Families burning solid fuel, for example wood and coal, to heat their homes, to prepare food and provide lighting may be at risk from exposure to indoor air pollution.

What is ‘vulnerability’?

The characteristics of a person or group in terms of their capacity to anticipate, cope with, resist and recover from the impact of natural or man made hazards.

This is of particular concern for vulnerable communities living in low-income areas. In South Africa, about 3.20 million households (out of a total of 13.3 million) use solid fuels for heating and 2.3 million households use solid fuels for cooking.

Conditions Are Worse In Winter

In winter, more fires are lit for space heating purposes, in addition to those used for cooking purposes, which increases the amount of pollutants released into the atmosphere.

In addition to this, the dispersion of air pollutants is often worse in winter, particularly during night time, as a consequence of what is called inversion conditions.

What are inversion conditions?

Hot air rises and cool air sinks, but during the night in winter, the air near to the ground is colder than the air above it. This prevents the air from mixing and air pollutants which are emitted at the earth’s surface become trapped beneath the temperature inversion layer. The concentrations of pollutants therefore build up, evident as a brown smog layer adjacent to the earth’s surface on winter mornings.

Once the sun warms the earth’s surface and the air above it, the air can mix and the inversion layer and trapped pollutants disperse.
The Importance of Fuel Type

Different materials release different gases and particles, as well as different amounts of energy (as heat) upon combustion. It is important that the type of fuel which is burnt releases the most heat per kilogram of fuel, in other words, is energy efficient. This means that less fuel needs to be burnt to get the most heat, but also, less air pollutants are released. For example, dry wood burns more efficiently than wet wood.

For indoor combustion where people are nearby and ventilation may not be optimal, the type of gases and particles released are also very important when choosing a fuel type. Sometimes people, who do not have sufficient resources to purchase conventional fuels, i.e. coal or wood, resort to the burning of waste materials such as plastics. This practice should be avoided as some plastics, particularly PVC (polyvinylchloride), release very toxic substances into the air when burnt. Examples are polycyclic aromatic hydrocarbons (PAHs) and polychlorinated dibenzodioxins and furans, which are known to be carcinogenic (cancer-causing).

Health Risks

The health risks associated with exposure to air pollutants, such as particulate matter, include lung cancer, chronic obstructive pulmonary disease and respiratory infections. Breathing in polluted air may also exacerbate the symptoms for tuberculosis. Often women attend to indoor fires and therefore are most exposed to air pollutants.

Surprisingly, an alternative method to using solid fuel for heating, cooking and lighting is using electricity. Generally, electricity is produced in clean power plants under stringent pollution control procedures. Also, there are no emissions at the point of use, in other words, in homes where people may be exposed.

The “Basa njengo Magogo” method

The “Basa njengo Magogo” (BnM) is a government-supported method for lighting a fire. Less smoke is produced using the Basa Njengo Magogo method, which also uses less coal. In a reversal of the traditional way of making a fire in a brazier, which produces large amounts of smoke, here coal is placed at the bottom of the brazier. Paper and a few sticks of kindling are added on top of the coal and the fire is lit. Once the wood is burning, a handful of coal is placed on the fire.

In 2004, the BnM technique was tested and compared with other methods under controlled laboratory conditions at the CSIR and it was found that total particulate emissions from using this technique were up to 27% less than from the bottom-up fires, while it boiled water the quickest and less solid fuel was used in terms of weight. However, no size characterisation tests were performed on the emissions. Exciting plans in preparation include a study to assess the potential nanotoxicity health risks from burning solid fuel.

Practical Solutions and Alternatives

Here are some practical solutions and alternatives for communities, especially vulnerable communities, to help improve the air they breathe:

• When possible, cook outdoors.
• Use the “Basa njengo Magogo” method of making a fire.
• Use electricity, sparingly.
• Do not burn plastics.
• Use a chimney which is taller than the roof of the house to remove smoke and gases from indoor fires. Close and seal windows and doors as best as possible to prevent loss of heat.
• Clean pots and food grids to prevent build up of charred food.
• Open windows during the day to allow fresh air to enter the home.