Community Sheet # 22

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last lecture we talked about classification of air pollutants and the sources, like man-made source, and this includes fixed or mobile subcategories.

In this lecture we will talk about the pollutants themselves

One way to classify them by the state of matter:

* solid: like dust (we have big amounts in Amman), Pollens and lead (which comes from cars and industry).
* liquid: like pesticides (when we spray them, there will be tiny liquid particles in the air), also the wind carry water particles from the oceans and seas and these contain salts and other particles might cause air pollution.

**\*** Acid rain is not an air pollutant, it's an outcome of air pollution.

* Gas: like CO, CO2, SO3 and NOx.

Air pollution is a big killer (however, it depends on the region, in Jordan we don't feel it, but in USA for example it's really affect the population), all in all it can kill people, in the developing countries 3 million people killed mostly from indoor air pollution.

Indoor air pollution comes from using different types of energy sources in closed places, we use these low quality energy sources and fuels (such as biomass and primitive kind of fules) for cooking and heating, and because we are in a confined area, then air pollution is formed and that's may kill people, in Jordan hundreds of people die every winter from (soppa), indoor pollution gains a lot of important nowadays.

**\***Indoor air pollution mainly referred to the houses.

The doctor mentioned that the number of people who get affected with alcohol air pollution annually has increased from 150000 to 350000 just in USA, which has a bad effect on the respiratory system like pneumonia, but doctors don't ask questions to find out why this increasing is happened and to determine the sources of the pollution (is it indoor or outdoor?).

Over 125000 Americans get cancer from diesel fuel, which has many uses such as for cars, heating purposes in houses, industry and in manufacturing or creating electricity (it's a cheap source of energy).

Heavy fuels are the remnants of the refinery after taking other components, it's much worse than diesel.

Another way to classify air pollutants is the chemical composition, organic and non organic air pollutants.

Organic pollutants contains (C,O and H atoms) like Methane and diesel.

Non organic pollutants like CO and CO2.

Air pollutants also classified according to its physiological effects or health impacts:

1. Asphyxia (suffocation): can be either simple or combined (chemical)

* Simple asphyxia: doesn't mean it's not dangerous, it's doesn't involve any chemical reaction, if something is heavier than O2 so Physically it will replace O2, for example CO2, which will accumulate in the breathing zone till we don't have air to breathe, then asphyxia will happen, and it might kill you, another example is CO, which compete with O2 in the blood, CO can make a bond 200 times stronger than O2 (if you are in a place where the concentration of CO is more than 1/200 of that of O2, then 50% of your blood becomes carboxyhemoglobin and if it increase a little bit you will die), which makes it very dangerous and kill in very low doses.

Other examples include Methane, Propane, Pentane and Nobel gases (Neon, Argon) they don't react they just replace.

* Combined (chemical) asphyxia: there's a chemical reaction.

1. Irritants: pollutants can irritate tissues like SO2, it affect the eye and upper respiratory tract, you will see tears and redness in the eye and start coughing if you are near a source of SO2, and this is good cause it considered as a warning signs.
2. Narcotic effect: we use some carbon compounds in operations to make the patient feel no pain, these pollutants have the same principle, the narcotic effect increases with increased carbon atoms in the compound, when you exposed to these compounds you'll feel dull, malaise and unable to do anything without any reason.
3. Cardiopulmonary effects: they affect the lung and heart but mainly the heart, the major example is CO, when you exposed to CO your tissues will be deprived from O2, then your heart start pump quickly to compensate and heart himself doesn't has enough amount of oxygen so it will be exhausted causing many heart problems, this happens when you continuously prone to CO.
4. Cancers: there're a good number of carcinogenic pollutants and gases, this number increases with time, lung cancer now is the number one cancer among males and almost females too, this is due to two reasons, smoking and air pollutants like benzoapirene, Arsenic and silica.

Air pollution has many impacts on environment, such as:

* Acid rain
* Affect the visibility
* Affect water quality leading to climate changes
* Affect the ozone layer causing ozone depletion
* The presence of air toxins in the atmosphere

Smog: it's a phenomenon happened when fog and smoke come together, London is one of the cities suffer from this phenomenon in the past.

The doctor said that thousands of people die from SO2, which accumulate in the breathing zone.

He viewed pictures of Los Angeles where haze completely interfere with visibility, in these pictures there's no air movement, after two days the they took a shot for same place and the haze was disappeared due to air movement.

Atmosphere divided into 4 layers:

1. Troposphere: where we live and the closest to the earth (up to 16 Km)
2. Stratosphere: it includes the ozone layer, which could be affected by (CFCs) Chloroflourocarbon gases.
3. Mesosphere
4. Ionosphere: the furthest from the earth.

We have the term standard air, although actually there's no standard air in real life, but we use it and has its own hypothetical formula by which we compare our air with the standard air, the main air components are (O2 and N2), other components includes (H, NO, Kr, methane, He, Ne and Xe), with time may new components enter our air, we have to measure all these components, if it reaches a certain degree then we can say that we have air pollution.

Eruption of a volcano can change the normal levels of air components, it also affect the visibility, and by releasing huge amounts of dust and ashes which can destroy houses, like what happen in Philippine before 6 to 7 years.

Air pollution isn't limited to a one area, it could distribute widely to other areas, for example a volcano erupt in Ireland in 2008, that stop the movement of airplanes in the whole Europe and was very close to reach our area.

We can classify air pollutants to:

Primary air pollutant: pollutants comes from their source as such, there's thousands of primary air pollutants including (CO2, SO2, NO2 and volatile organic compounds (VOC)), we calculate the concentration of the primary pollutants to come out with a figure to decide whether to warn people from going outside or not.

Secondary air pollutants: made by the reaction between primary air pollutants and the atmosphere, like ozone, it's a very bad pollutant and really affect your health if it's found in the breathing zone, unless we need it in the stratosphere (bad down and good up).

Usually the impact of air pollution on our health isn't obvious, we have to do certain studies to find out if there's an air pollution, however, when large number of people start to die then air pollution come to our attention, like what happened as we mentioned in London and in New York in 1963 and in many other places around the world.

There's two mechanisms which lead to reduce the effect of air pollution, first is the upward movement of the air pollution away from breathing zone when the pollutants are lighter than the air, the second mechanism is the sideways movement of the air.

So when the air stand still and don't move this will cause air pollution, another phenomenon leads to air pollution is atmospheric inversion (temperature inversion).

Normally when we go up in the atmosphere the temperature will decrease, but in some cases it starts to increase, then there's a layer of air acting like a blanket doesn't allow the air to go upward, also it doesn't moves sideways, then the pollutants can't get away and start to accumulate, this is the atmospheric inversion.

This phenomenon happened in Britain, with some aiding factors like the large buildings (prevents air from moving) and using large amounts of fuel for heating such as coal (mainly fossil coal which give high amount of heat but it's a very dirty source of energy), then SO2 accumulated in large amounts and killed people.

We said that SO2 causes irritation, but it could kill too, if there's solid particles in the atmosphere (like dust and ashes), SO2 will be adsorbed to the surfaces of these particles and when we breath it, it will reach the lung and being irritant to the deep tissues then damage the lung causing death.

In Amman, planners of the city are entitled with these problems, so they don't allow large vehicles to get inside the city during the day time, and they establish the green belt road, so these vehicles go around the city instead of getting inside.