3-RADIATION

3-1 UV-index

Depletion of stratospheric ozone has led to an increased exposure to ultraviolet-B (UV-B) radiation that in turn has affected the environment and human health. UV-B radiation is responsible for a wide range of potentially damaging human and animal health effects, particularly to the skin, eyes and the immune system.

Human exposure to UV-B depends upon the location, the duration and timing of outdoor activities and precautionary attire such as sunglasses, long-sleeved clothing , sunscreen lotions, etc. UV-B contributes to severe damage of the cornea, lens and retina of the human eye . Long exposures to UV-B radiation can result in photo keratitis or “snow-blindness”.

Lifetime cumulative exposures contribute to the risk of cataracts and other forms of ocular damage.

In addition, excessive exposure may have consequences ranging from premature ageing of the skin to skin cancer, which has become one of the most common types of cancer. Frequent and intense exposure to sunlight with sunburn, especially in infancy and childhood, encourages the formation of malignant melanoma . The number of new growths of malignant melanoma has doubled every 7 to 8 years over the past 40 years.

Nevertheless, ultraviolet rays also have positive properties.

They stimulate the formation of vitamin D3,which is important for formation of bones . A very low dose of ultraviolet rays is , however, sufficient for this and lies far below the threshold of sunburn.

It should be noted that, the UV flux received in countries situated near the equatorial zone is high and while the local population is better genetically adapted to the adverse effects of UV-B, often visitors from higher latitudes to these regions are exposed to high doses without getting adequate information and advice for protection, NMSs in such countries are encouraged to endeavor to provide information on the levels of expected UV radiation in their areas of responsibility for the protection of their own citizens as well as visitors.

**The UV index (UVI)**

Is a simple means of measuring the strength of ultraviolet rays that cause sunburn and is given as a daily maximum. The UVI was developed through an international effort by the World Health Organization (WHO), WMO, the United Nations Environment Programme (UNEP),the International Commission on Non- Ionizing Radiation Protection (ICNIRP) and the German Federal Office for Radiation Protection.

A booklet jointly prepared by these organizations entitled Global Solar UV Index, A Practical Guide contains valuable information about the scheme of reporting the UVI as well as sun protection messages and the Internet links of the organizations that report the UVI. Since its initial publication in 1995, several international meetings of experts have been convened with the aim to harmonize the reporting of UVI and to improve its use as an educational tool to promote sun protection. The index which is standard worldwide, takes cloud cover and the thickness of the ozone layer, which have a direct influence on the ultraviolet rays reaching the ground, into account. In central Europe the index has winter values of between 0 and 1 (low). In the summertime, the index values are in the range of 5 to 7 (high) in the northern, western and central Europe. Whereas, the values in the southern mainland Europe and islands such as the Canary Islands can be as high as 9 to 11 (very high to extreme).

However, it should be noted that very high values of 9 to 11 may also be found in high Alpine regions in Europe.

It is estimated that more than 71 000 new cases of skin cancers were diagnosed across Canada in 2 000 and over 800 people died from a particular kind of skin cancer known as melanoma. Skin cancers take a long time to develop – anywhere from 10 to 30 years – so early prevention is very important. In 1998,Environment Canada in partnership with Health Canada started the Children’s UV Index Sun

Awareness Program. The programmed teaches students under the age of 14 about the UV Index and how to use it to minimize the risk to their health from solar ultraviolet radiation.

3-2 WEATHER AND HEALTH ( BIO TROPY )

impact of weather, in particular of weather changes on human beings, resulting in deterioration in cardio-vascular and respiratory diseases , occurrence of blood clotting, aggravating inflammation and increased risks of occupational and traffic accidents. Other effects are subsumed under the term subjective impairment in wellbeing and include sleep disturbances, problems with concentration, headache and fatigue.

The human organism is obviously forced to respond to the weather-related stress called “biotropy”in order to remain homeostasis (in stable equilibrium). For weakened or impaired human beings the organism reacts insufficiently resulting in a so-called ARS (atmosphere related syndrome).

Several independent public opinion polls last year found out quite consistently that about 50 per cent of the population feels concerned about weather-related stress. Increased biotropy can be interpreted as an increased health risk.

With regards to biometeorology, turbulence is responsible for:

1. transferring heat, momentum and mass (water vapor, carbon dioxide, biogenic gases, pollutants) between the biosphere and the atmosphere and diffuses pollutants in the atmosphere.
2. imposing drag forces on plants, causing them to wave, bend and break.
3. mixing the air and diffusing air parcels with different properties, thereby forming spatial gradients.
4. gusts associated with turbulence place loads on the surface, which can erode soils and eject dust, spores and insect eggs into the atmosphere.
5. AIR QUALITY AND HEALTH

4-1 AIR QUALITY AND HEALTH

Air pollution comes from many different sources such as factories, power plants, automobiles and even from natural causes such as windblown dust, smoke from bush fires and volcanic eruptions. Air quality can be affected in many ways by the pollutants emitted from these sources. With the deterioration of air quality and a corresponding increase in health problems, many countries have started air quality monitoring programs, acid rain monitoring networks, ozone monitoring and even air quality forecasting.

Although the air quality monitoring activities may not be carried out by NMSs, nevertheless, weather plays an important part in the development, dispersion and transportation of particulates, ground-level ozone, pathogenic germs and gases. A few weather factors that will affect the changes in air quality include air temperature, amount of cloud cover, humidity ,pressure, wind speed and the presence of temperature inversion.

Air quality indices have been developed in many countries for reporting the levels of the various pollutants in the atmosphere. These indices make it easier for the public to understand the health significance of air pollution levels. Air quality can be measured by a nationwide or local monitoring system that records pollutant concentration at strategic locations throughout the country.

One example is an Air Quality Index (AQI) which ranges from 0 to 500. The higher the AQI value for a pollutant, the greater the danger. The AQI scale has been divided into distinct categories, each corresponding to a different level of health concern.

Table (1) shows the different categorization as prepared by the NWS of USA.

***Table 1—NWS Air Quality Scale***

***Ozone Concentration Air Quality Index Values Air Quality Descriptor***

***(ppm)***

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**0.0 to 0.064 0 to 50 Good**

**0.065 to 0.084 51 to 100 Moderate**

**0.085 to 0.104 101 to 150 Unhealthy for Sensitive Groups**

**0.105 to 0.124 151 to 200 Unhealthy**

**0.125 to 0.404 201 to 300 Very Unhealthy**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

Globally, the six principal pollutants that are monitored and analyzed are Carbon Monoxide, Lead, Nitrogen dioxide, Ozone, Particulate Matters and Sulphur dioxide. Toxic air pollutants also cause a wide range of effects from lung disease to birth defects and cancer. Table 2 indicates the source and possible health effects of the various pollutants