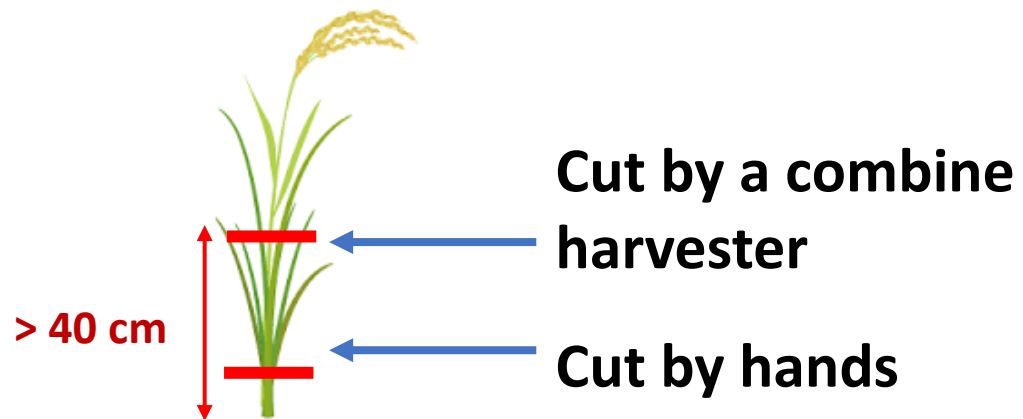
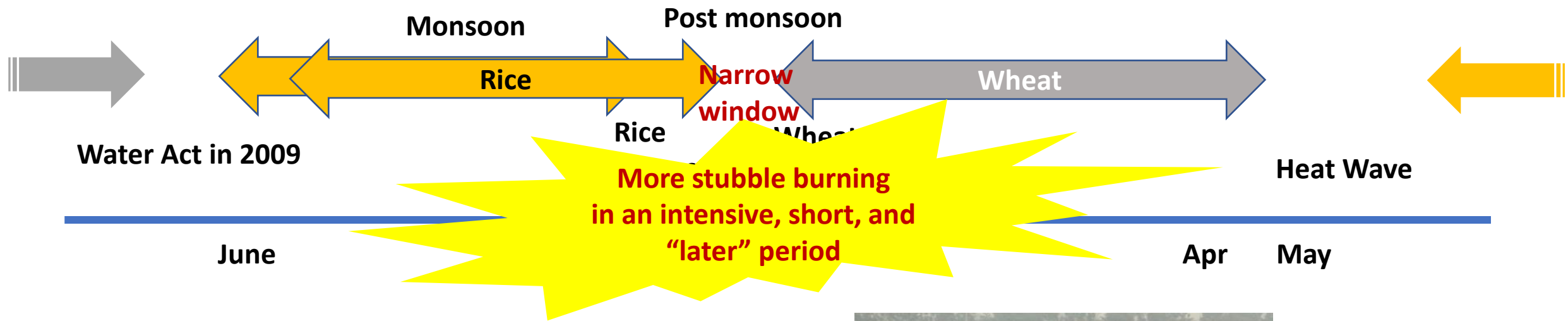
➔ WG2 Research Achievements

Background of the Problem



A massive amount of rice straw is burnt: ~20 Mt in Punjab and ~9 Mt in Haryana

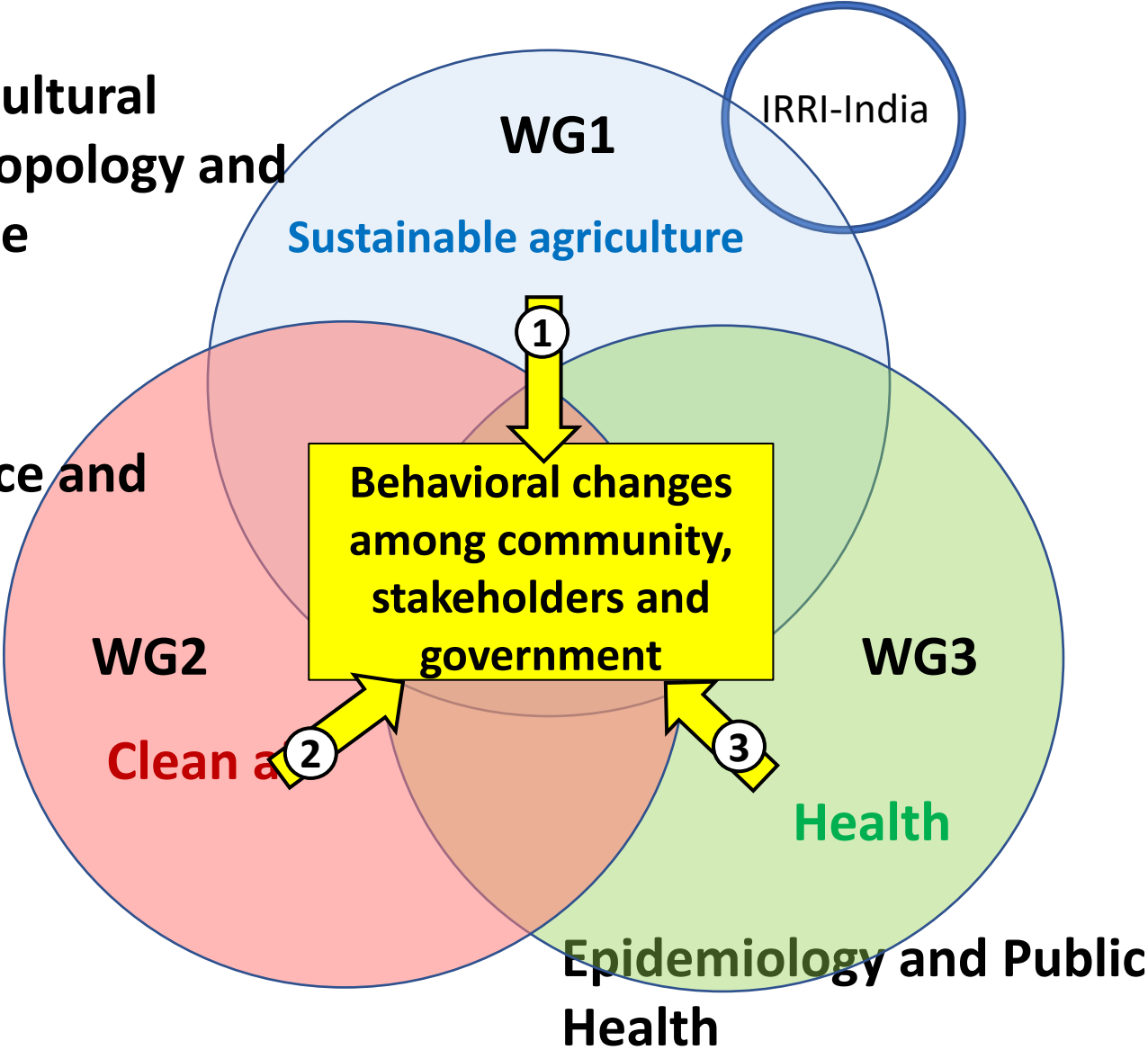
Why do farmers burn rice straw?



Structure

**Agro-Economics, Cultural
Geography, Anthropology and
Agricultural Science**

**Atmospheric Science and
Remote Sensing**



WG1c: new group to survey
straw use for biofuel

Goal of the Project

Encourage people to change their behavior by raising their health awareness of air pollution based on scientific findings.

Awareness Change

This presentation +

Prof. Kayo Ueda

Promote crop diversification by moving away from a cropping system biased toward rice-wheat double cropping.

Crop Diversification & Biochar production

Dr. Shigeto Sudo

Explore the potential for effective use of rice straw through mixed burning of straw and coal in thermal power plants, which has become a policy of the central government of India starting in 2021.

Low Carbon Society

Prof. Kamal Vatta

Examination of the socio-economic advantages and disadvantages of the various options

- Disseminate research findings to government agencies, local communities and local residents, and make recommendations for new policies and changes in daily behavior.
- Propose specific business models that will economically enrich local farmers.
- The goal is to provide a realistic pathway for farmers to convert to a sustainable form of agriculture.

Results of Intensive campaign of the air pollutants measurement From September to November in 2022

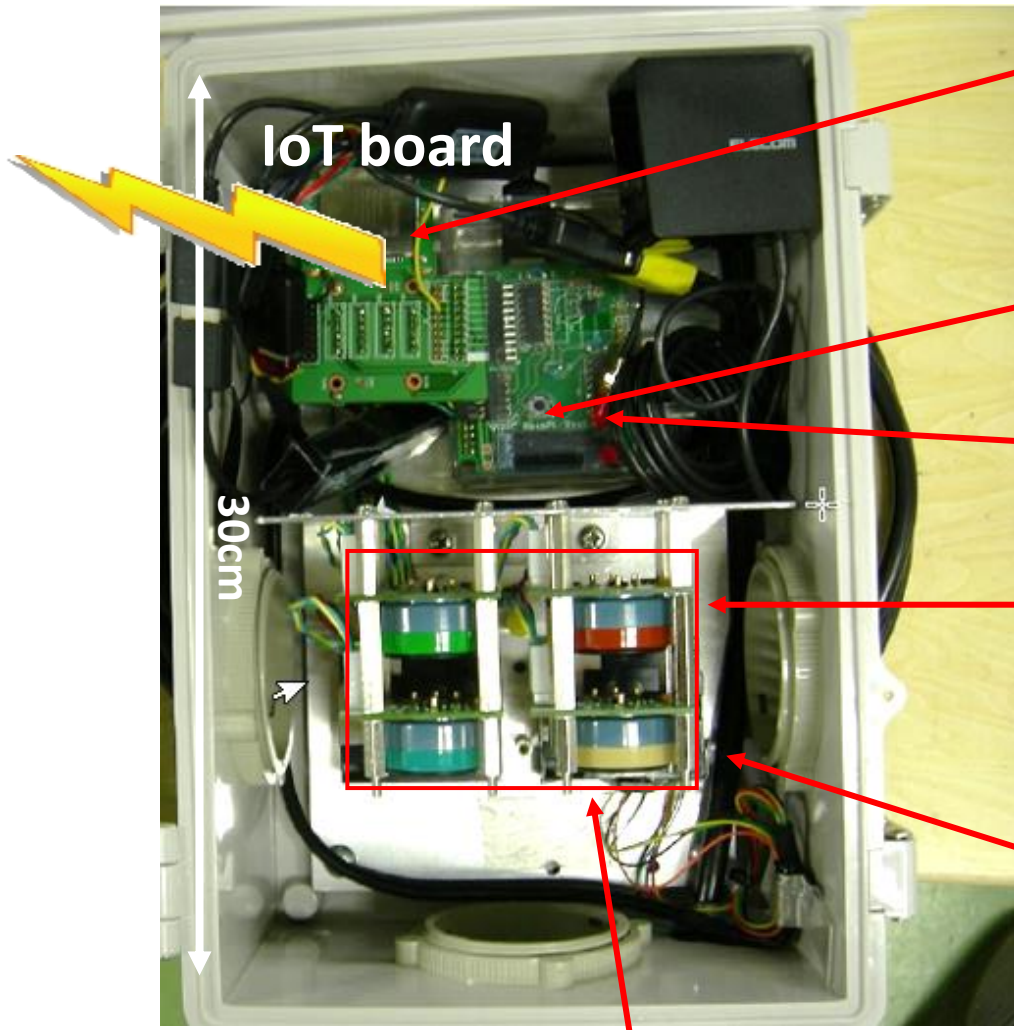
(India) Delhi Univ., JNU, Panjab Univ. PGIMER, Punjab Agricultural Univ.
Guru Nanak Dev Univ., ARIES (12 researchers)

(Japan) RIHN, Meteorol. Res. Inst., JAMSTEC, Kobe Univ., Nara Women's
Univ., Univ. Tokyo, Tohoku Univ. (17 researchers)

Supported by CIPT

The instrument for PM_{2.5} and pollutant gases: specially designed for the Aakash project

CUPI-G



SIM card
Transfer data
to the internet server
via mobile phone network

Raspberry Pi A+ (CPU)

GPS antenna

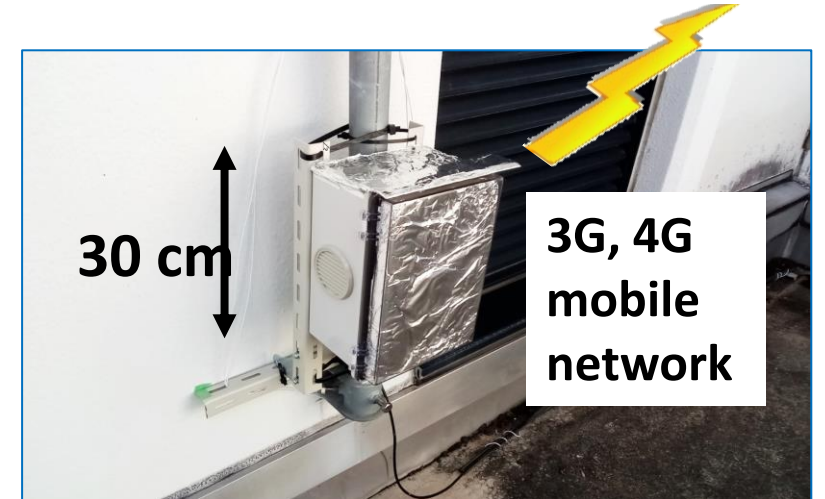
Electro-chemical
sensors
Alphasense corp.
CO, NO₂, NO, Ox(=O₃+NO₂)

Temp. and Humid.
Sensors

PM2.5 sensor
(Developed by Nagoya Univ. and Panasonic Corp.)

Developed by Yutaka Matsumi and
Tomoki Nakayama

Data transmission
to Cloud server



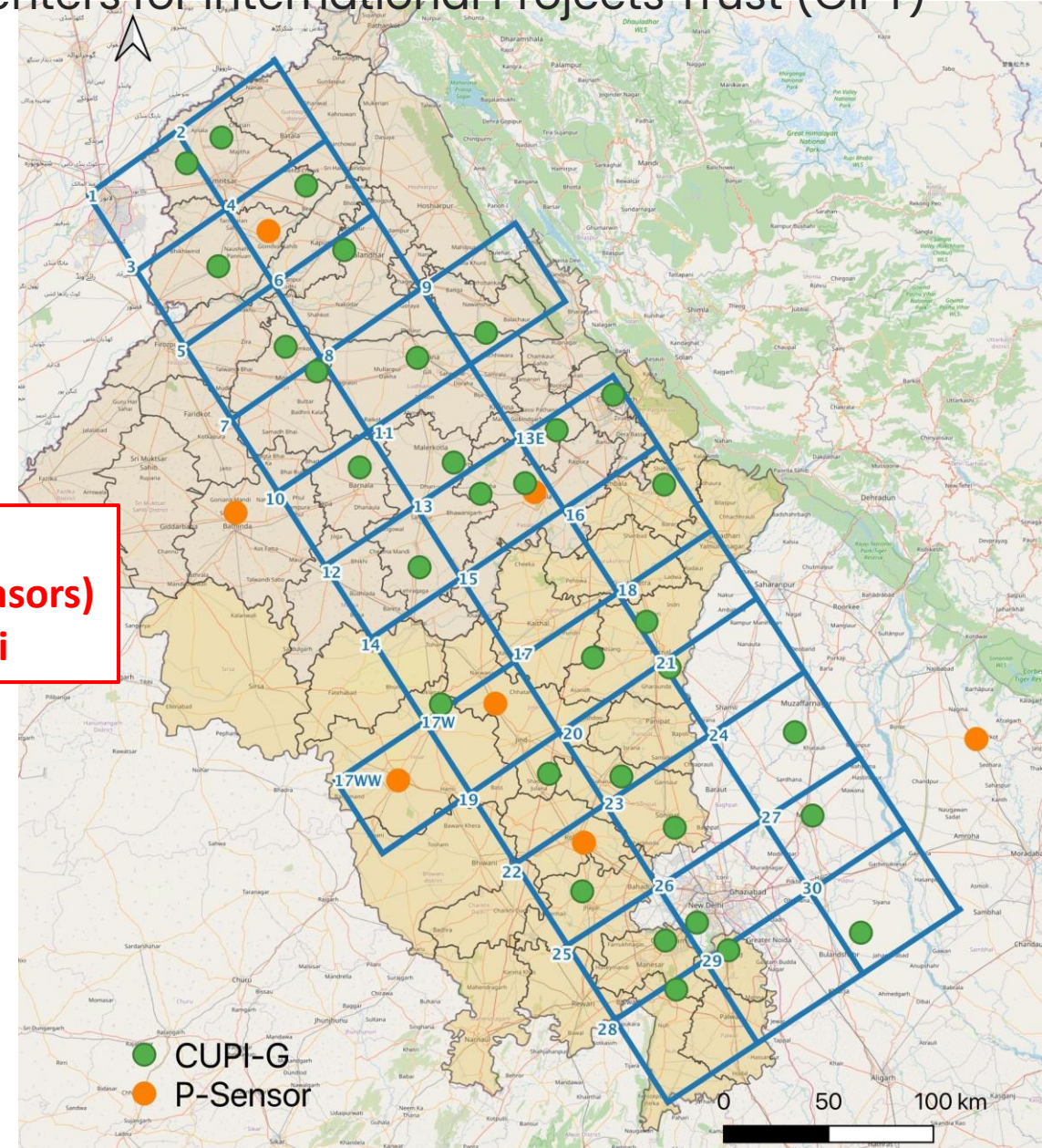
P-sensor will be demonstrated by
Shibata-Kagaku

Area of the observation campaign during straw burning season in 2022

Installation of devices were supported by Centers for International Projects Trust (CIPT)

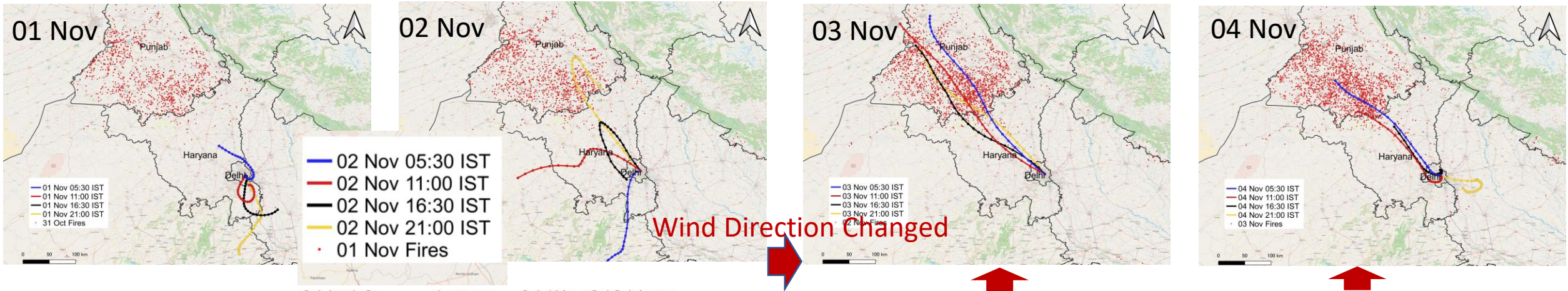


32 CUPI-Gs were installed with 8 additional small sensors (P-sensors) in the area between Punjab and Delhi



Backward trajectories at 500m height above Delhi on 01 November - 07 November 2022

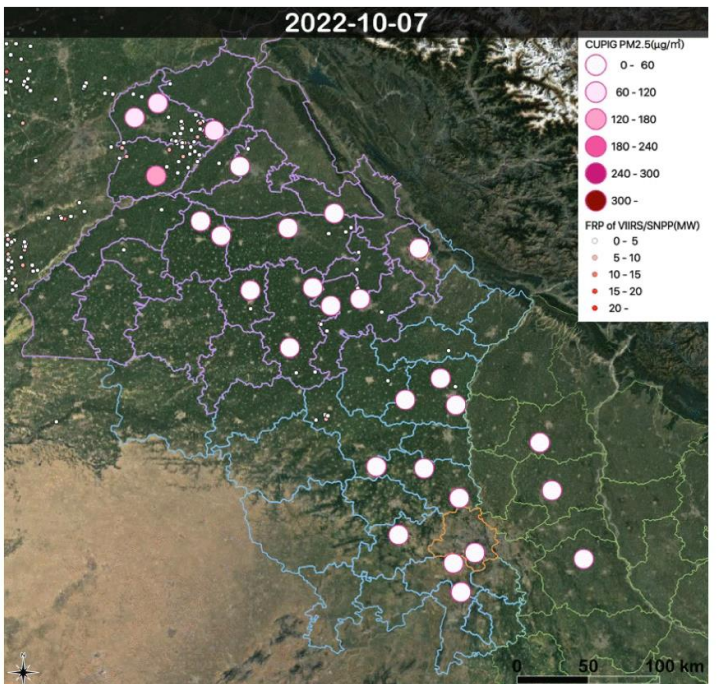
Trajectories calculated by HYSPLIT



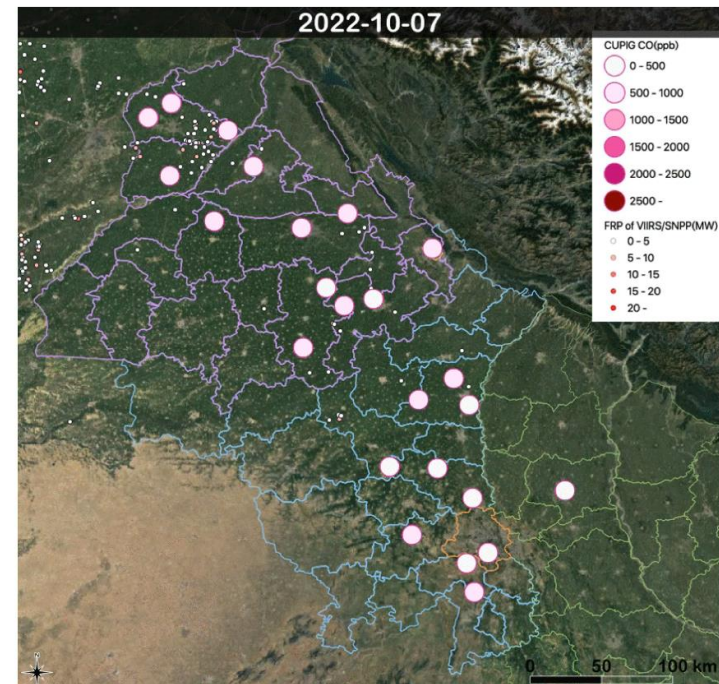
Air over Delhi came from the North!

CUPIGs and FRP of VIIRS/SNPP from 2022-10-07 to 202

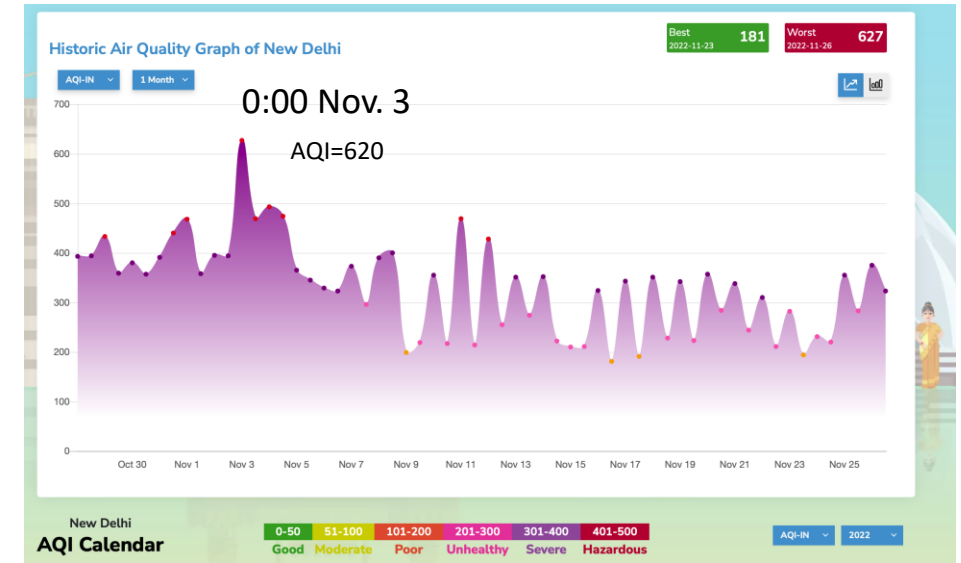
PM2.5



CO

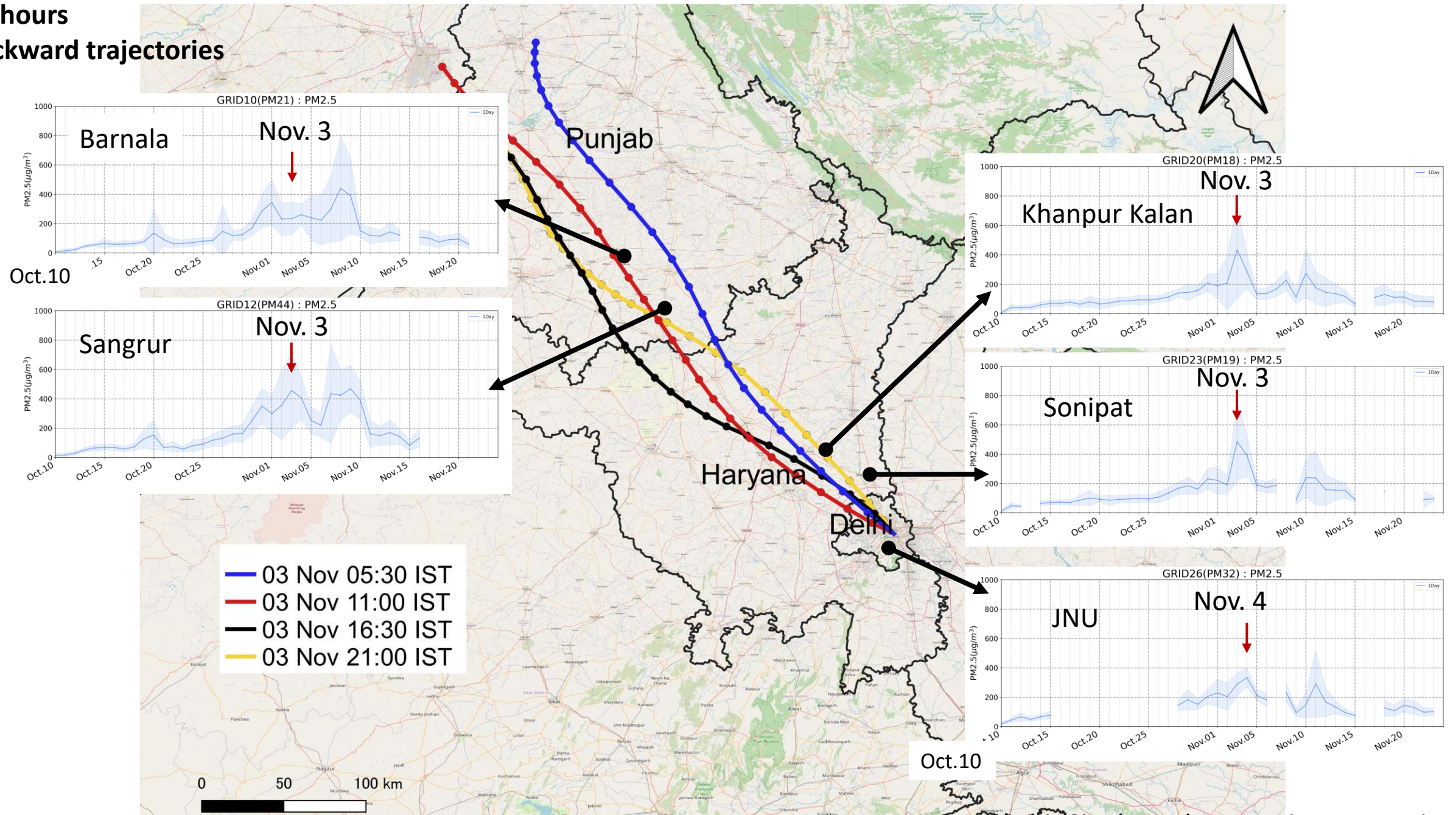


AQI in New Delhi



Tanbir Singh et al., paper in preparation

24-hours Backward trajectories



Summary

- 1. Weather conditions (e.g., wind direction) play a major role in the worsening of air pollution in Delhi.
- 2. Although attention tends to focus on air pollution in New Delhi, air pollution is likely to be occurring simultaneously over a wide area in Northwest India.
- 3. The distribution of air pollution around New Delhi has not been clear due to the deployment of instruments were biased toward the urban area. This study has clarified it is spread in wide areas.

In air pollution observation in Northwest India, it is important to establish a observation network by installing many instruments over a wide area, including the rural areas.

The use of good instrumentation is necessary for the atmospheric observation network

Air Monitoring Instruments: Shibata Kagaku





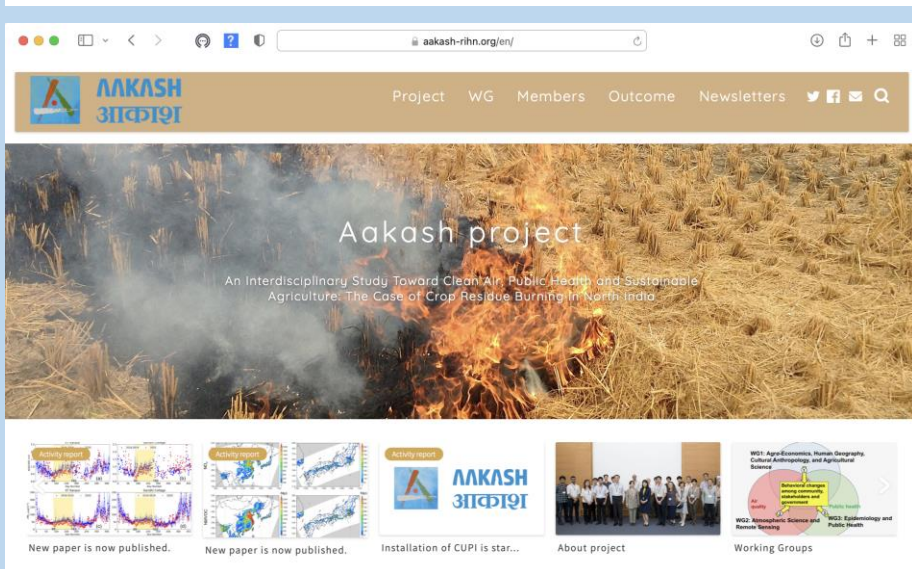
AAKASH
आकाश

toward clean air, public health, and sustainable agriculture:

Aakash

Look Videos!

HomePage: <https://aakash-rihn.org/en/>



THANK YOU !