Darkness behind Light

It is easy to dodge our responsibilities, but we can not dodge the consequences of dodging our responsibilities

Sir Josiah Stamp

Environmentalism

Environmentalism is not merely about pollution

It is a Philosophy dealing with Right Relationship with nature

- **Everything is connected to Everything Else**
- **Everything has to go somewhere**
- **Nature knows best**
- **There is no suchthing as a free lunch**

Clash between Ecosphere and Technosphere

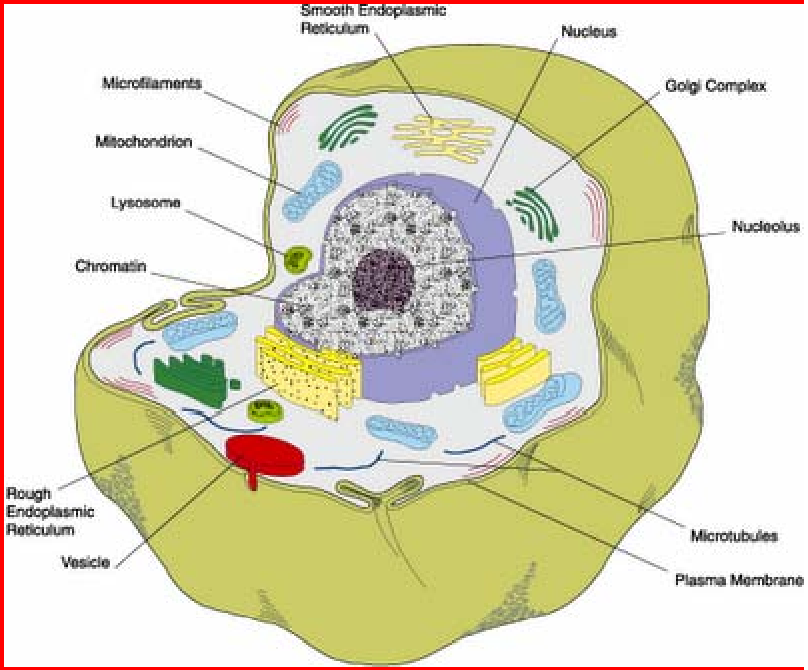
Deep Ecology, Social Ecology, Political Ecology, Feminist Ecology

Co-evolution of Life and Climate

Primordial Atmosphere:

Carbondioxide - 98.0%
Nitrogen - 1.9%
Argon - 0.1%

Atmosphere was anoxic



Life appeared spontaneously in the Oceans 3.8 billion years ago. Eventually one cell acquired the ability to persist by replicating. Green plants evolved some 475 million years ago.

Cyanobacteria – developed the ability for photosynthesis. This lead to the change of Earth's atmosphere.

Environmental degradation is built into the technical design of modern instruments of production. The environmental hazard is just as much an outcome of the facility's technological design as is its productive benefit.

- **High compression is the cause of both the auto engine's power and its production of nitrogen oxide-which triggers smog. 1,240,000 people died in vehicle crashes across the globe. That's 3,397 people per day or 142 per hour. (2010)**
- **The extensive use of nitrogen fertilizer accounts for the high productivity of the modern farm-and for the pollution of rivers and ground water as well.**
- **The same biochemical potency that made DDT an effective insecticide is also responsible for massive fish kills.**

- Barry Commoner, Making Peace with the Planet

“Coal is the single greatest threat to civilization and all life on our planet”

– Prof James Hansen

“… despite the complexity of our economy, most of the emissions problem seems to be quite simple: *stop burning coal to generate electricity*. Given the basic political will to take on the problem at all, this really shouldn’t be that hard. The problem, of course, is that such political will is lacking in the country that must lead on this issue: our own.”

Paul Krugman, Nobel Laureate in Economics

COAL THE GREATEST THREAT TO CIVILIZATION

The trains carrying coal to power plants are death trains. Coal-fired power plants are factories of death. They need to be shut down.

The moratorium must extend to developing countries within a decade, but that will not happen unless developed countries fulfill their moral obligation to lead this moratorium. **James Hansen**

"Many modern day bureaucrats and politicians no longer see themselves as trustees of public property and resources. They view their roles as those of political decision makers, vested with statutory discretion to allow damage to natural resources through the permit system. The present statutory system fails to impose a corresponding duty adequate to bridle this breathtaking power."

"But when officials suppress science and resist making findings of harm, the statutory provisions sit idle and environmental law loses its firepower. … Underlying and justifying this administrative system is a presumption that agencies will act as neutral seekers of the scientific truth and will regulate in the face of public harm. In many agencies today, that presumption has become a sham."

Nature's Trust, Mary Christina Wood

Sompeta

Kakarapalli

Sompeta & Kakarapalli Struggles

Climate Change

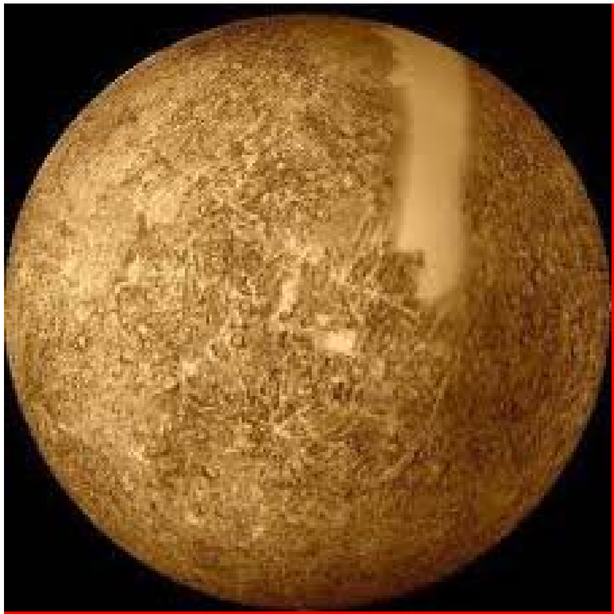
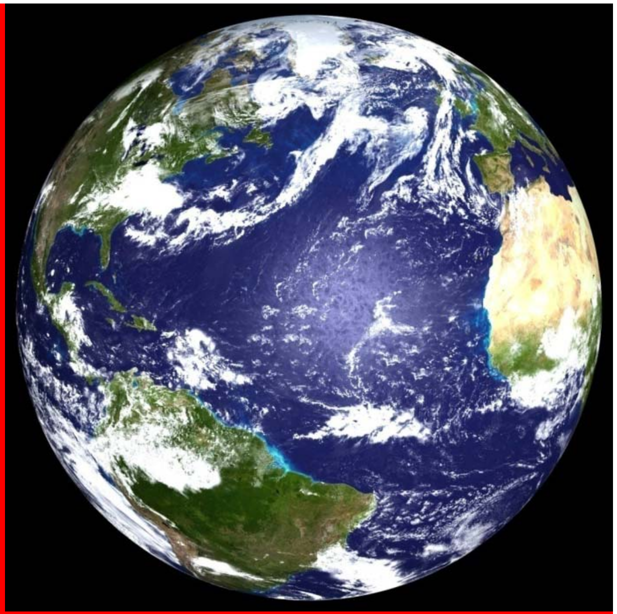
Carbon dioxide generated from burning fossil fuels is principal driver for climate change

"Humanity is called to take note of the need for changes in lifestyle and changes in methods of production and consumption to combat this warming, or at least the human causes that produce and accentuate it."

"Numerous scientific studies indicate that the greater part of the global warming in recent decades is due to the great concentration of greenhouse gases … given off above all because of human activity."

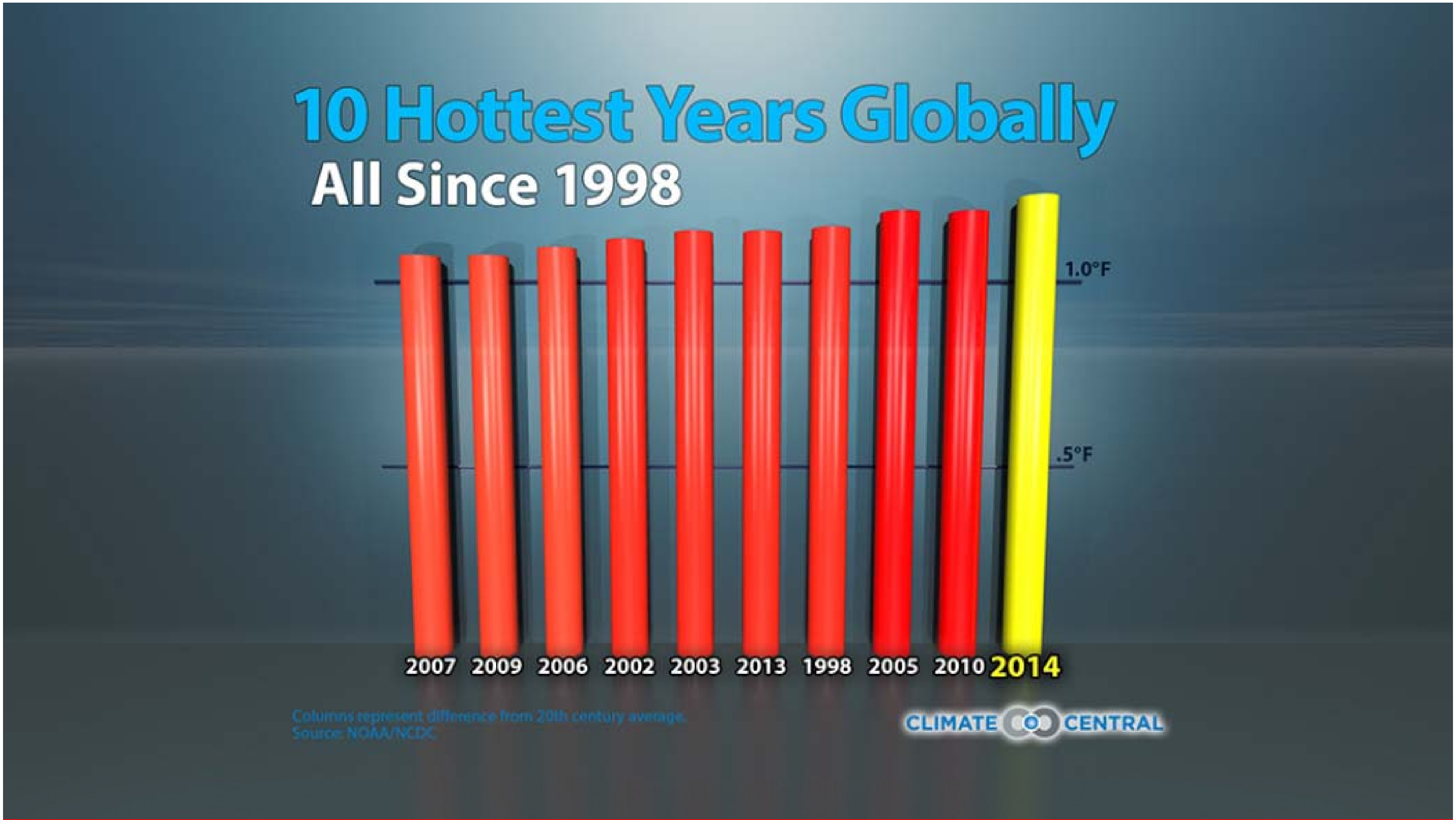
"The attitudes that stand in the way of a solution, even among believers, range from negation of the problem, to indifference, to convenient resignation or blind faith in technical solutions."

Pope Francis

	Mercury	Venus	Earth
Pres	Trace	90 atm	
Temp	427, -173 C	470 C	
Atm	Trace	Mostly Clouds of CO_2 & Sulphuric Acid	

Life creates conditions conducive for life

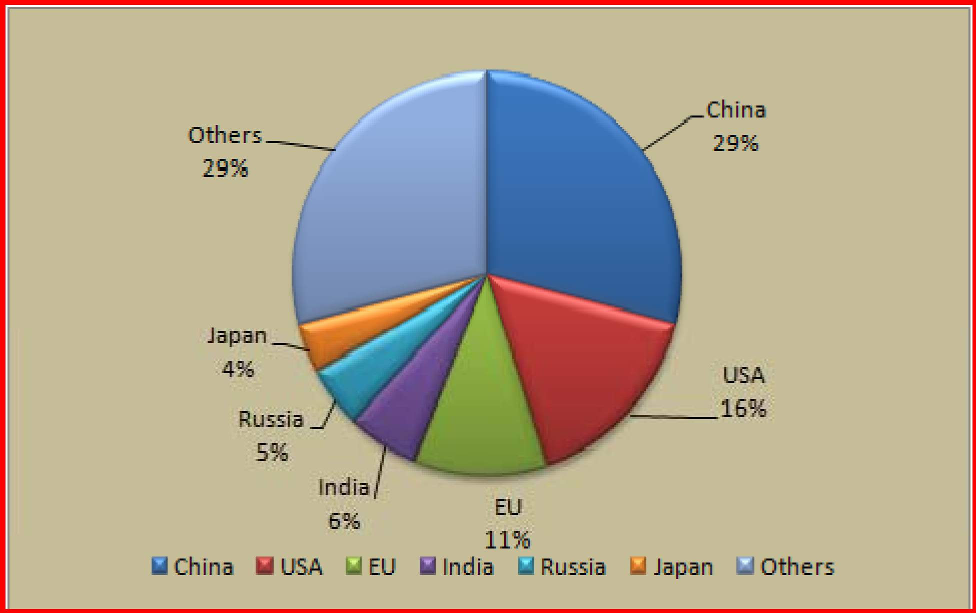


9 of the 10 warmest years are in this century

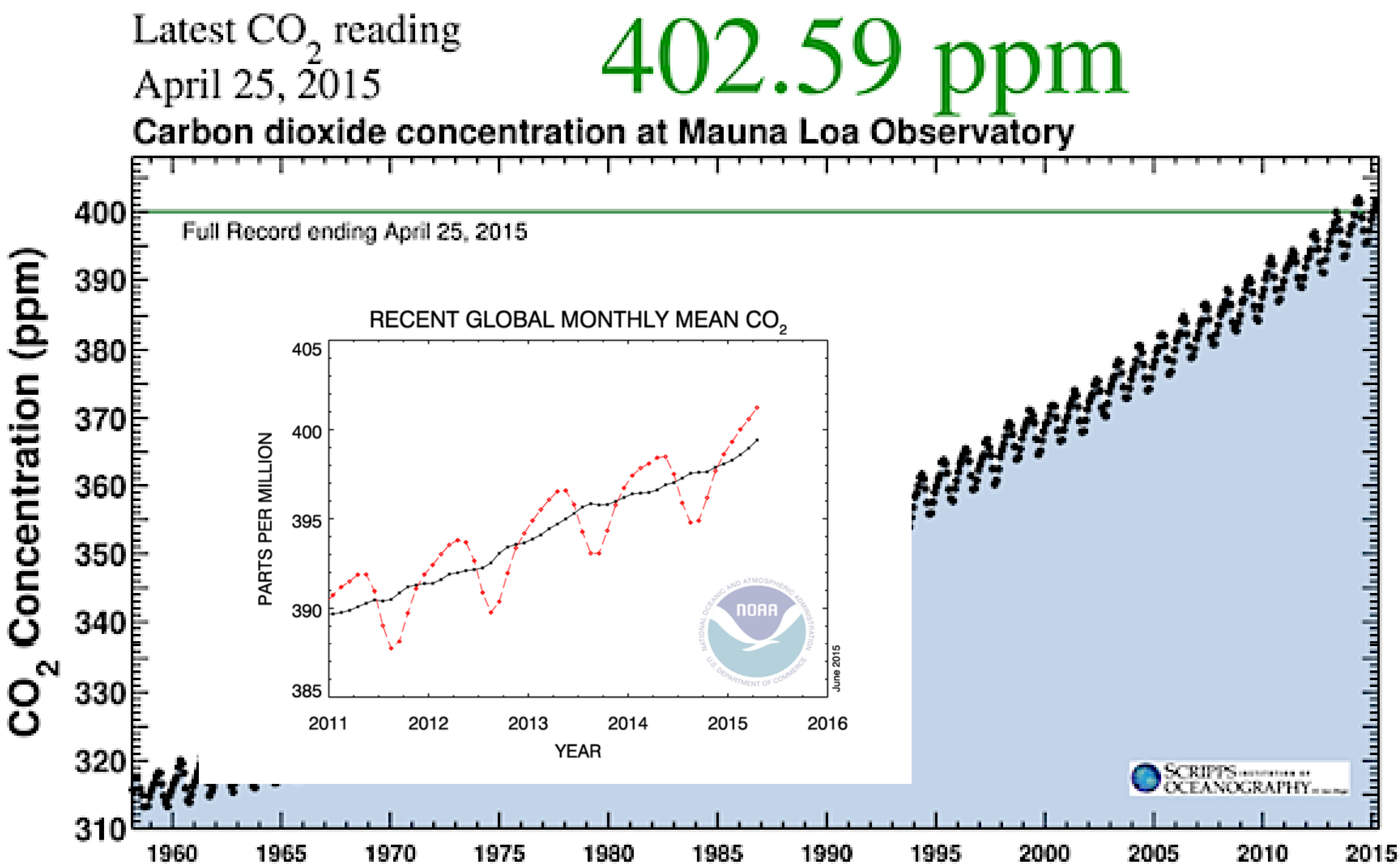
Pause in global warming is not True

Carbon Emissions

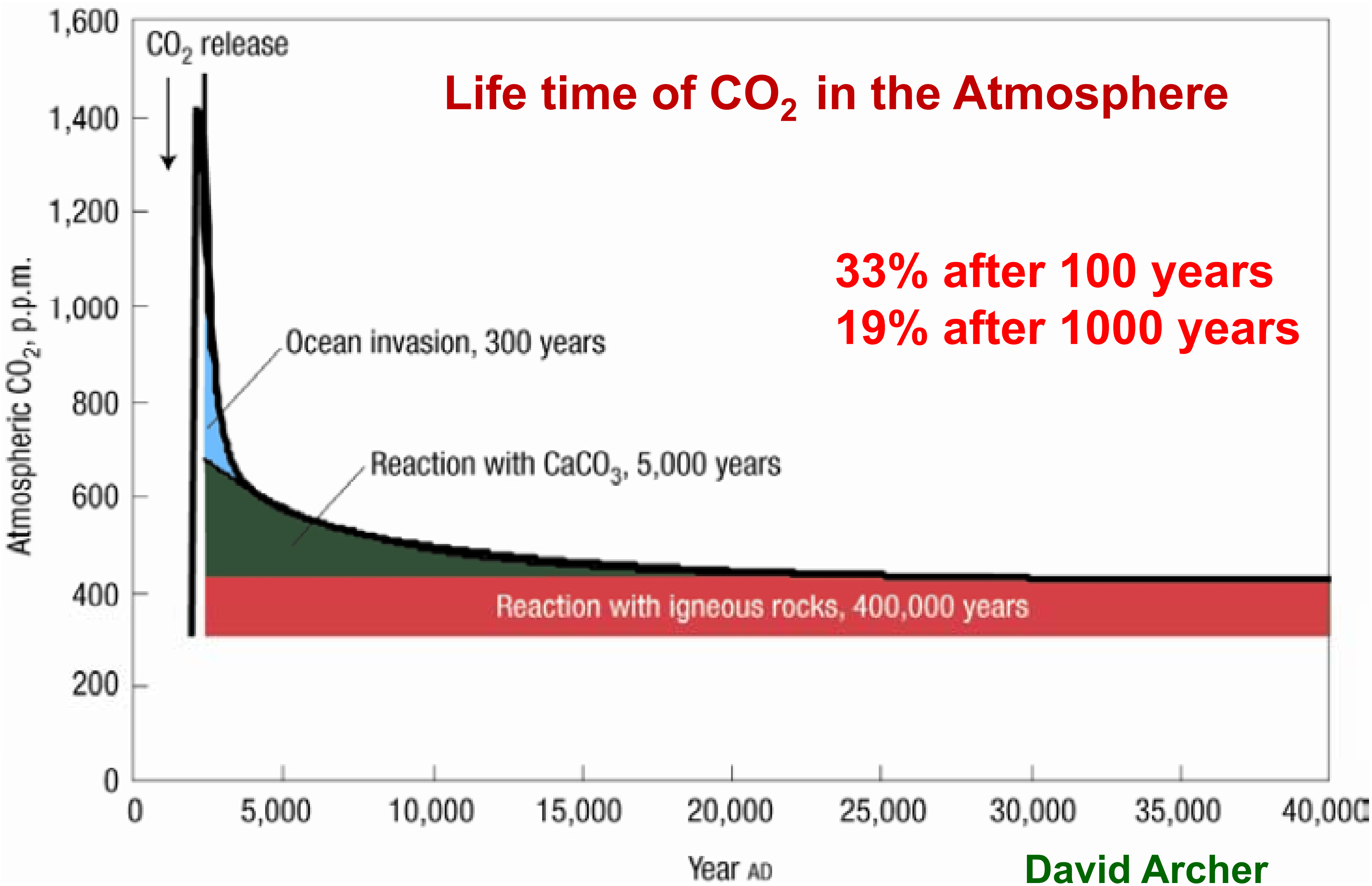
Year	Crore Tonnes
2010	3320
2011	3400
2012	3600



India is the third largest emitter of GHGs



Keeling Curve



"The climatic impacts of releasing fossil fuel CO2 to the atmosphere will last longer than Stonehenge, longer than time capsules, longer than nuclear waste, far longer than the age of human civilization so far."

Myles Allen et al (2009), suggests that we can burn, at most, another 400-500 billion tonnes of carbon at any time between now and the extinction of humanity if we want to avoid two degrees of warming.

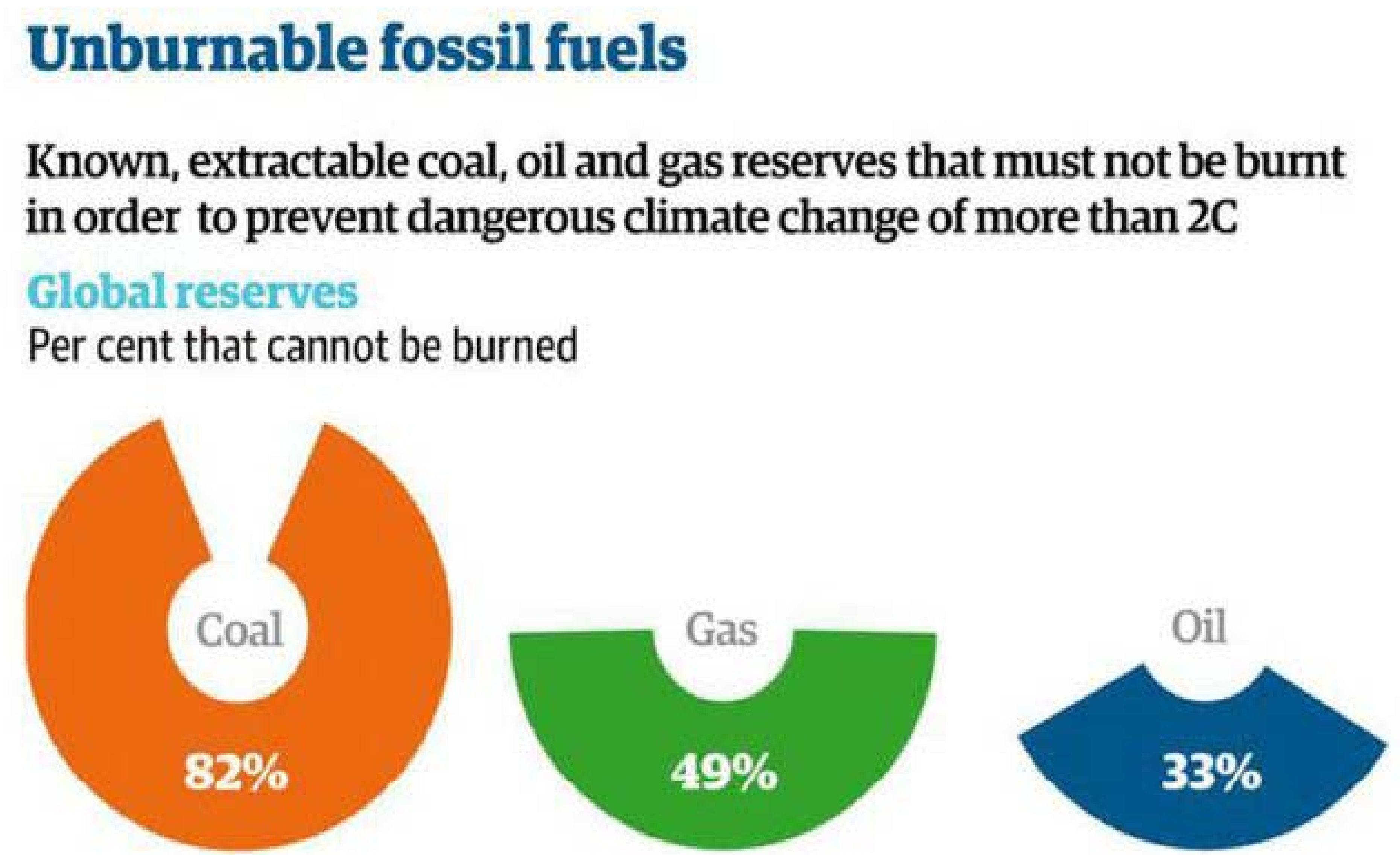
- Nature, 30 April 2009

We can afford to burn only 61% of known fossil fuel reserves between now and eternity.

Malte Meinshausen et al (2009), suggests that producing 1000 billion tonnes of CO2 between 2000-2050 would give us a 25% chance of exceeding two degrees.

- Nature, 30 April 2009

We can burn only, 33% minus what we have burnt between 2000 and today, between now and 2050



The geographical distribution of fossil fuels unused when limiting global warming to 2 °C
Christophe McGlade & Paul Ekins, *Nature* 517, 187–190, 08 January 2015

Carbon Burning Problem

Most of the carbon on the planet is in the form of Kerogen , a precursor to the formation of fossil fuels.

Total Kerogen on the Planet =$1.5x10^{16}$ T or $1.25x10^{21}$ mol

Carbon Consumption in 2013 = $9.2x10^{9}$ T

We have enough carbon to last a million years

Total Oxygen on the Planet = $1.2x10^{+15}$ t or $3.7x10^{+19}$ mol

$$C + O_2 \longrightarrow CO_2$$

Carbon is about 33 times more abundant than Oxygen

Ugo Bardi

Estimated Cost (2008 US $)

	Low	Best	High
Total (in Billions $)	175	345	523
Additional cost per unit (in cents)	9	18	27

Harvard School of Public Health estimates of external costs

Air Pollution

Pollutants from Coal Combustion

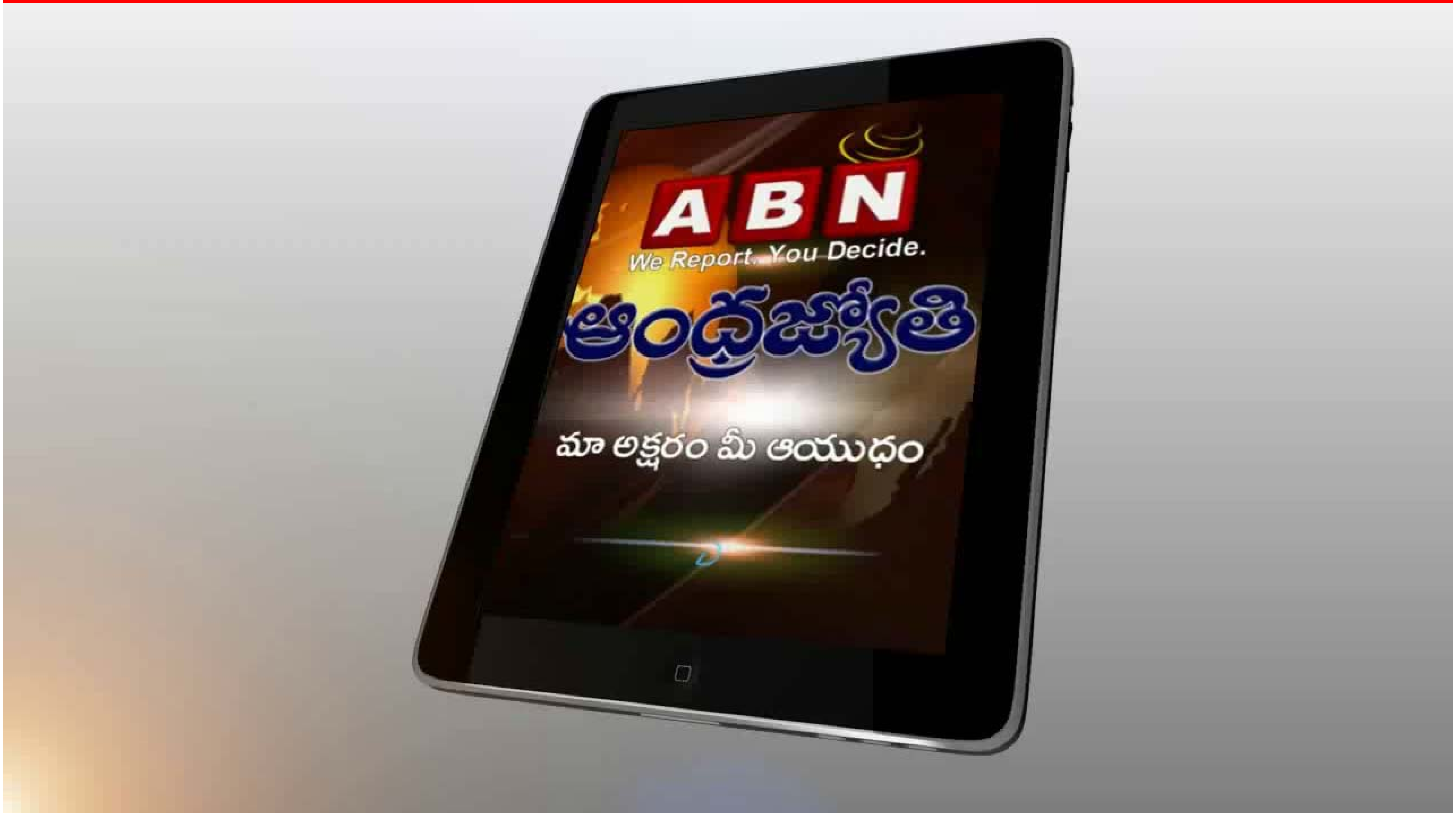
Particulate Matter
Sulphur Dioxide
Nitrogen Oxides
Carbon Dioxide
Hydrogen Chloride
Hydrogen Flouride
Benzene
Dioxins
Formaldehyde
Methane
Polycyclic Aromatic Hydrocarbons (PAHs)
Toluene
Volatile Organic Compounds (VOCs)

Ozone is generated as a secondary pollutants

Stack Gas online Monitoring Data Unit 1 NTTPS				
Date&Time	Carbon Monoxide (mg/m3)	NOx	SOx	SPM
28/02/2015 -- 12:00	12.15	294.34	1559.1	105.97
28/02/2015 -- 11:00	0	130.81	1167.41	123.36
28/02/2015 -- 09:00	12.92	382.76	1451.03	174.82
28/02/2015 -- 08:00	32.15	242.01	1495.16	176.34
28/02/2015 -- 07:00	48.87	242.69	1597.99	165.75
28/02/2015 -- 06:00	2.37	232.9	1351.13	159.05
28/02/2015 -- 05:00	0	431.93	1549.03	156.12
28/02/2015 -- 04:00	23.23	321.79	1426.04	154.61
28/02/2015 -- 03:00	50.12	432.46	1421.75	152.8
28/02/2015 -- 02:00	100.02	228.55	1462.98	150.2
28/02/2015 -- 01:00	21.09	425.07	1513.75	149.07
28/02/2015 -- 00:00	45.22	420.97	1402.33	152.95

“The level of suspended particulate matter emission should not exceed 150 milligram per normal cubic metre (mg/Nm3). However, our random inspections of KTPS units have revealed that suspended particulate matter level at times has gone up to 1,000 mg/Nm3”

DC | Sudheer Goutham | February 08, 2015


ABN
We Report. You Decide.
ఆంధ్రజ్యోతి
మా అక్షరం మీ ఆయుధం

KTPS online monitoring

Date & Time	SPM
28/02/2015 -- 14:02	275.10
28/02/2015 -- 13:02	286.80
28/02/2015 -- 12:02	300.20
28/02/2015 -- 11:02	282.30
28/02/2015 -- 10:02	287.30
28/02/2015 -- 09:02	288.80
28/02/2015 -- 08:02	287.00
28/02/2015 -- 07:02	298.60
28/02/2015 -- 06:02	312.50
28/02/2015 -- 05:02	305.60
28/02/2015 -- 04:02	275.60
28/02/2015 -- 03:02	303.00
28/02/2015 -- 02:02	292.60
28/02/2015 -- 01:02	296.70
28/02/2015 -- 00:02	292.30

Table 2. Concentrations of major constituents and trace elements in Indian coal and FA/coal ash from thermal power stations (TPS) (TPS) compared to European coal/FA

Constituents	The Netherlands[14]		India						
				Fly ash[19]	Coal ash[19]	Fly ash			
								Tamil Nadu TPS[20]	
	Coal	Fly ash	Coal[14]	Mean (From-to)	From-to	Chandrapur STPS*	Bhusawal TPP*	Mettur	Ennore
Major constituents, wt %									
Al	1.65	15.0	0.85+0.01	14.94 (12.43-19.29)	12.76-13.90				
C	73.2	4.3	78.11+0.37					0.08	0.26
Ca	0.14	1.2	0.20+0.006	0.94 (0.07-3.43)	1.43-1.55				
Fe	0.51	4.7	0.75+0.045	3.42 (1.49-5.41)	2.79-2.80	3.15-3.17	2.98	1.7	2.5
K	0.17	1.5	0.074+0.0028	0.52 (0.08-0.94)	0.81			0.32	0.10
Mg	0.08	0.7	0.038+0.0008	0.43 (0.28-0.72)	0.84-3.06			1.3	2.6
N	1.6	0.3	1.56+0.07					0.01	0.04
Na	0.04	0.4	0.051+0.0011	0.19 (0.07-0.28)	0.36				
P	0.01	0.10			0.24			0.19	0.21
S	0.7	0.1	1.89+0.06	0.14 (0.03—0.87)				0.3	0.6
Si	2.82	25.7		29.01 (25.92-30.24)	26.51-27.22			58	51.
Ti	0.08	0.8	0.043+0.0017		0.72				
Trace elements (mg kg-1)									
As	3.7	34	3.72+0.09			3.4-3.7	1.9		
B	43	163							
Ba	158	1438	67.50+2.1	400	120-350				
Cd	0.10	0.9	0.06+0.0027			11.8-12.1	9.7		
Co	5.8	52	2.29+0.17	14	5-25	54-57	49	3.8	4.8
Cr	14.4	131		145	40-100	79-82	68		
Cu	16.6	151	6.28+0.30	72	20-60	60-61	54	30	20
Ga	2.0	18		50	15-25			44	35
Hg	0.16	0.23				<0.008	<0.005		
La	7.6	69		108	15-20				
Mn	46	415	12.40+1.0			213-216	194	30	25
Mo	3.0	27							
Ni	11	98	6.10+ 0.27			141-142.5	136		
Pb	8.5	77	3.67+0.26	95	10-30	10-41	36	2.8	3.1
Rb	9.2	84	5.05 +0.11						
Se	2.2	13	1.29+0.11	10	1-8				
Sr	107	971		164	40-350				
Th	2.9	26	1.342+0.036	112	39-85				
U	1.5	13	0.436+0.012	21	8-27				
V	29	262		321	55-150				
Y				47	20-50				
Zn	24	218	11.89+0.78	295	180-460	106 -118	90	40	190

* Data obtained by the authors within the current research project of CFRI (CSIR) Dhanbad, India

Major Elements 12

Trace Elements 22

Table 1
Arithmetic and Geometric Means for Chemical Elements in US Coal

	Arithmetic		Geometric			
Component	Mean	S.D.	Mean	S.D.	Max.	Num.
Ash %	13.1	8.3	10.9	1.9	50.0	7976
Aluminum (Al) %	1.5	1.1	1.1	2.1	10.6	7882
Antimony (Sb) ppm	1.2	1.6	.61	3.6	35	7473
Arsenic (As) ppm	24	60	6.5	5.5	2200	7676
Barium (Ba) ppm	170	350	93	3.0	22000	7836
Beryllium (Be) ppm	2.2	4.1	1.3	3.5	330	7484
Bismuth (Bi) ppm	(<1.0)	n.d.	n.d.	n.d.	14	920
Boron (B) ppm	49	54	30	3.1	1700	7874
Bromine (Br) ppm	17	19	9.1	4.1	160	4999
Cadmium (Cd) ppm	.47	4.6	.02	18	170	6150
Calcium (Ca) %	.46	1.0	.23	3.3	72	7887
Carbon (C) %	63	15	62	1.3	90	7154
Cerium (Ce) ppm	21	28	5.1	7.1	700	5525
Cesium (Cs) ppm	1.1	1.1	.70	3.2	15	4972
Chlorine (Cl) ppm	614	670	79	41	8800	4171
Chromium (Cr) ppm	15	15	10	2.7	250	7847
Cobalt (Co) ppm	6.1	10	3.7	2.9	500	7800
Copper (Cu) ppm	16	15	12	2.1	280	7911
Dysprosium (Dy) ppm	1.9	2.7	.008	35	28	1510
Erbium (Er) ppm	1.0	1.1	.002	73	11	1792
Europium (Eu) ppm	.40	.33	.12	5.8	4.8	5268
Fluorine (F) ppm	98	160	35	15	4000	7376
Gadolinium (Gd) ppm	[1.8]	n.d.	n.d.	n.d.	39	2376
Gallium (Ga) ppm	5.7	4.2	4.5	2.1	45	7565
Germanium (Ge) ppm	5.7	14	.59	16	780	5689
Gold (Au) ppm	(<0.05)	n.d.	n.d.	n.d.	n.d.	n.d.
Hafnium (Hf) ppm	.73	.68	.04	38	18	5120
Holmium (Ho) ppm	[0.35]	n.d.	n.d.	n.d.	4.5	1130
Hydrogen (H) %	5.2	.09	5.2	1.2	9.5	7155
Indium (In) ppm	(<0.3)	n.d.	n.d.	n.d.	n.d.	n.d.
Iodine (I) ppm	(<1.0)	n.d.	n.d.	n.d.	n.d.	n.d.
Iridium (Ir) ppm	(<0.001)	n.d.	n.d.	n.d.	n.d.	n.d.
Iron (Fe) ppm	1.3	1.5	.75	2.9	24	7882
Lanthanum (La) ppm	12	16	3.9	6.0	300	6235
Lead (Pb) ppm	11	37	5.0	3.7	1900	7469
Lithium (Li) ppm	16	20	9.2	3.3	370	7848
Lutetium (Lu) ppm	.14	.10	.06	4.7	1.8	5008
Magnesium (Mg) %	.11	.12	.07	2.7	1.5	7887

Trace Elements in Coal Environmental and Health Significance

ROBERT B. FINKELMAN

U.S. Geological Survey, 1999

37 Elements

Table 1 *(Continued)*

Component	Arithmetic Mean	Arithmetic S.D.	Geometric Mean	Geometric S.D.	Max.	Num.
Manganese (Mn) ppm	43	84	19	3.9	2500	7796
Mercury (Hg) ppm	.17	.24	.10	3.1	10	7649
Molybdenum (Mo) ppm	3.3	5.6	1.2	6.5	280	7107
Neodymium (Nd) ppm	[9.5]	n.d.	n.d.	n.d.	230	4749
Nickel (Ni) ppm	14	15	9.0	2.8	340	7900
Niobium (Nb) ppm	2.9	3.1	1.0	7.7	70	6843
Nitrogen (N) %	1.3	0.4	1.3	1.4	13	7153
Osmium (Os) ppm	(<0.001)	n.d.	n.d.	n.d.	n.d.	n.d.
Oxygen (O) %	16	12	12	2.0	60	7151
Palladium (Pd) ppm	(<0.001)	n.d.	n.d.	n.d.	n.d.	n.d.
Phosphorus (P) ppm	430	1500	20	20	58000	5079
Platinum (Pt) ppm	(<0.001)	n.d.	n.d.	n.d.	n.d.	n.d.
Potassium (K) %	.18	.21	.10	3.5	2.0	7830
Praseodymium (Pr) ppm	[2.4]	n.d.	n.d.	n.d.	65	1533
Rhenium (Re) ppm	(<0.001)	n.d.	n.d.	n.d.	n.d.	n.d.
Rhodium (Rh) ppm	(<0.001)	n.d.	n.d.	n.d.	n.d.	n.d.
Rubidium (Rb) ppm	21	20	.62	41	140	2648
Ruthenium (Ru) ppm	(<0.001)	n.d.	n.d.	n.d.	n.d.	n.d.
Samarium (Sm) ppm	1.7	1.4	.35	13	18	5151
Scandium (Sc) ppm	4.2	4.4	3.0	2.3	100	7803
Selenium (Se) ppm	2.8	3.0	1.8	3.1	150	7563
Silicon (Si) %	2.7	2.4	1.9	2.4	20	7846
Silver (Ag) ppm	(<0.1)	.35	.01	9.1	19	5038
Sodium (Na) %	.08	.12	.04	3.5	1.4	7784
Strontium (Sr) ppm	130	150	90	2.5	2800	7842
Sulfur (S) %	1.8	1.8	1.3	2.4	25	7214
Tantalum (Ta) ppm	.22	.19	.02	13	1.7	4622
Tellurium (Te) ppm	(<0.1)	n.d.	n.d.	n.d.	n.d.	n.d.
Terbium (Tb) ppm	.30	.23	.09	7.7	3.9	5024
Thallium (Tl) ppm	1.2	3.4	.00004	205	52	1149
Thorium (Th) ppm	3.2	3.0	1.7	5.0	79	6866
Thulium (Tm) ppm	[0.15]	n.d.	n.d.	n.d.	1.9	365
Tin (Sn) ppm	1.3	4.3	.001	54	140	3004
Titanium (Ti) %	.08	.07	.06	2.2	.74	7653
Tungsten (W) ppm	1.0	7.6	.10	14	400	4714
Uranium (U) ppm	2.1	16	1.1	3.5	1300	6923
Vanadium (V) ppm	22	20	17	2.2	370	7924
Ytterbium (Yb) ppm	[0.95]	n.d.	n.d.	n.d.	20	7522
Yttrium (Y) ppm	8.5	6.7	6.6	2.2	170	7897
Zinc (Zn) ppm	53	440	13	3.4	19000	7908
Zirconium (Zr) ppm	27	32	19	2.4	700	7913

Trace Elements in Coal Environmental and Health Significance

ROBERT B. FINKELMAN

U.S. Geological Survey, 1999

41 Elements

Total 78 Elements

Trace Elements in Coal and Ash

Table 2

Average elemental concentrations (μg/g) in the fly ash, bottom ash, and feed coal of five power plants.

	Cd	Ni	Li	Cr	Co	Mn	Mg	Pb	Zn	Cu	Fe	As	Hg
Fly ash													
Plant-1	0.60	42.13	49.53	21.25	23.53	133.25	76.25	22.93	39.25	45.75	24,725	0.19	0.51
Plant-2	0.83	27.08	8.68	37.25	10.50	114.70	10.75	35.30	65.00	55.75	15,076	0.22	1.08
Plant-3	0.83	25.18	6.73	45.00	9.45	111.95	13.00	27.70	77.25	57.50	14,107	0.31	2.13
Plant-4	0.80	34.50	6.75	45.00	11.53	567.20	10.50	7.60	41.25	34.50	49,772	0.35	1.76
Plant-5	0.93	48.38	33.03	60.75	18.18	182.45	31.50	30.38	42.25	55.25	27,381	0.23	1.48
Bottom ash													
Plant-1	0.49	38.33	30.26	16.60	16.02	112.06	67.10	14.24	16.24	32.99	16,590	0.11	0.41
Plant-2	0.62	19.46	5.00	26.67	7.20	97.04	7.70	28.28	48.15	36.16	10,704	0.10	0.80
Plant-3	0.63	33.23	4.13	33.50	11.38	139.70	4.25	10.50	32.10	37.25	12,436	0.21	1.32
Plant-4	0.65	35.65	5.33	40.00	12.18	328.20	15.00	8.80	26.25	30.75	34,786	0.30	1.58
Plant-5	0.79	39.43	21.47	43.74	13.36	173.33	27.56	19.74	35.91	41.44	17,798	0.15	0.99
Coal													
Plant-1	0.27	18.32	41.27	6.77	10.69	38.40	39.10	10.42	117.15	19.72	9437	1.14	2.31
Plant-2	0.37	7.80	7.09	12.51	3.31	31.82	5.92	20.37	107.80	29.41	5546	1.39	9.18
Plant-3	0.30	12.93	3.10	35.25	3.43	50.18	12.50	5.03	294.25	19.75	7314	2.20	13.21
Plant-4	0.31	15.43	1.90	13.29	4.33	148.51	6.49	3.25	160.11	13.42	14,250	1.55	4.40
Plant-5	0.48	26.88	16.04	19.02	7.06	99.61	17.97	13.22	158.60	21.41	10,811	1.55	8.14

Distribution of trace elements in coal and combustion residues from five thermal power plants in India, International Journal of Coal Geology 86, 349–356, 2011

Heavy Metals Released from NTTPS

Component	Compositionmg /kg	Quantity, TPA
Lead	7.269	95.224
Cadmium	0.0706	0.925
Mercury	< 0.5	< 6.55
Arsenic	1.335	17.49
Chromium	19.24	252.0
Zinc	57.85	757.8
Copper	12.82	167.94
Selenium	< 0.5	< 6.55

Heavy Metal Emissions from NCCPP, Sompeta

S. No	Metal emitted	Content in Coal, mg/kg	Quantity emitted, TPA	
			@85% PLF	@100% PLF
1	Mercury	0.5	6.25	7.3
2	Lead	207	2587.5	3022.2
3	Arsenic	0.3	3.75	4.38
4	Chromium	75	937.5	1095
5	Zinc	109	1362.5	1591.4

Mercury released is 5.84 mg/yr for every Indian

Dead spruces Bavarian Forest National Park Germany

Acid rain, woods, Jizera Mountains, Czech Republic

Trees killed by Acid Rain, Smoky Mountains, Tennessee, USA

Disfiguring of Statues

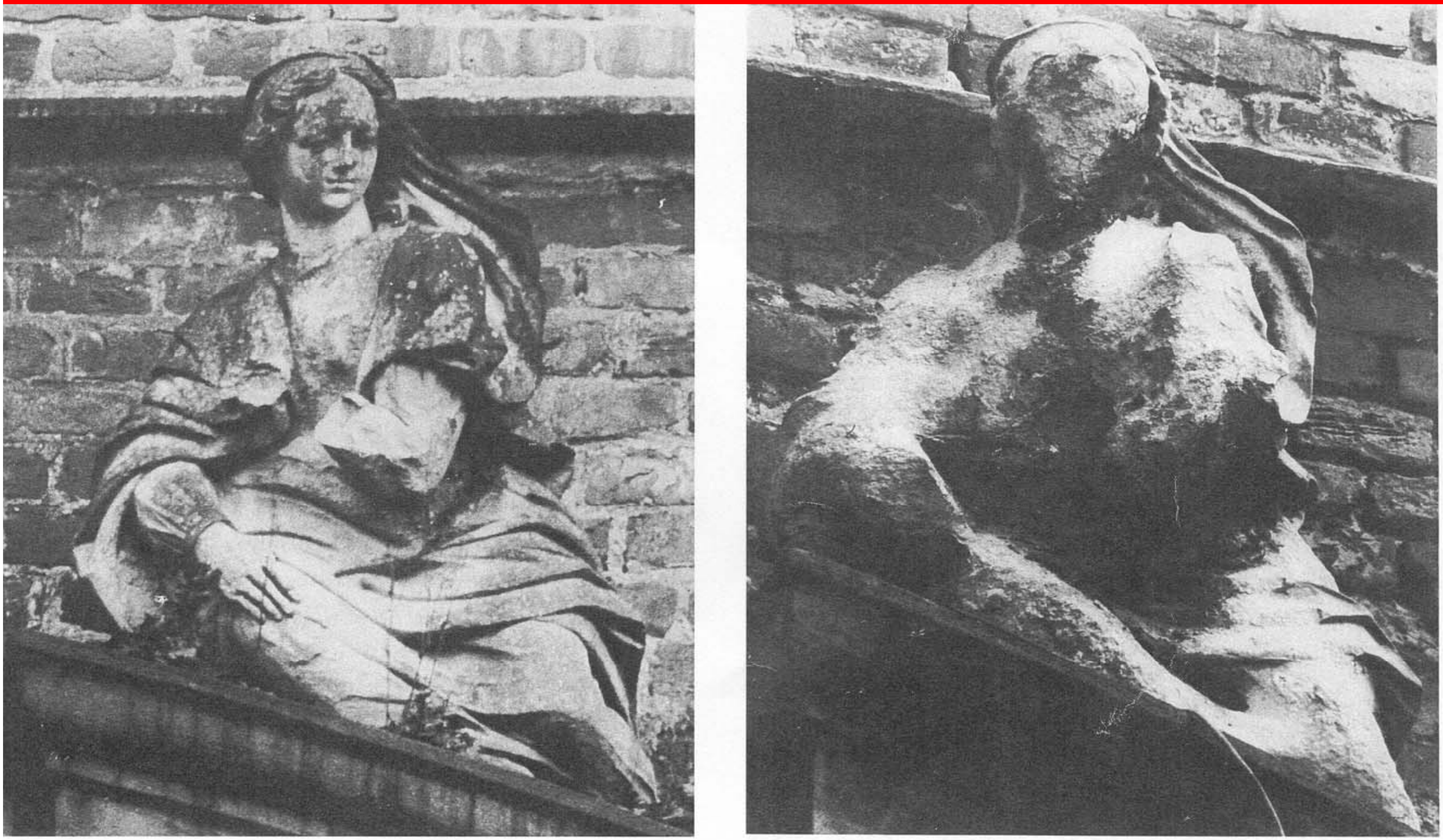


Figure 2.2.1 German ornamental figure made of sandstone. The figure, from 1702, is found at the Herten Castle in the outskirts of the Ruhr area. The picture on the left shows how the figure still looked in 1908. On the right one can see what had happened to the figure 60 years later (picture taken in 1969). It is a telling proof of how the stone has weathered under the damaging influence of serious air pollution (source: Westfälisches Amt für Denkmalpflege, Münster)

Acid rain can eat through stone and metal. It has accelerated the natural weathering process of this scarred stone angel's face.

Statistics show that China's annual sulfur dioxide emission, of which thermal power emission makes up 34.6 percent, exceeds the maximum of environmental capacity by 80 percent. The resulting acid rain costs annual loss of 110 billion yuan (US$13.3 billion), two or three percent of the annual Gross Domestic Production.

The darkened nose and other areas on the head of China's Leshan Giant Buddha are attributed to acid rain from coal-fired power plants.

Ash

KTPS plant: The Kinnerasani river is being polluted by fly ash.

P. Viswanath, joint chief environmental engineer to DC, February 08, 2015

NTTPS discharges flyash from Ashpond to Krishna River

Human Health

In response to an RTI application, "Gujarat's Department of Industrial Safety and Health (DISH) stated in January 2013 that there were 128 cases of work-related diseases in seven power plants in the State. It was also stated that no compensation had been paid under the provisions of the Workmen's Compensation Act, 1923."

http://www.frontline.in/environment/norms-to-the-winds/article5692761.ece? homepage=true

Coal pollutants affect all major body organ systems and contribute to four of the five leading causes of mortality in the U.S.: heart disease, cancer, stroke, and chronic lower respiratory diseases.

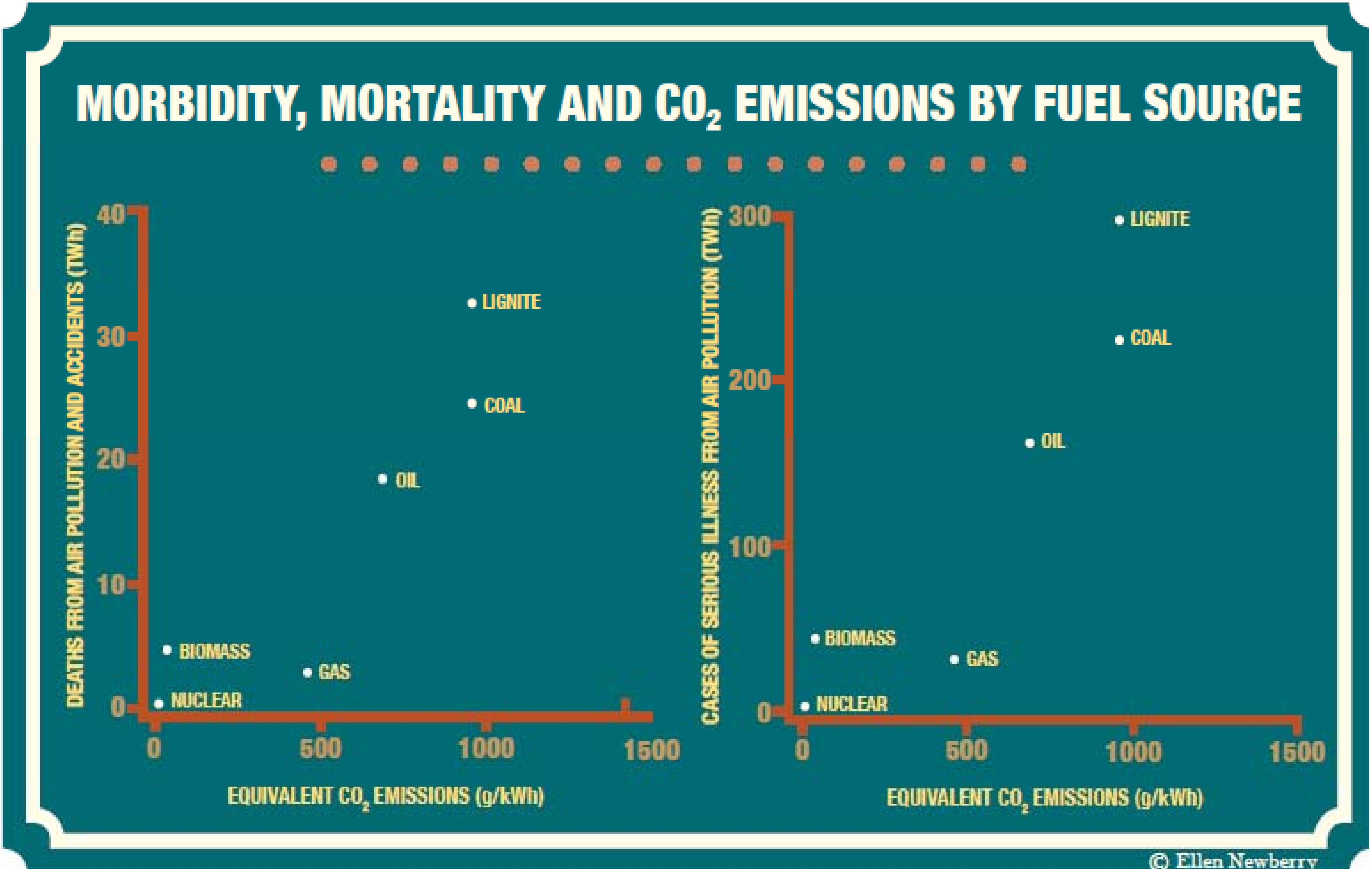
There should be no new construction of coal fired power plants, so as to avoid increasing health-endangering emissions of carbon dioxide, as well as criteria pollutants and hazardous air pollutants.

Physicians for Social Responsibility

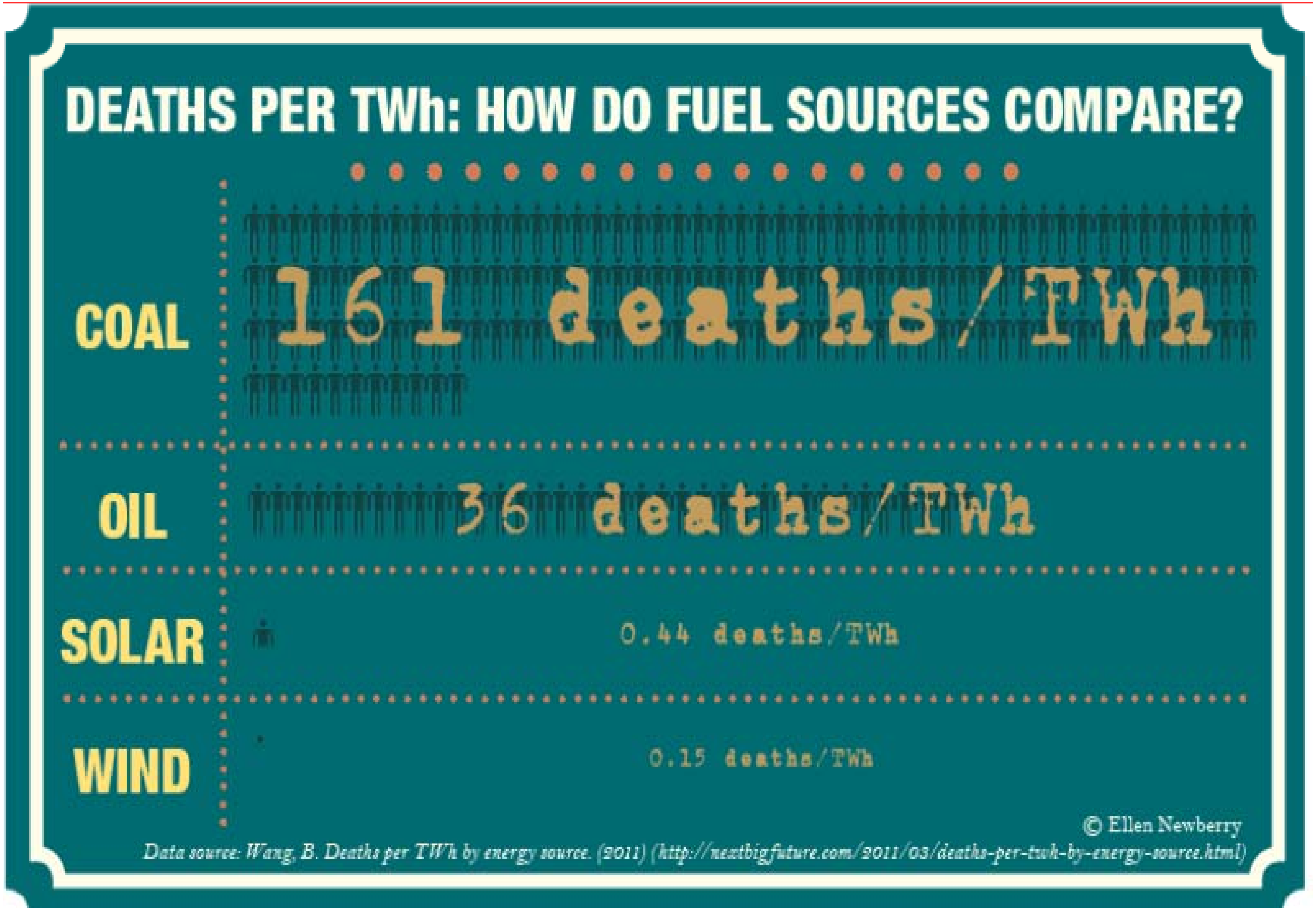
Hidden Costs

In 2005 the total annual external damages from sulfur dioxide, nitrogen oxides, and particulate matter created by burning coal at 406 coal-fired power plants, which produce 95 percent of the nation's coal-generated electricity, were about $62 billion; these nonclimate damages average about 3.2 cents for every kilowatt-hour (kwh) of energy produced.

National Academies USA to US Congress, Oct 19, 2009



Markandya and Wilkinson's (2007) estimates of the health impacts of different energy sources per unit of energy produced, against their carbon intensity. Renewables not included in this figure have overall health impacts and emissions similar in magnitude to those of nuclear energy.


DEATHS PER TWh: HOW DO FUEL SOURCES COMPARE?
COAL
161 deaths/TWh
OIL
36 deaths/TWh
SOLAR
0.44 deaths/TWh
WIND
0.15 deaths/TWh
© Ellen Newberry
Data source: Wang, B. Deaths per TWh by energy source. (2011) (http://nextbigfuture.com/2011/03/deaths-per-twh-by-energy-source.html)

Animal Health

“From the present investigation, it may be concluded that the cattle reared nearby the thermal power plant may have suffered detrimental effects due to the ingestion of high levels of mercury metal compared to the control animals.”

Mercury concentrations estimated in the blood, milk, and urine of exposed (n=20) and control (n=20) animals were 7.41±0.86, 4.75±0.57, 2.08±0.18, and 1.05±0.07, 0.54±0.03, 0.20±0.02 μg/kg, respectively.

“Influence of mercury from fly ash on cattle reared nearby thermal power plant” Journal Environment Monitoring Assessment, 2012

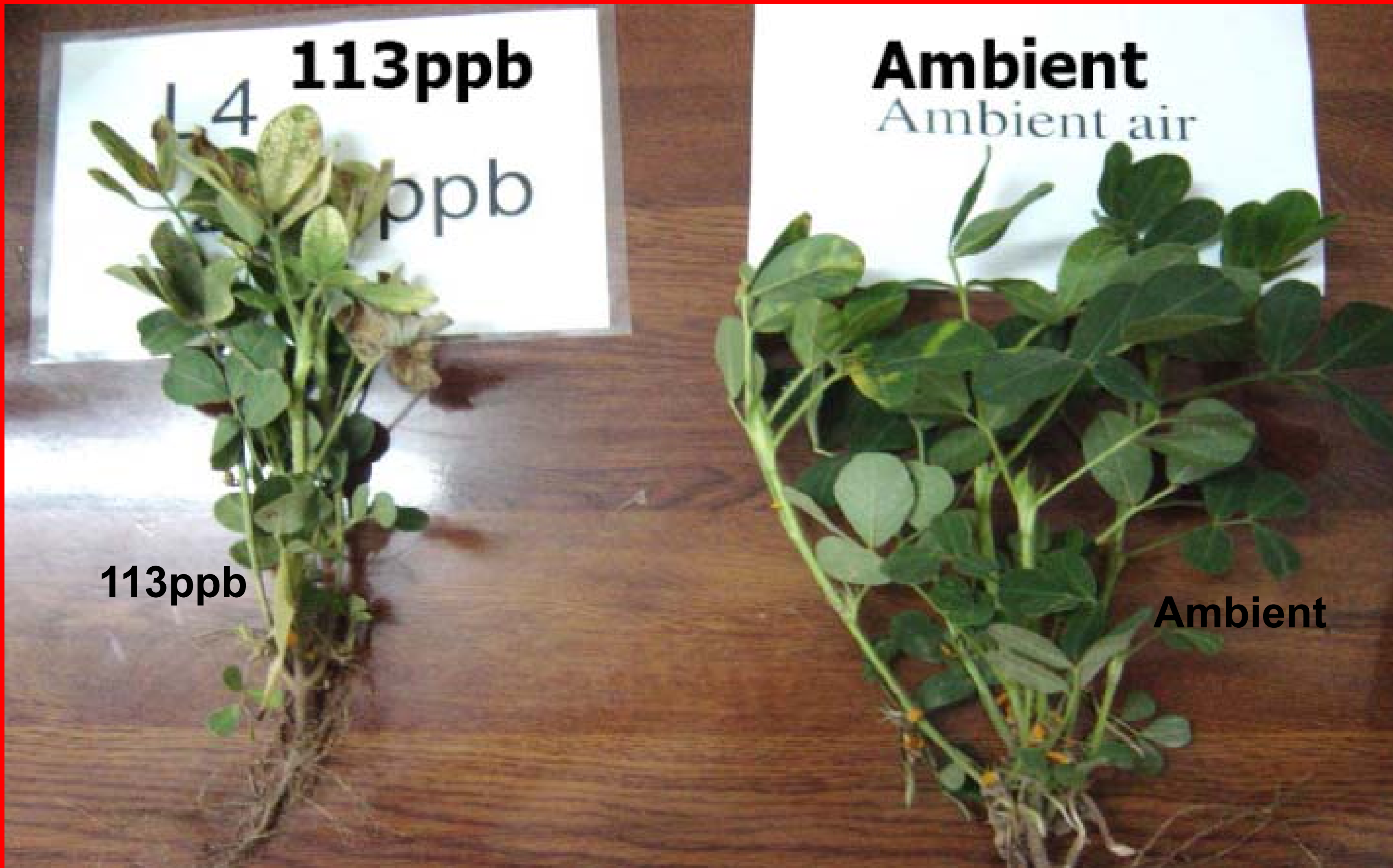
Agriculture

Ozone Damage to Plant

Ozone effects: flecks on upper surface of leaves, premature aging, suppressed growth

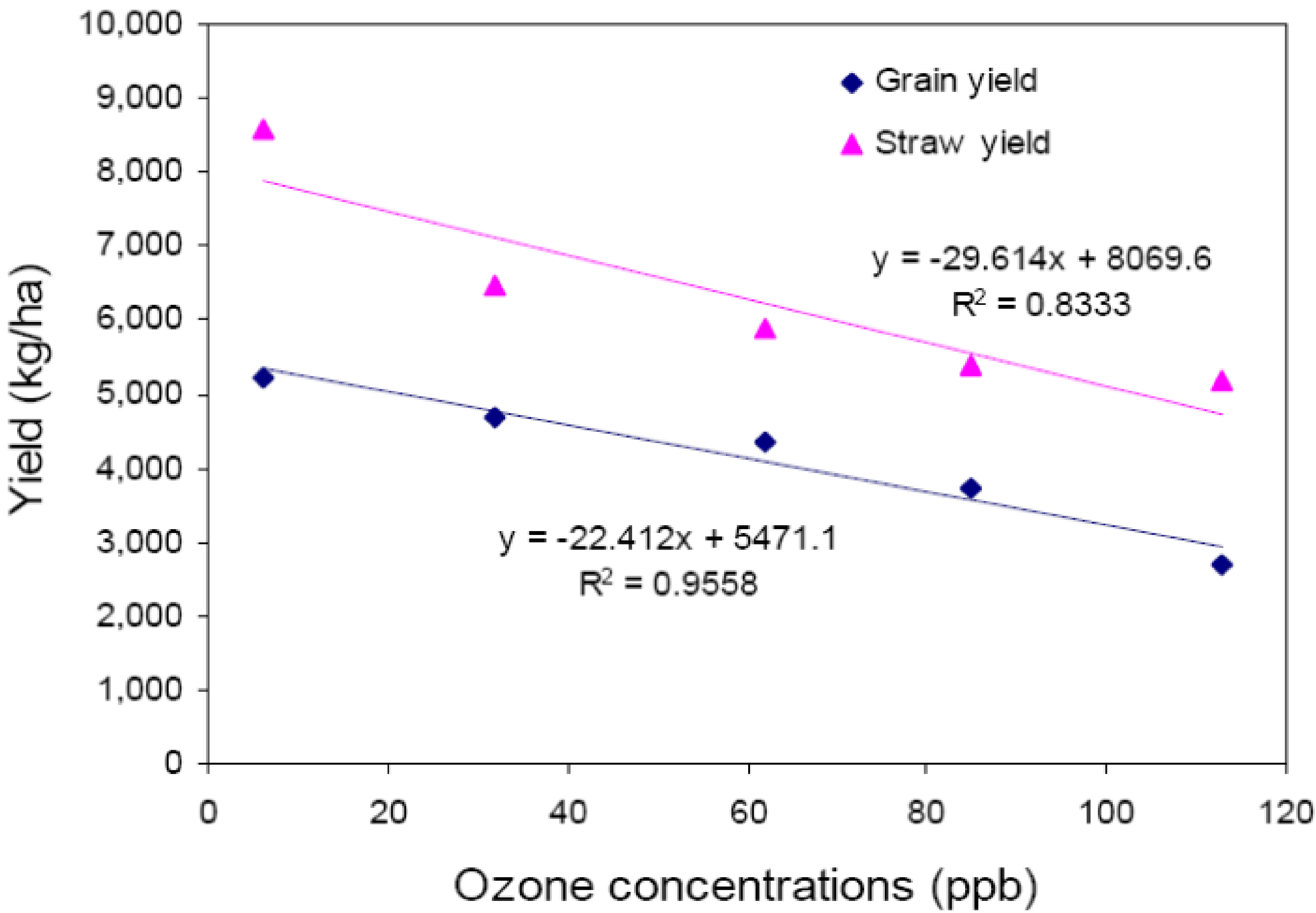
Yield loss in different crop from ground level O3

Crop	O_3, ug/m^3	Yield reduc. %	Country	Reference
Wheat	86	40	Pakistan	Wahid et al, 1995a
Rice	143	40-60	Pakistan	Wahid et al. 1995b
Soybean	80-150	64	Pakistan	Wahid et al, 2001
Radish	55-67	30	Egypt	Hassan et al. 1995
Turnip	55-67	17	Egypt	Hassan et al. 1995
Bean	686	40	Mexico	Laguette-Rey et al. 1986
Tomato	88-90	24	India	Varshney and Rout, 1998
Soybean	46-65	16-31	India	Varshney and Rout, 2003



Peanut at 15 days ozone exposure

Rice grain and straw yield in different ozone treatments



University of Agricultural Sciences, Bangalore conducted a study on the impact of Raichur Thermal Power Station (RTPS) on agriculture and observed 34.5 % reduction in paddy crop, 35.16% reduction in cotton and 50% reduction in sorghum produced per acre in the severely affected zone within 3 km of the plant.

Table 2
Estimated relative crop productions losses (%) due to current and near-future (year 2030) ozone concentrations according to different modeling approaches[a] for major Indian crop plants.

Crop	Present $[O_3]$	Future $[O_3]$
Wheat	5–48%	10–48%
Rice	3–18%	5–28%
Soybean	3–19%	8–32%
Bean	13–26%	27–52%
Barley	4–14%	5–22%
Maize	2–8%	3–16%
Potato	2–9%	7–16%

[a] Van Dingenen et al., 2009; Emberson et al., 2009; Feng and Kobayashi 2009; Avnery et al., 2011a,b.

"Impacts of increasing ozone on Indian plants" Environmental Pollution, 2013

Radioactive Pollution

Table 1. Radioactivity content in coal and lignite samples

Source	U-nat	Ra-226	Ra-228	Po-210	Pb-210
	(Bq/kg)				
Coal					
Singareni	5.7–21.5	6.7–15.5	8.9–17.0	2 6–21 8	4 9–24.5
Bengal	22.3	14.2	17.4	17.5	16.3
Chanda	20 6	15.7	18 5	18 1	14 4
Talcher	40 3	38 9	40.2	35.8	36.1
Singrauli	53 8	54 4	45 5	50.1	48 6
Ennore	40.4–56 8	8 1–31.8	6 6–28.9	18.9–43.7	17.4–45.0
Lignite					
Neyveli	0.7-3.2	BDL-5.4	BDL-1 3	BDL-9 8	1.1–7 6
Neyveli (power station)	74.5–99.5	37.3–109.9	BDL-7 5	67.1–87.7	30.7–85.8

Table 2. Radioactivity content in fly-ash samples

Source	U-nat	Ra-226	Ra-228	Po-210	Pb-210
	(Bq/kg)				
Singareni	18 8–27 9	15 5–66 6	13.7–44 4	24 1–27 4	25 7–30 2
Ennore	73.1–121 4	16 0–94 1	15 8–79 9	5 9–55 9	7 0–69 6
Neyveli	207.5–635.3	177.5–596 4	24 4–59 4	98 9 -276.4	155 8–271 4

Coal contains a large number of chemical elements including radioactive elements.

NTTPS Fly ash sample analysis done at BARC (September 09, 2014)

S.No.	Sample Name.	Sample Id.	Activity (Bq/kg)				
			^{238}U	^{226}Ra	^{232}Th	^{40}K	^{137}Cs
1.	Fly Ash	D - 41	144.2 ± 14.4	138.2 ± 11	165.9 ± 10	330.7 ± 2.5	≤ 0.2

limits 99 to 203 | 317 to 614 | 185 to 255 | 255 to 546

Table 5

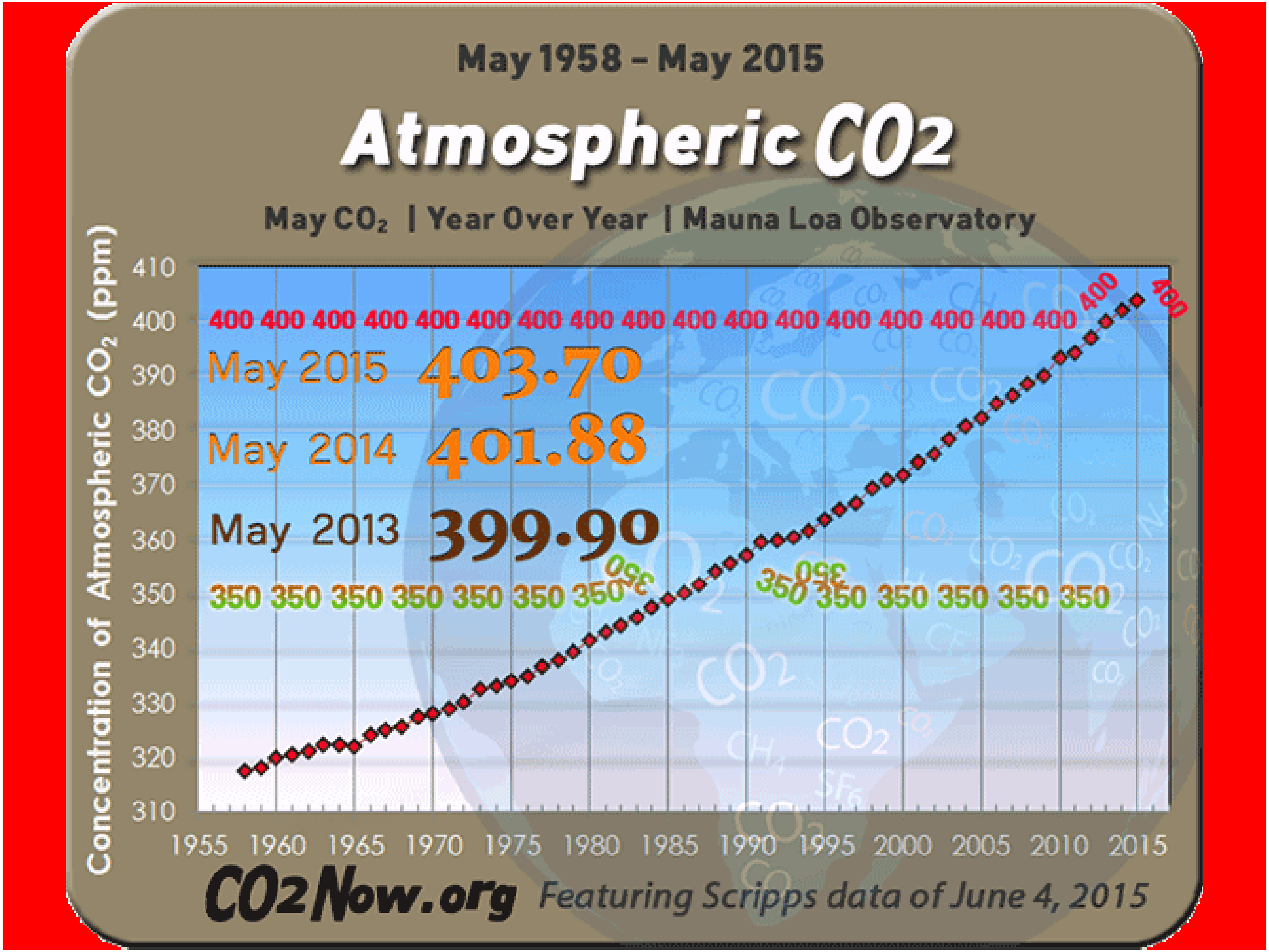
Comparison of mean activity coefficients of radionuclides (^{226}Ra, ^{232}Th and ^{40}K) and absorbed dose rate from fly ash of NTPC Dadri, with other thermal power plants in India.

Thermal power station (India)	Activity (Bq kg^{-1})			Absorbed dose rates (nGy h^{-1})	References
	^{226}Ra	^{232}Th	^{40}K		
Allahabad (Uttar Pradesh)	78.4	89.1	362.7	107.6	Vijayan and Behera (1999)
Angul (Orissa)	78.5	86.5	278.1	102.4	Vijayan and Behera (1999)
Badarpur (Delhi)	75.5	88.1	286.4	102.5	Vijayan and Behera (1999)
Chandrapur (Madhya Pradesh)	58.2	89.2	301.2	96.5	Vijayan and Behera (1999)
Raichur (Karnataka)	83.1	102.5	334.1	117.3	Vijayan and Behera (1999)
Talchir (Orissa)	79.2	96.3	291.6	109.7	Vijayan and Behera (1999)
Bokaro (Bihar)	70.3	118.4	252.0	118.9	Lalit et al. (1986)
Ramagundam (Andhra Pradesh)	59.2	95.1	507.0	109.4	Lalit et al. (1986)
Neyvelli (Tamil Nadu)	64	126.9	370.0	126.8	Lalit et al. (1986)
Amarkantak (Madhya Pradesh)	49.2	106.2	329.3	105.0	Lalit et al. (1986)
Nasik (Maharashtra)	126.9	138.0	279.0	157.2	Lalit et al. (1986)
Nellore (Andhra Pradesh)	64	126.9	370.0	126.8	Lalit et al. (1986)
Farakka (West Bengal)	84.1	98.8	297.1	113.7	Vijayan and Behera (1999)
Bakreshwar (West Bengal)	76.3	87.5	288.1	102.5	Vijayan and Behera (1999)
Kolaghat (West Bengal)	111.4	140.2	350.7	150.8	Mondal et al. (2006)
Durgapur (West Bengal)	97.3	107.5	315.8	123.0	Mondal et al. (2006)
Bandel (West Bengal)	126.9	106.3	321.8	136.3	Mondal et al. (2006)
NTPC, Dadri (Uttar Pradesh)	**118.6**	**147.3**	**352.0**	**158.4**	**Present study**

The data is given in bold as (i) This data is obtained from the present experiment (ii) This data is compared with the previous available data from India.

Radium Equivalent Activity for NTTPS fly ash is 404.7 Bq/Kg and the absorbed dose is 179.9 nGy/hr. These are the highest values compared to all the 18 TPPS data given in the table above.

Thank You


May 1958 – May 2015
Atmospheric CO2
May CO₂ | Year Over Year | Mauna Loa Observatory
Concentration of Atmospheric CO₂ (ppm)
410
400
390
380
370
360
350
340
330
320
310
400 400 400 400 400 400 400 400 400 400 400 400 400 400 400 400 400 400 400
May 2015 403.70
May 2014 401.88
May 2013 399.90
350 350 350 350 350 350 350 350 350 350 350 350 350 350 350
1955 1960 1965 1970 1975 1980 1985 1990 1995 2000 2005 2010 2015
CO2Now.org
Featuring Scripps data of June 4, 2015