

## Phase 1: Problem Definition and Design Thinking

The scope of this document is to analysis air pollution in Tamil Nadu, to monitor station in Tamil Nadu and to control pollutions in high pollution areas.

### Problem Definition:

The objective of this project is to analyse and visualize air quality data from various monitoring stations in Tamil Nadu. The project aims to gain insights into the air pollution trends, identify areas with high pollution levels, and create a predictive model to estimate RSPM/PM10 levels based on SO2 and NO2 levels.

### Why air quality data analysis?

- The analysis of air quality data can provide important insights into the formation and transport of air pollution
- Air Quality
  - Affects public health
  - Can damage plants and ecosystems (e.g., acid rain)
  - Causes deterioration of buildings, monuments, etc.
  - Contributes to climate change

### Sample of air pollution health effect study:

The screenshot shows the top portion of a web page for The New England Journal of Medicine. At the top is the journal's logo and name. Below it are navigation links: HOME, SUBSCRIBE, SEARCH, CURRENT ISSUE, PAST ISSUES, COLLECTIONS, and HELP. A line of text indicates the institution: UC SHARED JOURNAL COLLECTION. Below this is the label 'ORIGINAL ARTICLE'. Navigation arrows for 'Previous' and 'Next' are shown, along with the article's volume (351:1721-1730), date (October 21, 2004), and number (17). The article title is 'Exposure to Traffic and the Onset of Myocardial Infarction', followed by the authors' names. The 'ABSTRACT' section is visible, with a highlighted quote: 'Time spent in traffic (including time in cars, on public transport, or riding bicycles) 1 or 2 hours earlier increased the relative risk of MI onset by 2- to 3-fold compared with control periods.' At the bottom right, there is a 'TOOLS & SERVICES' section with a link to 'Add to Personal Archive'.

### Outline and Key Points:

- Motivation
  - The purpose is to understand the Tamil Nadu air pollution & answer questions
- Conceptual model
  - Understand the data –put a study in context
- Available data ,tools and resources

- Air quality measurements and estimates of emissions
- Models, techniques ,more examples

## **Design and Thinking:**

1. Develop a conceptual description of the problem to be addressed
2. Develop a modeling/analysis protocol (a plan)
3. Select an appropriate model
4. Select appropriate meteorological time periods to model
5. Choose an appropriate geographic area to model, with appropriate horizontal/vertical resolution, and establish the initial and boundary conditions that are suitable for the application
6. Generate meteorological inputs to the air quality model
7. Generate emissions inputs to the air quality model
8. Run the air quality model with initial year (base case) emissions and evaluate model performance. Perform diagnostic tests to improve the model, as needed.
9. Perform future year modeling, including additional control strategies if needed to meet air quality standards
10. Perform supplemental analysis consider the weight of evidence to confirm the modeled

### **Conceptual Model is First Step**

- Develop a conceptual description of the problem to be addressed
  - We must understand something about the data you are analysing
  - Formulate relevant science and policy question

## **Conceptual Model:**

- A conceptual model is summary or what we know and don't know about the system we want to study
- A conceptual model includes a statement of relevant questions we want to answer

## **Who/what /where/when/why/how?**

- Who or what causes air pollution?
- Where and when is air pollution a problem?
- For whom is it a problem?
- Why does air quality get better or worse?
- What is good air quality? What's our goal?
- How do we measure progress in solving air pollution problem?
- What don't we know about air pollution?

**Conclusion:****Examples of Data Analysis Of Air pollution in Tamil Nadu (Madurai)**

<b>Ambient Air Quality Monitoring Results of Madurai Between 2003 &amp; 2012</b>				
<b>C. Location: Highway Project Building ,Madurai</b>				
<b>Category-Residential Area</b>				
<b>Year</b>	<b>Annual Average Concentration of Air Pollutant,µg/m<sup>3</sup></b>			
	<b>TSPM</b>	<b>RSPM</b>	<b>NO<sub>x</sub></b>	<b>SO<sub>2</sub></b>
<b>2003-2004</b>	135	60	25	8
<b>2004-2005</b>	109	51	20	9
<b>2005-2006</b>	110	37	27	9
<b>2006-2007</b>	98	37	23	9
<b>2008-2009</b>	84	41	24	10
<b>2009-2010</b>	97	46	25	10
<b>2010-2011</b>	101	47	24	11
<b>2011-2012</b>	NA	47	24	10
<b>Prescribed Standard</b>				
<b>Industrial</b>	360	120	80	80
<b>Residential,Rural &amp; Other Areas (Mixed)</b>	140	60	60	60
<b>NAAQS-2009</b>	NA	60	40	50

## Chart Analysis of the Data given:

