

Q: What do you think air pollution (old or recent phenomena)?

ANS: before human being activities, there is natural source such as volcano ,however, the scale of the problem becomes more and is more recognized nowadays .

Pollution : is the release of physical ,biological, medical contaminant to the environment.

Kinds of pollution: air, water, soil, noise, light, visual pollution.

When we mention a reference area we said that in order to compare how bad is air sample we need a reference air

- Really it is difficult to come up with a clean reference air,, for example,, CFCs are not supposed to be ingredients in the air,, but now it's normal to have CFCs in any air sample.  
elements in the air: Nitrogen 78 Oxygen 20.6 and others e.g Argon, Neon, Lithium, krypton: 1.4
- When we are talking about air pollution and problem , we r talking about air in troposphere - were we live - and the layer above it it called stratosphere where the ozone is found
- Air pollutant are considered primary and secondary:  
Primary pollutant is released from its source i.e sulfur dioxide it comes from its source sulfur dioxide  
Secondary pollutant it not released from its source , It is the result between reaction of primary pollutant with atmosphere
- So we do have secondary pollutant that formed in the atmosphere as a result of release primary pollutant ,an example: ozone  
Does ozone a pollutant?  
Ans : it depends on where this ozone is , if it is in the right place in stratosphere it is good for protection , but if it is down - like in the troposphere - then considered pollutant.  
Photochemical reaction( was done to prove ozone is secondary pollutant )between oxidized nitrogen and VOCs - VOCs is abbreviation for ( volatile organic carbons) -  
Another atmospheric constitutes

we have families of air pollutant such as sulfur containing compound , hydrogen containing compound, and so on .....

So we group them as family and each one has certain characters,, and this is how we classify air pollutants chemically.

Another Classification: fires - e.g a major fire that happened in California US affected other continents in a large scale. And by this we figure out another way of classifying air pollutants,,

According to the effect we classify them to:

**limited effect: it affect small area**

**regional effect: e.g eruption of volcanoes in some areas and in summer time the wind affects many countries and the weather becomes dusty like in the Gulf areas, Sudan and Jordan. This causes a lot of problem like accidents and difficulty in vision.**

another classification looks in certain pollutants of importance and label them as criteria air pollutant.

according to EPA (environmental potential agency ) in united state , it is one of the major agencies in the world that work on the environmental pollution , it is a major reference from which people learn what to do about pollution, scientist in this agency take six major pollutant out of the total and thousand pollutant that can be founded in atmosphere and they call them criteria pollutant .

those six pollutants are monitored continuously in many sites of the united state(many cities and many places), really, it is not easy to monitored these six pollutant continuously, it needs a lot of resources and capabilities.

what they do with numbers coming from these pollutant?

Those numbers come from certain calculations, they put them in certain formula(equation) and this equation contains these concentrations of those materials and they come up with a figure (number) and this number is indicator of the situation of air pollution in a given area.

- For example If air pollution is 6 this is mean medium
  - So this is utilization of the information for the benefit of people for their health
- One of those pollutants is O<sub>3</sub> (bad down –good up)  
Ground ozone level is hazardous and it is a major constituent of photochemical smog, so O<sub>3</sub> is considered secondary pollutant.  
Ozone in stratosphere it absorbs some harmful U.V

### Sulfur dioxide

Why do we have to know their source?

In order to control it

Sulfur is one of the pollutant found in fossil fuel ( oil and coal)

Coal is a huge source of burning , in factories for example, Although in London as example ladies used to use it as source of energy in their houses for cooking and that's why in 1952 there was a major outbreak of pollution that killed thousands of people.

As example , the fuel that comes from Qatar is better than that come from Iraq because one way to classify it is the level of sulfur, the more sulfur is bad quality because it make more pollution and cheaper.

Sulfur from fuel so from where oxygen ?

From atmosphere for burning

So oxygen react with sulfur after burning , when start burning in cars , factories u start to have SO<sub>2</sub> coming as pollutant.

There are many natural sources for SO<sub>2</sub> for example marine planktons, bacteria, sea water and volcanoes eruption .

---

Major nitrogen containing compound NO<sub>x</sub>( more than compound\_result from reaction of nitrogen and oxygen NO , NO<sub>2</sub>, NO<sub>3</sub> N<sub>2</sub>O<sub>4</sub> .....

How come from where we have nitrogen oxide come to atmosphere?

First you don't need to have Nitrogen in the burning material In order to have nitrogen oxides,, The nitrogen and oxygen come from the atmosphere and the heat coming from the burning material is the one which makes the reaction between them occur, and without this the all oxygen and nitrogen in atmosphere will end up in the form of nitrogen oxide , so nitrogen oxide need **high heat** to be formed. And it depends on how high is this heat to produce NO or NO<sub>2</sub> or NO<sub>3</sub>,, ETC.

If nitrogen found in the burning material , its amount will become high , so we have a term biomass burning:

Biomass burning is worldwide problem and now is increasing by tag especially in poor areas when they are not capable for buying oil so they try to use remain of plant branches or remain of animals even excreta of animal as a source of burning

Such some people use ( الجفت ) or collecting excreta of animal for burning

So this is what we call biomass - coming from a biological source – which is used for cooking for example,, now when biomass burning happens the amount of nitrogen increases more than the normal burning because the burning material in biomass burning already contains nitrogen and this will lead to release of nitrogen( which will form nitrogen oxide) more than other material that don't contain nitrogen. So biomass burning is worse than normal.

So we have to source of nitrogen in biomass burning :

- 1- Atmosphere
- 2- Material
- 3- Rural and poor area , ladies and children have a major problem coming out of biomass because this biomass is burn inside the house , it is not always burned outside , so there is no good ventilation and those people are exposed to high concentrations of NO<sub>x</sub>

Natural sources : bacteria and lightening

Lightening usually in the upper atmosphere will change nitrogen oxide from NO TO NO<sub>2</sub> and the cycle will continue due to this reaction and a new other nitrogen oxide formation ( lightning gives energy for this process)

---

Carbon containing material ( CO AND CO<sub>2</sub>)

CO come from burning(at low temperature – incomplete compustion )

CO<sub>2</sub> ( when the heat is higher)

In the morning when the weather is called , CO will result engine of the car and when the engine heat up CO<sub>2</sub> will release . when there's a traffic jam and cars are not capable of moving CO results.

In the cigarette 4% of the smoke is CO.

There's a difference between CO coming from the main stream and from the side stream of the cigarette which is the burning heat.

Those pollutant, some of them might not give u warning signs such as ( bad taste or smell or color )

CO is colorless and odorless , so it might be in the house or work place without being noticed by people , so people might be died without knowing .

In the winter,, CO poisoning increases so if you are an emergency room specialist you you'll notice a lot of cases in which whole families are poisoned, that's because CO poisoning affects the brain and causes something called bad judgment or confusion, for example: when CO level is increased in the room at night and somebody wakes up and he's intoxicated, instead of removing the source of CO from the room he might close the window!!, he might think that he woke up because he's cold – bad judgment.

CO sometimes come from their source as primary and some time as secondary sources such as oxidation of methyl in atmosphere , but mainly CO is primary pollutant .

In some patient in room hospital , u might see mask on his face for oxygen ,also . u might see CO<sub>2</sub> , CO<sub>2</sub> is a treatment , if somebody's breathing stop this mean that breathing centre is not working and if u giving him oxygen at that time , the centre make him go more sleep , so we give it CO<sub>2</sub> in order to activate his breathing centre and return breathing( note this process should be done under control).

---

Hydrocarbon ( H + C+ other chemical )

One major source of VOCs IS FORESTS.

Gas stations also are a source of VOCs.

Methane (CH<sub>4</sub>) this material becoming more and more importance because it is one of the threatening pollutant to our planet .

It comes from RICE PADDY! in the far east in the place where there is rice.

Rice when we grow it you need to cover it with water and usually and the root of these paddies there might be bacteria growing there that release methane; so these paddies are producing more and more methane.

Cows and ruminating animals ( you give these animals food, they will eat it in few minutes, so there's no food. If you go and come back after 2,3 or 4 hours, you will find these animals chewing and this is due to the nature of the way they feed; they eat very quickly, food is sent to the first stomach and then to the second to third and to fourth and they go back to the first and then again all the way to the fourth, in this situation, these animals start to have methane bacteria that give huge amount of methane. So methane can come out of such animals .

Dumping large material containing organic matters can give you methane .  
fossil fuels combustion and evaporation of gasoline give methane.  
natural sources that give methane : decomposition of organic compounds by certain types of plants.