

# Environmental Hazards in Thailand\*

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**Living in or visiting to Thailand inevitably encounter potentially harmful environments varying in different parts of the country, especially between those in urban and rural areas.**

The term '*Environment*'\*\* denotes :

- a surrounding or being surrounded,
- something that surrounds; surroundings,
- all the conditions, circumstances, and in-

fluences surrounding, and affecting the development of, an organism or group of organisms; often contrasted with *heredity*.

**Thailand** is in a strict sense a largely rural developing country. Harmful environments exist in certain areas. The nature of these environmental hazards varies in different parts of the country; the difference is especially pronounced between those in urban areas and rural areas *per se*, or due to modernization (civilization) to some extent.

The potentially hazardous environments include polluted air, water and soil; high altitudes; natural catastrophes; toxigenic plants, including marine creatures and insects; and lastly man-made adverse environments.

## Air Pollution

In Thailand, there are differences in air quality between *urban* and *rural* areas with regard to the type and extent of the contaminants from various sources.

*Outdoor air* in *urban areas* is polluted with smog caused mostly by vehicular traffic, while in *rural areas* the air contains mainly a variety of plant pollens, fungal spores, soil dust and in some places fog-like smoke from wildfires.

With regard to *indoor air*, in *urban areas* with mainly relatively closed-type buildings, the air is polluted with chemical compounds released from interior decorations together with all sorts of collections, and with natural soil gas (radioactive radon) that leaks in from underneath the floors, supplemented by microbial contaminants discharged from mechanical ventilators and humidifiers, and in many cases enhanced by poor sanitation.

In *rural areas*, the majority of houses in Thailand are the open type, built on high footings, thus providing effective natural ventilation both indoors and out of doors under the floor, and have fewer interior sources of toxic chemicals and pathogenic microorganisms. Nonetheless, despite contamination with relatively small amounts of toxic chemical compounds from engine sources in *rural areas*, the hazards from increasing industrialization in rural towns, such as electricity-generating plants, quarries and other factories, have begun to produce ill effects, such as the problem of chemical aerosols and acid rain produced by the lignite-power plant in Mae Moh district and the health impacts from quarries. And, the fog-like smoke of particulate matter during forest fire episodes in some provinces has been shown to result in mutagenicity and adverse health impacts.

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\*\*Webster's New World Dictionary of the American Language, College Edition. Cleveland & New York: The World Publishing Co.; 1959. p.486.

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The natural soil gas, **radon**, another indoor air contaminant is claimed to be a potential cause of lung cancer. It has been advocated strongly by international authorities and by reports from international as well as local researchers that indoor radon is another important cause of lung cancer, second only to cigarette smoking. A report from a group of Thai investigators suggested that **indoor radon** might have been the cause of the high prevalence of lung cancer in a northern province.

### Water Pollution

The term *water pollution* usually refers to the condition of drinking-water sources for public water system, commercially bottled and vended water, surface water and ground water (which includes wells, ponds, pools, streams, springs, rivers and seas), and sometimes the water for specific uses (such as water used in cooling towers) containing toxic chemicals or pathogenic microorganisms that exceed maximum contaminant levels (MCL).

The vulnerability of ground water to chemical contamination with pesticides that mainly occurs in agricultural areas and organic chemicals mainly in industrialized areas, are the result of human practices. Contaminants also include naturally occurring substances such as arsenic, asbestos, selenium and radionuclides such as radium, radon and uranium.

The presence of certain microorganisms, especially the typhoid bacillus, in commercially bottled drinking water and vended ice-cubes has been reported. Asbestos from asbestos-cement pipe has also been a concern.

Natural ponds, swamps and hot springs are sources of pathogenic organisms, including *Schistosoma mekongi* in border towns along the Mekong River, *Burkholderia pseudomallei* and *Leptospira interrogans* in northeastern provinces, and *Legionella* organisms and free-living amoebae (*Naegleria* and *Acanthameba*) in ubiquitous natural water sources.

### Soil Pollution

Soil pollution is a condition when the soils in particular areas become enriched with naturally inhabiting pathogenic organisms as well as toxic chemicals which enter the soil directly from dumping or the pumping of wastes or as runoff, or by airborne deposition (fallout) of particulate matter; in certain areas, the soil is radium or uranium-rich, thus potentially emitting radioactive radon gas into the ambient air.

Health hazards occur by: (1) direct contact with particular pathogenic organisms, natives of the soil, namely: *Burkholderia pseudomallei* (causative organism of melioidosis), *Ancylostoma duodenale* and *Necator americanus* (causative parasites of hookworm disease), and *Leptospira interrogans* (causative organism of leptospirosis);

(2) toxic chemicals (which enter the soil as previously described) can be taken up by plants or ingested directly by animals, including man; and (3) exposure to indoor radon, the natural radioactive soil gas; an important cause of lung cancer world-wide.

### High Altitudes

At high terrestrial altitudes, the atmospheric pressure is lower and so the oxygen partial pressure ( $P_{O_2}$ ), resulting in a loss of head pressure driving oxygen from the alveoli ( $P_{A_{O_2}}$ ) to the blood, causes a fall of arterial oxygen pressure with the consequence being the so-called **altitude hypoxia** which manifested by loss of night vision, impairment of the ability. To learn complex and then simple tasks, a deterioration in the performances of already-learned skills, a progressive loss of muscular power, and eventually loss of consciousness, convulsions and death.

Acute pulmonary edema could occur in individuals who have an exaggerated pulmonary arterial pressure response to hypoxia and who develop pulmonary hypertension at high altitude.

### Natural Catastrophies

**Torrential rain** and **mudslides** from mountains could be dangerous to residents and tourists.

Many natural phenomena in coastal areas such as **rib current** and **tidal current** can endanger persons not familiar with the area. **Wind waves**, which are under the influence of monsoon winds of seasonal character, are also a major cause of danger for marine tourism. Thailand also from time to time suffers the effects of **tropical cyclones**, such as storm surges causing devastating catastrophic events.

On December 26, 2004 came the **tsunami** along the coast of several countries in Asia (including Thailand) and Africa and caused a great loss of life and it left many illnesses in its wake.

### Toxigenic Plants

In Thailand, there are a variety of plants prevalent in some rural areas or another that could cause some ill effects (marked irritation, pain and severe reactions)

upon contact, consumption or inhalation. There are also some inedible **poisonous mushrooms**, which cause severe illness or even death if consumed.

The poisonous mushroom has four subtypes according to their toxin: (1) the cytotoxic comprises three groups (cyclopeptide, orellanin and jyromitricin); (2) neurotoxic type (muscimol and ibotenic acid, indol and muscarine); (3) those with disulfiram-like action; and (4) enterotoxic type.

### Dangerous Wild Animals

Wild animals encompass all kinds of creatures naturally living in the forests and water sources of Thailand. Some wild animals are a danger to people's health if their habitat is approached. Examples of wild animals include venomous snakes, poisonous marine creature and insects.

**Venomous snakes** are classified by toxicity to the nervous system, muscular system, and hematologic system as well as mild toxicity. Their habitat is rather specific in different parts of the country.

**Poisonous marine creatures** include: (1) venomous animals, i.e., sea anemones, jelly fish, sea sponge, sea feather, corals, fire worms, cone shells, sea urchins, rays, electric ray, catfish, lion fish, stone fish; they inject venom by biting, piercing or stinging; (2) poisonous animals, i.e., crabs, puffer fish, horseshoe crabs, bivalve shells in certain seasons and areas; poisoning develops when a person consumes them; (3) dangerous animals causing lacerations and extremely painful or fatal wounds are cone shells, corals, cephalopods, crown-of-thorns sea star, sea urchins, rays, electric ray, rock barnacles, catfish, lion fish, sharks, Morley eels, puffer fish, and sea snakes.

**Insects:** There are more than one million species of insects in Thailand, among which are a large number of harmful species (approx. 99%).

The harmful insects, or human rivals, include: (1) *cockroaches*, which contaminate food with dirt and pathogenic organisms, their whole body and the cast off skin are important allergens in allergic rhinitis and bronchial asthma; (2) *mosquitoes*, which are human blood suckers, annoyers and painful biters, and vectors of malaria, encephalitis, dengue fever, filariasis, etc.; (3) *house flies* and *blow flies or green bottle flies* are vectors of many pathogenic organisms; (4) *eye flies or eye gnats* are vectors of red-eye disease, yaws and mastitis; (5) *horse flies* are vectors of anthrax and foot and mouth disease; (6) *deer fly* is vector of filariasis, loa loa and anthrax; (7) *bed bugs* are human ectopara-

sites and vectors of leprosy, relapsing fever, oriental sore, Q-fever and brucellosis; (8) *fleas* are vectors of plague; chigoe flea feeds on human blood; (9) *lice*, the sucker, comprise three important kinds: human head louse, pubic or crab louse and body louse; (10) *venomous arthropods* (i.e., bees, wasps, yellow jacket, and hornets) : besides producing painful stings and pruritus local skin lesions, hornet venom may cause acute tubular or cortical necrosis due to a direct nephrotoxic effect in some cases; (11) *bombardier beetles* release quinine toxin as a fog through the anus against enemies and produce a loud crepitation; upon contact, the toxin may produce pain and burns on human skin, and in the eyes it can cause temporary or permanent blindness.

Besides the insects mentioned above, there are animals which are related to insects, e.g., ticks and mites which are vectors as well as the cause of diseases.

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**บทคัดย่อ :** สิ่งแวดล้อมอันตรายในประเทศไทย

สมชัย บวรกิตติ

สำนักวิทยาศาสตร์ ราชบัณฑิตยสถาน กรุงเทพฯ ๑๐๓๐๐

ประเทศไทยเป็นประเทศกำลังพัฒนา สภาพแวดล้อมในพื้นที่เขตเมืองกับพื้นที่ชนบทแยกกันได้ค่อนข้างชัดเจน. บทความนี้บรรยายปัจจัยเสี่ยงสุขภาพผู้อยู่อาศัย หรือผู้เข้าไปเยือนที่ต้องสัมผัสมลพิษทางอากาศ ทางน้ำ ดิน และพื้นที่ระดับสูงมาก, มหันตภัยธรรมชาติ, สัตว์อันตราย และสิ่งแวดล้อมที่เกิดจากน้ำมือมนุษย์.

**คำสำคัญ :** สิ่งแวดล้อม, ปัจจัยเสี่ยงสุขภาพ, เขตเมือง, ชนบท, ประเทศไทย