

Smog Beyond Index in Lahore

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Saleem, Alam & Co.

Air Pollution Law in Pakistan

- Shehla Zia vs. WAPDA (1994)
 - Every citizen is guaranteed the right to a clean and healthy environment
 - +ve Obligation
 - Anujum Irfan vs. LDA (1997)
 - Direction to frame National Environmental Quality Standards
 - Mansoor Ali Shah vs. Government of Punjab (2007)
 - Clean Air Commission (2003) and 4-stroke CNG rickshaws in Lahore
 - Lahore Canal Case (2012)
 - Doctrine of Public Trust affirmed by the Supreme Court of Pakistan
- **Every man, woman and child has the right to take a deep breath of air without getting sick and the State must protect against any violations of this right.**

- **A clean and Healthy Environment**
- **Punjab Environment Protection Act, 1997**
 - Can't pollute in excess of PEQS
 - Have to get Environmental Approval of projects "before commencement or construction"
 - Allows EPA to
 - Regulate motor vehicles
 - Pass Environment Protection Orders
- **Punjab Local Government Act, 2013**
 - MCL/MCs responsible for environmental control, including control of air, water and soil pollution in accordance with Federal and Provincial laws and standards

Government of the Punjab
Environment Protection Department

NOTIFICATION: No. SO(G)/EPD/7-26/2013. - In exercise of the powers conferred under clause (c) of sub-section (1) of section 4 of the Punjab Environmental Protection Act, 1997 (XXXIV of 1997), Environmental Protection Council has approved the following as the Punjab Environmental Quality Standards for Ambient Air:

Punjab Environmental Quality Standards for Ambient Air

PEQS for Ambient Air

| Pollutant | Time-weighted average | Concentration in Ambient Air | Method of measurement |
|-----------------------------------|-----------------------|------------------------------|---------------------------------|
| Sulfur Dioxide (SO ₂) | Annual Average* | 80 µg/m ³ | Ultraviolet Fluorescence method |

| | | |
|--|-----------------|----------------------|
| Respirable Particulate Matter PM _{2.5} | Annual Average* | 15 µg/m ³ |
| | 24 hours** | 35 µg/m ³ |

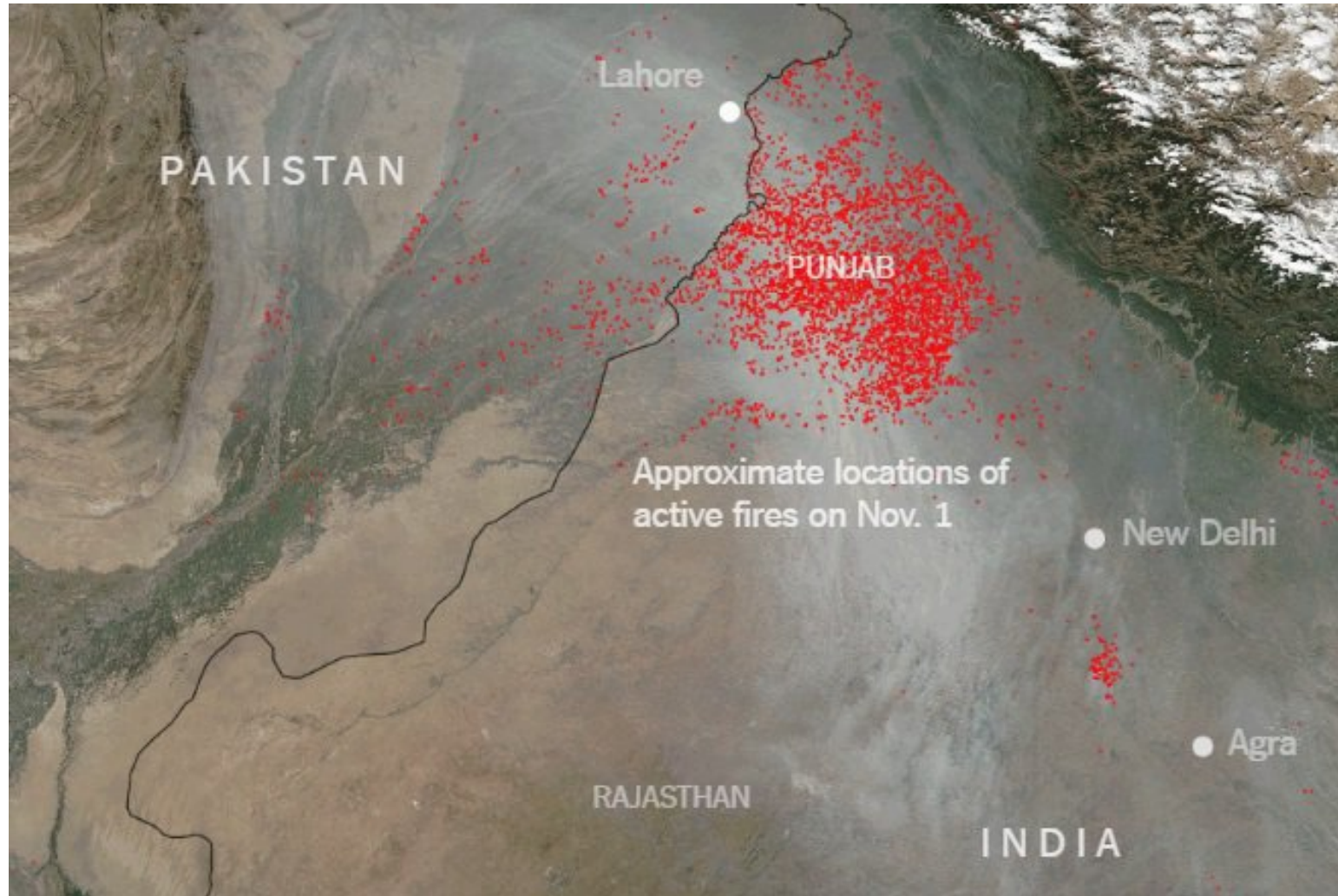
| | | | |
|--|-----------------|-----------------------|------------------------------------|
| Respirable Particulate Matter PM ₁₀ | Annual Average* | 120 µg/m ³ | Preferably β-Ray absorption method |
| | 24 hours** | 150 µg/m ³ | |
| Respirable Particulate Matter PM _{2.5} | Annual Average* | 15 µg/m ³ | Preferably β-Ray absorption method |
| | 24 hours** | 35 µg/m ³ | |

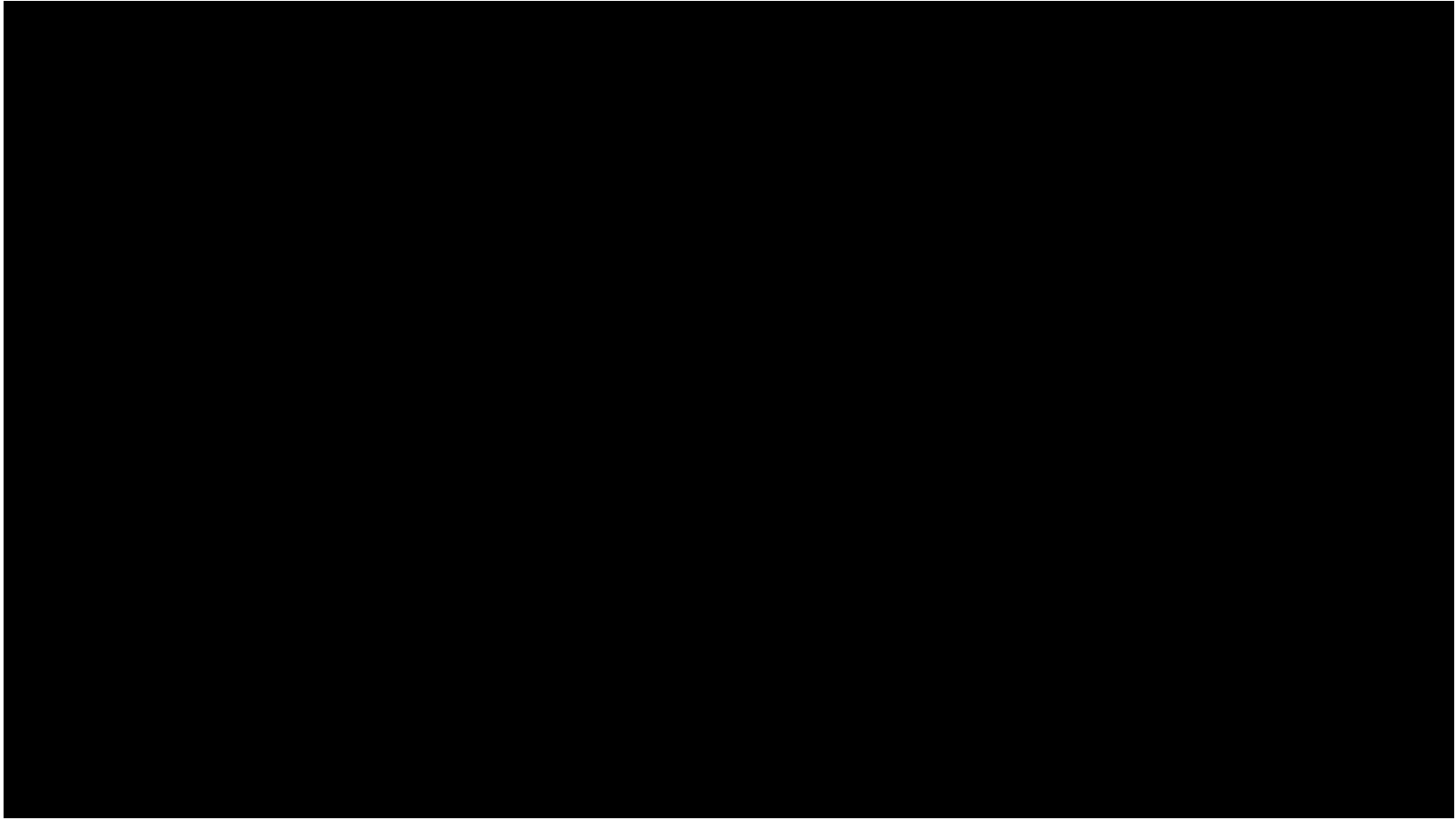
15. Regulation of motor vehicles.— (1) Subject to the provisions of this Act and the rules and regulations made thereunder, no person shall operate a motor vehicle from which air pollutants or noise are being emitted in an amount, concentration or level which is in excess of the Punjab Environmental Quality Standards, or where applicable the standards established under clause (g) of sub-section (1) of section 6.

(2) *For ensuring compliance* with the standards mentioned in sub-section (1), the Provincial Agency may direct that any motor vehicle or class of vehicles shall install such pollution control devices or other equipment or use such fuels or undergo such maintenance or testing as may be prescribed.

(3) Where a direction has been issued by the Provincial Agency under sub-section (2) in respect of any motor vehicles or class of motor vehicles, no person shall operate any such vehicle till such direction has been complied with.

Transboundary Pollution





International Law on Air Pollution

- Trail Smelter Case (1941)
 - Established the “No Harm Principle”
 - “... no State has a right to use or permit the use of its territory in such a manner as to cause injury by fumes in or to the territory of another or the properties or persons therein, when the case is of serious consequence and the injury is established by clear and convincing evidence.”
 - Level of precaution to be shown is same as would be shown a citizen of the country
- Principle 21, Stockholm Declaration (1972)

States have, in accordance with the Charter of the United Nations and the principles of international law, the sovereign right to exploit their own resources pursuant to their own environmental policies, and the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other States or of areas beyond the limits of national jurisdiction.

What's the Situation?

Cleaning Pakistan's Air: Policy Options to Address the Cost of Outdoor Air Pollution (World Bank 2014):

- *Limited available evidence indicates concentrations of $PM_{2.5}$ in Islamabad, Karachi, Lahore, Rawalpindi and Quetta are significantly above NEQS*
- *In Lahore, dust sources were found to contribute on average 41% of PM_{10} mass and 14% $PM_{2.5}$ mass;*
- *$PM_{2.5}$ levels in Lahore ranged from 2 to 14 times higher than the prescribed limits;*
- *The major contributions to $PM_{2.5}$ in Lahore are soil/road dust, industrial emissions, vehicular emissions and secondary aerosols.*
- *Lahore was the city with the highest concentration of sulfur dioxide with maximum daily values of $309\mu\text{g}/\text{m}^3$.*

Health impacts of polluted air on children

Local evidence: Children in Delhi

A massive 2010 study by the Chittaranjan National Cancer Research Institute, Kolkata, looked at the health effects of air pollution on over 11,000 school children in Delhi. Some important findings:

- Compared to the control group, **Delhi's kids had 1.8 x more respiratory illnesses** (sinusitis, running or stuffy nose, sneezing, sore throat and common cold with fever) and **2 x more lower respiratory illnesses**. frequent dry cough, sputum-producing cough, wheezing breath, breathlessness on exertion, chest pain or tightness and disturbed sleep due to breathing problems).
- Respiratory symptoms were more prevalent in children from lower socio-economic status and least in children from families with higher economic status.
- The symptoms were more prevalent in winter, when levels of particulate matter are highest, and least prevalent during monsoon season when particular matter is lowest
- The results showed a reduction in lung function of 43.5% of the Delhi school kids, compared to 25.7% in the control group.**
- Lung function reduction was more prevalent in the girls in both settings than in the boys.

Professor
Kamran K. Chima MD
Diplomate American Board of Internal Medicine
Diplomate American Board of Pulmonary Medicine
Diplomate American Board of Critical Care Medicine
Diplomate American Board of Sleep Medicine

Patient Name: [REDACTED]
Age / Sex: **4 Years Female**
Smoking Status: **Non-Smoker**
Contact(s): [REDACTED]
Visit Date: **November 04, 2016**
Address: **LAHORE**

Head of Department
Pulmonary & Critical Care Medicine
Services Institute of Medical Sciences I Services Hospital Lahore

1 **ASTHMA**
Worsened by Smog
Was not using pulmicort for 6 weeks but has resumed now.

2 **MULTIPLE ALLERGIES**
Diarrhea
Allergic Rhinitis
Hyperactive Airways
IgE 36

3 **PSORIASIS**

4 **VACCINATION**
RECEIVED FLU SHOT JAN 2015

SaO2(%): 96 P/min: 92 WEIGHT (Kgs): 19

Assessment / Plan:
[REDACTED] has multiple allergies that have been worsened by smog. She should avoid outdoor exercises and remain indoor.

| Medicine | Instructions | ہدایات |
|--|--|--|
| 1 SERETIDE 25/50 INHALER + SPACER | 2 Puffs TWICE daily with a spacer device Rinse mouth after use. | 2 پف صبح، 2 پف شام بوس میں لگا کر لیں۔ استعمال کے بعد کلی کر لیں۔ |
| 2 FLIXONASE NASAL SPRAY | 1 Spray both sides of nose daily. | 1 سپرے ناک میں دونوں طرف روز کریں۔ |
| 3 TAB SINGLAIR 4 mg | Take 1 tablet ONCE daily. | 1 گولی روز لھائیں۔ |
| 4 PULMICORT RESPULE 0.5 mg/ml + NORMAL SALINE 1 cc | Mix & nebulize ONCE daily. | روزانہ ملا کر نیبولائز کریں۔ |
| 5 NORMAL SALINE NOSE DROPS | Take 3 drops TWICE daily on each side of nose. | 3 قطرے صبح، شام ناک میں دونوں طرف ڈالیں۔ |
| 6 SYRUP KESTINE | Take 1 tea spoon ONCE daily | 1 تیچ روز لھائیں۔ |
| 7 INJ VAXIGRIP 0.5 ml I.M | Get injection via I.M route every year in October / November. | تیکہ ہر سال اکتوبر / نومبر میں لگوائیں۔ |

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For
Dr. Asad

Punjab Smog Policy

4-715 Sulphur contents.

2. Adopting Euro-II Standards for vehicular emission: While stringent vehicular emission standards can only be implemented for diesel vehicles once Low-Sulphur diesel is available; these can be extended to petrol vehicles immediately. A preferable standard is Euro II. It is obvious that adoption of such a standard will be meaningless unless it is backed up by a strict vehicle inspection regime. Such standards may be mandated for both new and second-hand imported vehicles. Particulate matter control technologies can effectively be installed on in-use vehicles, such as diesel oxidation catalysts (DOCs) and diesel particulate filters (DPFs). DOCs require a maximum of 500-ppm Sulphur in diesel and DPFs require a maximum of 50 ppm to function effectively. Therefore, for adopting Euro II/Pak II standards:

- (i) Relevant Ministry in the Federal Government will be approached for restricting the import of used gasoline vehicles which do not comply with Euro II standard.
- (ii) In coordination with the Transport Department, Environmental Protection Agency will devise a time bound plan to restrict awarding Environmental Approval to the manufacture of any three and four wheeled vehicles which do not comply with the Euro II standard.

3. Installation of vehicular pollution control devices: This measure is closely related to the foregoing measure. Vehicular emissions contain oxides of Nitrogen (NO_x), oxides of Sulphur (SO_x) and Carbon Monoxide (CO) which can transform into secondary compounds. These secondary compounds then contribute to what is called the Los Angeles or photo-chemical smog. The aim is to adopt a phased approach towards installation of appropriate devices in the vehicles, such as the Catalytic Converter, to convert NO_x, SO_x and CO into simpler non-harmful forms before escaping the exhaust pipe. With this in view Federal Government will be approached to make it mandatory upon all vehicle manufacturers and importers to install appropriate devices by a mutually agreed cut-off date.

4. Better traffic management: Experience indicates that Particulate Matter (PM) emissions



Annex A
Air Quality Index

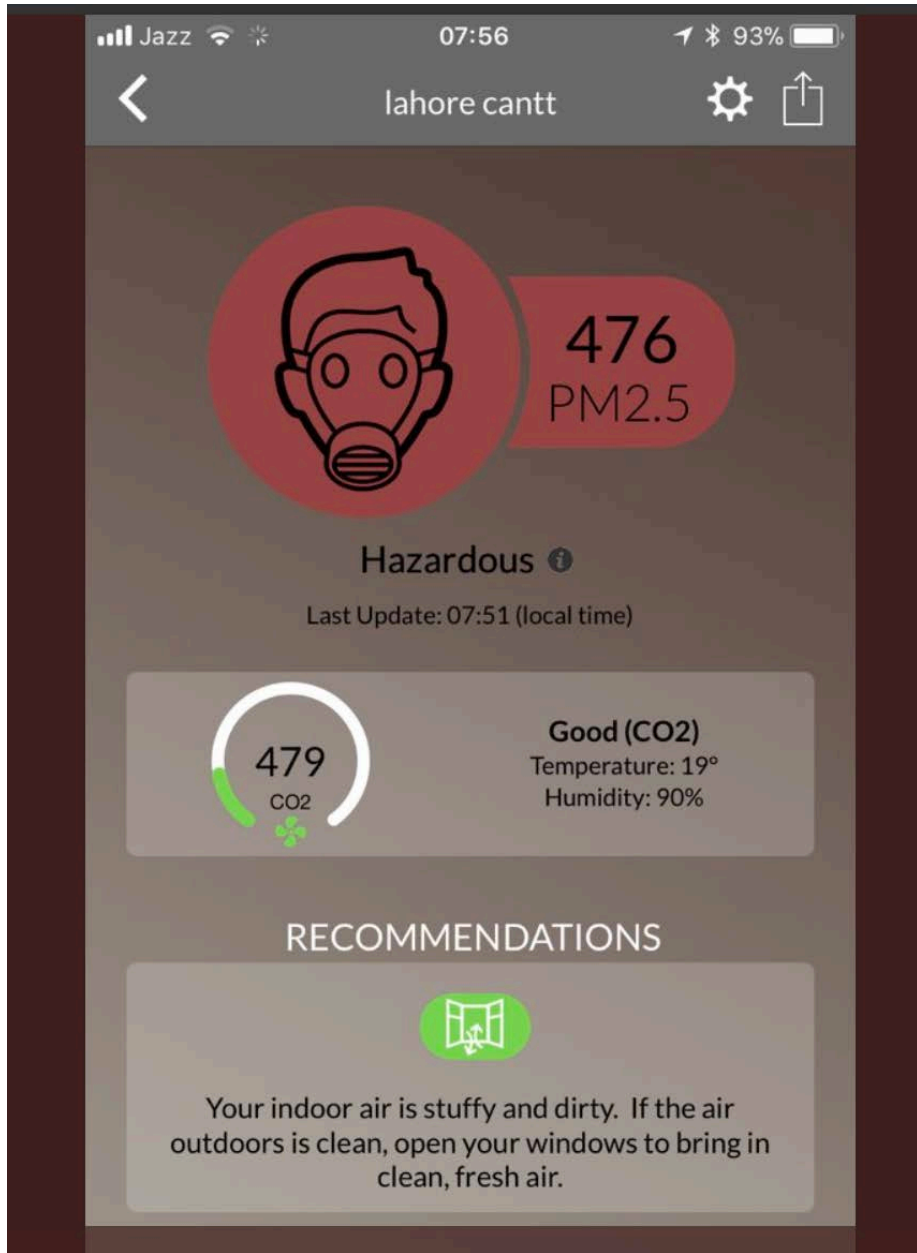
Air Quality Index will be calculated based upon 24 hourly/8 hourly average concentration of those ambient air quality criteria pollutants' concentrations whose measured values are available through Ambient Air Quality Monitoring Stations (AQMSs) namely PM₁₀, PM_{2.5}, SO₂, NO₂, CO and O₃. The basis of Ambient Air Quality Index (AQI) are limit values defined in Punjab Environmental Quality Standards for Ambient Air. Beyond limit interpretations have been proposed keeping in view the regional practice of assigning Air Quality Indices based on multiplication factors in proportion to standard limits and individual tolerance levels. Intermediate values for Air Quality Index for specific pollutant will be computed by interpolation.

| PM ₁₀ ¹ | PM _{2.5} ² | SO ₂ ³ | NO ₂ ⁴ | O ₃ ⁵ | CO ⁶ | Air Quality Index | Indicator Color | Overall Description |
|-------------------------------|--------------------------------|------------------------------|------------------------------|-----------------------------|-----------------|-------------------|-----------------|---|
| 0-150 | 0-35 | 0-120 | 0-80 | 0-130 | 0-5 | 0-100 | Green | Good – Minimal Impact |
| 151-200 | 36-70 | 121-240 | 80-160 | 131-260 | 5-10 | 101-200 | Light Green | Satisfactory – May cause minor breathing discomfort to sensitive people. |
| 201-250 | 71-105 | 241-360 | 161-320 | 261-450 | 11-25 | 200-300 | Yellow | Moderately Polluted – May cause breathing discomfort to people with lung disease such as asthma, and discomfort to people with heart disease, children and older adults. |
| 251-350 | 106-140 | 361-700 | 321-560 | 451-550 | 26-40 | 301-400 | Orange | Poor – May cause breathing discomfort to people on prolonged exposure, and discomfort to people with heart disease. |
| 351-430 | 141-300 | 701-1600 | 561-800 | 551-1900 | 41-50 | 401-500 | Red | Very Poor – May cause respiratory illness to the people on prolonged exposure. Effect may be more pronounced in people with lung and heart diseases. |
| 430 + | 300 + | 1600 + | 800 + | 1900 + | 50 + | 500+ | Maroon | Severe – May cause respiratory impact even on healthy people, and serious health impacts on people with lung/heart disease. The health impacts may be experienced even during light physical activity. |

Nitrogen (NOx) and Sulphur (SOx) are exceeded frequently. Industrial units both large and small, many of which use furnace oil high with Sulphur contents, burning of agricultural residual and municipal waste, and vehicular emissions are the main source of these pollutants. A wide range of small to medium-scale industries, including brick kilns and steel re-rolling mills make a much larger contribution as compared to the size of their economic activity due to the use of “waste” fuels such as old tires, paper, wood, and textile waste. At the micro level, air quality is further impaired by the widespread use of small diesel electric generators in commercial and residential areas in response to electricity outages.

Issues with Law & Implementation

- Lack of air quality testing equipment
- Don't want to upset the applecart (criminal negligence?)
- Smog is a phenomenon
 - We don't know it's composition, can't determine its exact sources
 - PM2.5, other pollutants, in excess of PEQS year round



LHC's SHEAP!

Air Monitoring results ordered to be placed online at the EPD website.

“14. The Smog Emergency Health Action Plan will come into motion on the basis of highest reading of any one of the five stations mentioned above. The petitioner or the amici curiae are free to approach this Court in case there is any lapse on the part of the Government to put the above Emergency Health Action Plan into action.”

| | | | INDUSTRIAL UNITS AND CONSTRUCTION ACTIVITIES IN THE AFFECTED AREA |
|---------|--------|---|--|
| 71-105 | Yellow | Moderately Polluted – May cause breathing discomfort to people with lung disease such as asthma, and discomfort to people with heart disease, children and older adults | <ul style="list-style-type: none"> • SHUT DOWN HIGH AIR POLLUTION GENERATING INDUSTRIAL UNITS • IMPOSE RESTRICTIONS ON THE USE OF MOTOR VEHICLES. |
| 106-140 | Orange | Poor – May cause breathing discomfort to people on prolonged exposure, and discomfort to people with heart disease. | <ul style="list-style-type: none"> • ISSUE PUBLIC WARNINGS FOR CHILDREN AND ELDERLY TO REMAIN INDOORS IN CLEAN AIR ESPECIALLY DURING PEAK TIMES. • SHUT DOWN PRIMARY SCHOOLS. |
| 141-300 | Maroon | Very Poor -May cause respiratory illness to the people on prolonged exposure. Effect may be more pronounced in people with lung and heart diseases. | <ul style="list-style-type: none"> • SHUT DOWN ALL EDUCATIONAL INSTITUTIONS. • DIRECT EVERYONE TO WEAR MASK WHEN OUTDOOR. • DISTRIBUTION OF FACE MASKS • CLOSING DOWN OF PARKS |
| 300+ | | Severe - May cause respiratory impact even on healthy people, and serious health impacts on people with lung/heart disease. The health impacts may be experienced even during light physical activity. | <ul style="list-style-type: none"> • IMPOSITION OF MEDICAL EMERGENCY WITH THE SUSPENSION OF ALL OTHER OUTDOOR ACTIVITIES. • EVACUATION TO THE SAFE PLACES AS FAR AS PRACTICABLE. |

Monitoring of Air Quality of Lahore
(Average Values for 18 hours ending at 09:00 am of February 10, 2018)

| PEQS Location | PM10 (ug/m³) | PM2.5 (ug/m³) | CO (mg/m³) | NO (ug/m³) | NO₂ (ug/m³) | O₃ (ug/m³) | SO₂ (ug/m³) |
|--------------------------|------------------------------------|-------------------------------------|----------------------------------|----------------------------------|--|---|--|
| | 150 | 35 | 5 | 40 | 80 | 130 | 120 |
| Gulberg | 55 | 54 | 12 | 329 | 145 | 9 | - |
| Jail Road | 310 | 177 | 12 | 324 | 120 | 38 | 50 |
| Ravi Road | - | 175 | - | 279 | 140 | - | 78 |
| Mughalpura | - | 225 | - | 100 | 93 | - | 82 |
| Mcleod Road | - | 213 | - | 184 | 112 | - | 44 |
| Misri Shah | 227 | 55 | 10 | 24 | 85 | 6 | - |

| | Index Values | PM2.5 conc. | Lahore | Peshawar | Islamabad | Karachi |
|----------------|--------------|---------------|--------|----------|-----------|---------|
| Good | 0 to 50 | 0.0 – 12.0 | 2 | 1 | 0 | 4 |
| Moderate | 51 to 100 | 12.1 – 35.4 | 39 | 224 | 57 | 157 |
| Sensitive | 101 to 150 | 35.5 – 55.4 | 47 | 48 | 105 | 97 |
| Unhealthy | 151 to 200 | 55.5 – 150.4 | 101 | 87 | 143 | 50 |
| Very Unhealthy | 201 to 300 | 150.5 – 250.4 | 39 | 5 | 10 | 2 |
| Hazardous | 301 to 500 | 250.5 – 500 | 36 | 0 | 2 | 0 |
| #nodata | | | 101 | 0 | 48 | 55 |

Lahore has the worst air quality in Pakistan, with 2 blue sky days in 2017 with #Good air quality, and 36 days with #Hazardous air pollution.



Air Quality Index for Health impact as defined by the USA EPA. The Environmental Protection Agency of Pakistan (PK-EPA) recommended $15 \mu\text{g}/\text{m}^3$ as the safe level for yearly exposure, after which serious health effects occur. The WHO guideline value is $10 \mu\text{g}/\text{m}^3$.

Data: Pakistan Air Quality Initiative (PAQI پاکسی) 01 January to 31 December 2017

A word on Climate Change

- Pakistan extremely vulnerable
- Post-18th Amendment leaves question as to whether it is a Federal or Provincial responsibility
- Federal Government has
 - Ratified Paris Agreement
 - Submitted INDC
 - Enacted Pakistan Climate Change Act, 2017
 - No Authority notified as of yet! So only on paper
- 2 of the 4 Provinces have moved to draft climate policies but intervention of Federation has been to weaken provincial efforts

4.3 Overall Projected Emissions for 2030

Projected levels of GHG emissions and their comparison with the last two GHG inventory years (1994 and 2015) are as follows:

Table 7: Sector Wise Projection of Emissions (*MT CO₂-equivalent*)

| Sectors | 1994 | 2015 | 2030 |
|------------------------------|--------------|---------------|-------------|
| Energy | 85.8 | 185.97 | 898 |
| Industrial Process | 13.29 | 21.85 | 130 |
| Agriculture | 71.63 | 174.56 | 457 |
| Land-Use Change and Forestry | 6.52 | 10.39 | 29 |
| Waste | 4.45 | 12.29 | 89 |
| Total | 181.7 | 405.07 | 1603 |

While from 1994 to 2015 the emissions increased by about 123 percent, the total emissions are expected to increase by about 300 percent for the projected period (2015-2030).

5.2 Pak-INDC Statement

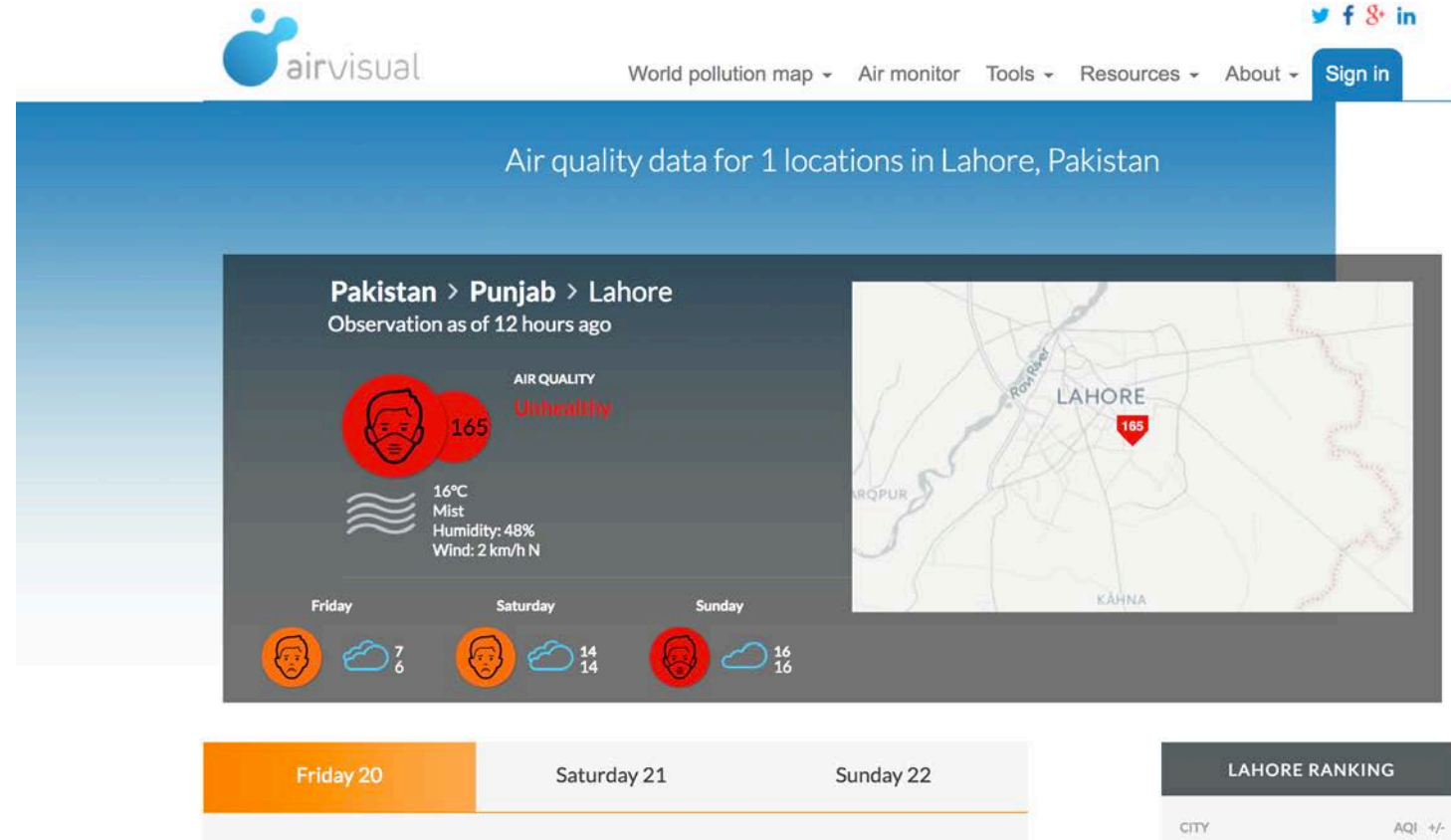
Having considered the existing potential for mitigation in the country, Pakistan intends to reduce up to 20% of its 2030 projected GHG emissions subject to availability of international grants to meet the total abatement cost for the indicated 20 percent reduction amounting to about US\$ 40 billion at current prices.

Pakistan's adaptation needs range between US\$ 7 to US\$ 14 billion/annum during this period.

New Initiatives

Twitter:

- @KarachiAir
- @LahoreSmog
- @PakAirQuality



Thank You – Be Green!

