

## SOCIO-POLITICO-ECONOMIC-CULTURAL CHALLENGE

Fossil fuel based economy

Externalisation of air pollution costs

### PUBLIC HEALTH CHALLENGE

Access and quality of health care

Appropriate air quality standards

Warning systems, and  
Protocols for high  
pollution days

Access to  
protective  
devices such as  
pollution masks

Monitoring  
and research  
in air pollution  
health impacts

### BIOMEDICAL CHALLENGE

Asthma, COPD, Stroke, Heart  
attacks, lung cancer

Informing policy  
about strategies  
to reduce air pollution,  
and also strengthening  
health systems

Monitoring and  
regulating pollution  
from various sources

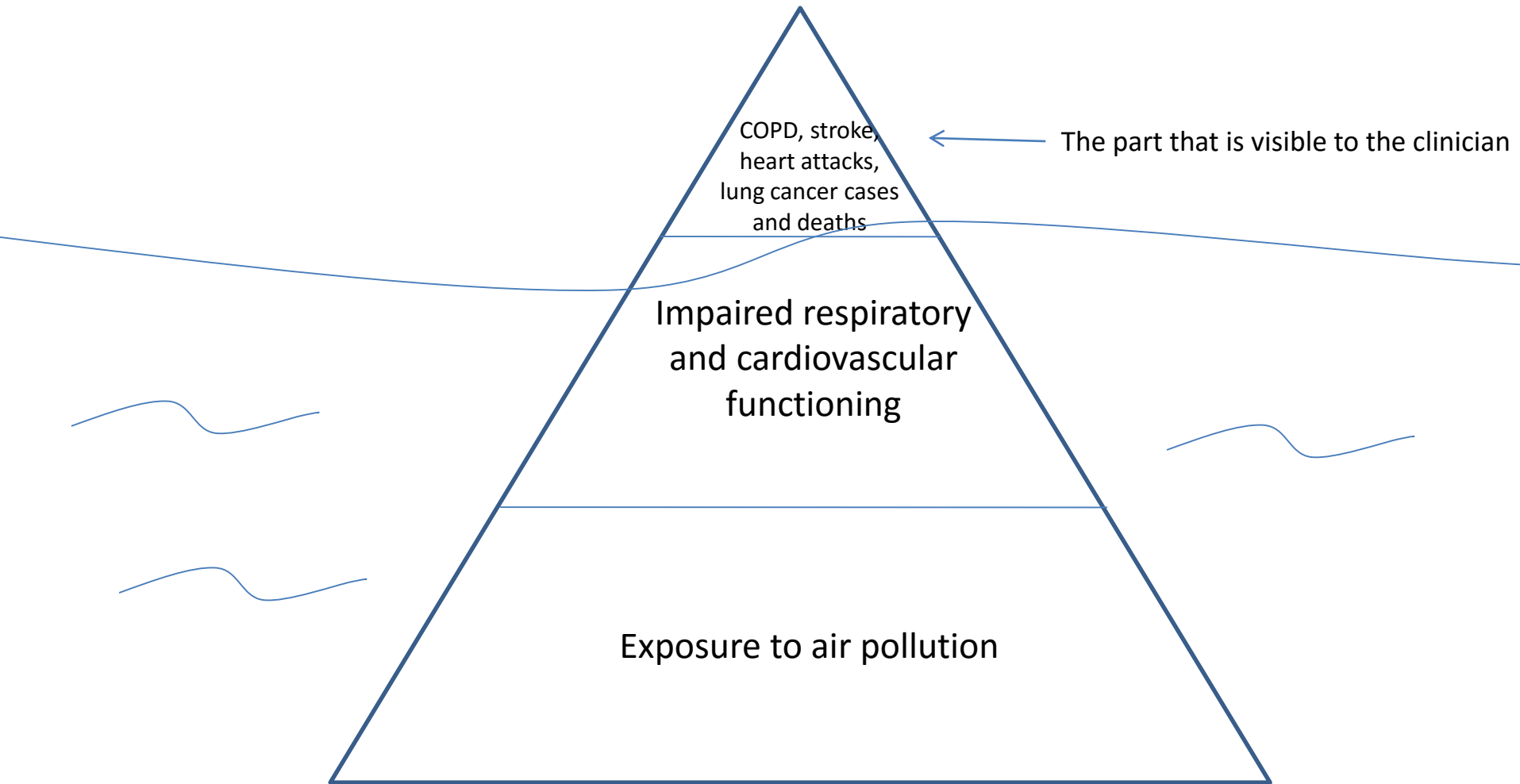
Creating awareness about  
air pollution prevention  
and protection

Influence of wealth

Inequity

Inappropriate  
“development” metrics

**Levels of challenges – air pollution**



**Health pyramid, and iceberg phenomenon of air pollution health impacts**

# Key facts and figures – outdoor (ambient) air pollution

- India
  - 670,000 deaths (Lim, 2013)
  - 1.2 million deaths (Greenpeace, 2017)
  - 1.1 million deaths (State of Global Air, 2017), or **11.1% of all deaths**!! (TB 3.7%, Malaria 2.0%, Cancers 6.1%, DM 2.3%) (CGHR, 2015)
- Bangalore
  - 0.22% mortality increase with 10mcg/m<sup>3</sup> increase in PM2.5 (IIM, 2014), higher for long-term exposure (TERI, 2015)
  - If risks and exposure are equally distributed across India, air pollution deaths in Bangalore would be approximately 10,000 deaths per year

# IAP deaths

- Of all deaths:
  - 12% are due to pneumonia
  - 34% from stroke
  - 26% from ischaemic heart disease
  - 22% from chronic obstructive pulmonary disease (COPD), and
  - 6% from lung cancer.

# Vulnerability

- Elderly and infirm – for short duration air pollution peaks
- Everyone – for long term high levels of pollution

## NATIONAL AMBIENT AIR QUALITY STANDARDS

S. No.	Pollutant	Time Weighted Average	Concentration in Ambient Air		
			Industrial, Residential, Rural and Other Area	Ecologically Sensitive Area (notified by Central Government)	Methods of Measurement
(1)	(2)	(3)	(4)	(5)	(6)
1	Sulphur Dioxide (SO <sub>2</sub> ), µg/m <sup>3</sup>	Annual* 24 hours**	50 80	20 80	- Improved West and Gaeke -Ultraviolet fluorescence
2	Nitrogen Dioxide (NO <sub>2</sub> ), µg/m <sup>3</sup>	Annual* 24 hours**	40 80	30 80	- Modified Jacob & Hochheiser (Na-Arsenite) - Chemiluminescence
3	Particulate Matter (size less than 10µm) or PM <sub>10</sub> µg/m <sup>3</sup>	Annual* 24 hours**	60 100	60 100	- Gravimetric - TOEM - Beta attenuation
4	Particulate Matter (size less than 2.5µm) or PM <sub>2.5</sub> µg/m <sup>3</sup>	Annual* 24 hours**	40 60	40 60	- Gravimetric - TOEM - Beta attenuation
5	Ozone (O <sub>3</sub> ) µg/m <sup>3</sup>	8 hours** 1 hour**	100 180	100 180	- UV photometric - Chemiluminescence - Chemical Method
6	Lead (Pb)	Annual*	0.50	0.50	- AAS /ICP method after

- WHO, 2005

### Guidelines

<b>PM<sub>2.5</sub>:</b>	<b>10 <math>\mu\text{g}/\text{m}^3</math> annual mean</b> <b>25 <math>\mu\text{g}/\text{m}^3</math> 24-hour mean</b>
<b>PM<sub>10</sub>:</b>	<b>20 <math>\mu\text{g}/\text{m}^3</math> annual mean</b> <b>50 <math>\mu\text{g}/\text{m}^3</math> 24-hour mean</b>







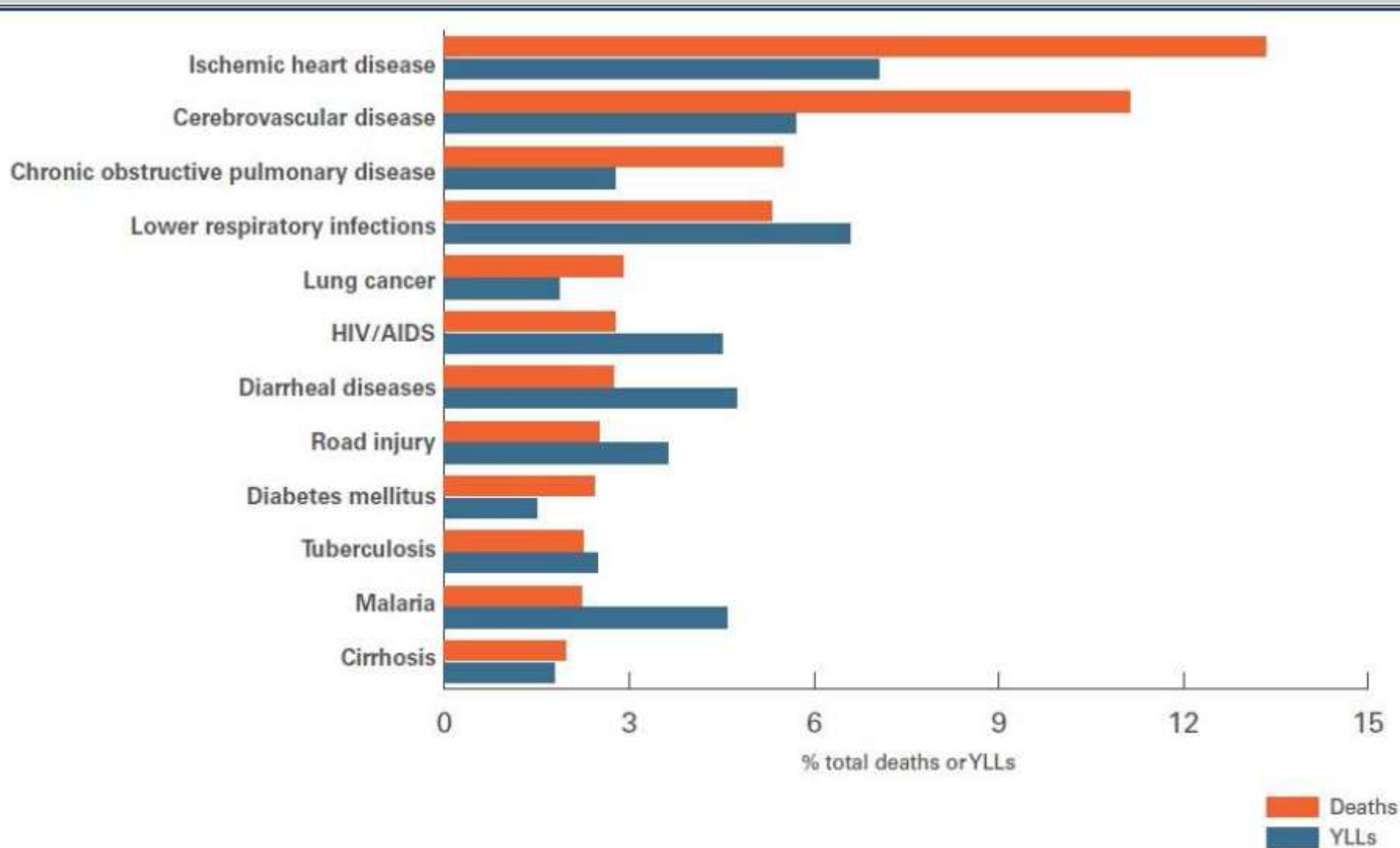
<http://bangalore.citizenmatters.in/articles/no-studies-no-data-air-pollution-continues-to-haunt-bengaluru>

# Coal fired plants also contribute to air pollution deaths in cities

**Table 5**

Installed capacity, modeled daily average PM<sub>2.5</sub> concentrations, health impacts of emissions from coal fired power plants for 7 regions at finer resolution in India in 2010–11.

No.	Cluster (size in degrees)	Regional features	No. of plants (those more than 1000 MW)	Installed capacity (MW)	Modeled PM <sub>2.5</sub> <sup>a</sup> – median (95th percentile) µg/m <sup>3</sup>	Estimated premature mortality within the region <sup>b</sup>
1	Delhi – Haryana (2.5° × 2.5°) (in-land)	Delhi is the national capital, listed among the top 10 cities with worst air quality in the world (WHO, 2011) and Haryana is an agricultural state	8 (5)	8080	3.9 (7.7)	6400–8800
2	Kutch (Gujarat) (2.5° × 2.5°) (coastal)	A coastal cluster, with two super-critical power plants in Mundra (Gujarat), both private, operated by Tata and Adani power groups	5 (2)	9900	1.0 (2.8)	100–120
3	Western-MH (2.5° × 2.5°) (coastal)	Including Mumbai, the most commercial and congested city in the country	3 (1)	2780	0.9 (2.3)	1700–2400
4	Eastern MH and Northern AP (3.0° × 4.0°) (in-land)	All plants are located closer to the coal belts of Chandrapur and Ghugus (Maharashtra – MH) and Singareni (Andhra Pradesh – AP)	10 (6)	14,800	3.2 (5.1)	1100–1500
5	MP–CH–JH–OR (4.0° × 4.5°) (in-land)	This cluster covers four states – Madhya Pradesh (MP), Jharkhand (JH), Chhattisgarh (CH) and Orissa (OR) and home to the largest coal fields of Jharia, Dhanbad, Korba, Singrauli, Karanpura, and Mahanadi	21 (10)	29,900	9.1 (23.1)	7900–11000
6	WB–JH–BH (3.0° × 4.0°) (in-land)	This cluster covers West Bengal (WB), JH, and Bihar (BH) sourcing mostly from Raniganj and Jharia coal belts	19 (7)	17,100	3.7 (5.6)	10700–14900
7	Eastern AP (2.5° × 2.5°) (coastal)	A coastal cluster including the port city of Vishakhapatnam	2 (2)	3000	0.8 (1.8)	1100–1500



**Figure 3: Leading causes of global deaths and premature deaths**

Source: Global Burden of Disease (2010)