Types of water pollution: point source and non-point source

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Abstract. Water is an important element to human life, this is why around water sources human settlements have been built which led to the development of these specific areas. One person needs a minimum of 5 L water per day, out of which 1.5-2 L are consumed as know and the rest is being retained from food (Ghidra 2004). Due to this water pollution has a negative impact on human and animal health and it also affects the surrounding environment. Water pollution means changes on its natural qualities and the inclusion of foreign elements, resulted from a series of natural and artificial phenomena, making it unsuitable for the previously mentioned aims. Water pollution can be natural or artificial and it can have permanent, irregular or accidental effects.
Key words: point source, non-point source, pollution, effects, prevention.

Rezumat. Apa este un element important pentru viaţă, de aceea în jurul surselor de apă s-au construit aşezăminte umane care au dus la dezvoltarea acestor arii specifice. O persoană are nevoie de minimum 5 L de apă pe zi, din care 1,5-2 L se consumă ca atare şi restul este reţinut din mâncare (Ghidra 2004). Tocmai de aceea poluare apei are un impact negativ asupra sănătăţii omului şi animalelor şi afectează şi mediul înconjurător. Poluarea apei înseamnă modificarea calităţilor sale naturale şi incluziunea unor elemente străine, rezultate dintr-o serie de fenomene naturale şi artificiale, făcând-o nepotrivită pentru scopurile menţionate anterior. Poluarea apei poate fi naturală sau artificială şi poate avea efecte permanente, neregulate sau accidentale.
Cuvinte cheie: sursă punctiformă, sursă nepunctiformă, poluare, efecte, prevenţie.

Inbegriff. Wasser ist ein wichtiges Element für das menschliche Leben, darum wurden um Wasserquellen Siedlungen gebaut die zu der Entwicklung dieser Flächen geführt hat. Eine Person braucht minimum 5 L Wasser pro Tag, von denen werden 1.5-2 L so wie genannt verbraucht und der Rest wird vom Essen entnommen (Ghidra 2004). Deswegen hat die Wasserverschmutzung einen negativen Impakt auf die Gesundheit der Menschen und Tiere und es betrifft auch die Umwelt. Die Wasserverschmutzung bedeutet Änderungen der natürlichen Qualitäten des Wassers und die Einwicklung von fremden Elementen, die das Ergebnis von natürlichen und künstlichen Phänomenen sind, die es ungeeignet für die vorher erwähnten Zwecke machen. Die Wasserverschmutzung kann natürlich oder künstlich sein und es kann dauerhafte, unregelmässige oder zufällige Wirkungen haben.
Schlüssel-Wörter: Punkt-Quelle, Non-Punkt Quelle, Verschmutzung, Wirkungen, Prävention.

Introduction. Water is a resource that has many uses, including recreational, transportation, hydroelectric power, agricultural, domestic, industrial and commercial. Water is an important element for life, individuals and society because it is a source of energy and is responsible for all productive activities that surround us.

Water also supports all forms of life and affects our health, lifestyle and economic well being. As individuals, we use water for sanitation, drinking and many other needs, and we pay for the public water utilities that provide us.

Although water flows from our faucets throughout the day, we often take the amount of fresh water available on Earth for granted, even though it is the dominant factor in maintaining the ecological balance and its substitution could not be possible, because it assures viability to the surrounding environment.

Water Status on Earth. Although more than three quarters of the Earth's surface is made out of water, only 2.8 percent of the Earth's water is available for human consumption. The other 97.2 percent is in the oceans and it is too salty to use it for most purposes and salt is very costly to be removed (Tables 1-2, Figs 1-2).

Most of the Earth's fresh water is frozen in polar ice caps, icebergs and glaciers.

Table 1

Earth's total water supply

Oceans (saltwater)	97.2%
Fresh water	2.8%

Table 2

Earth's fresh water supply

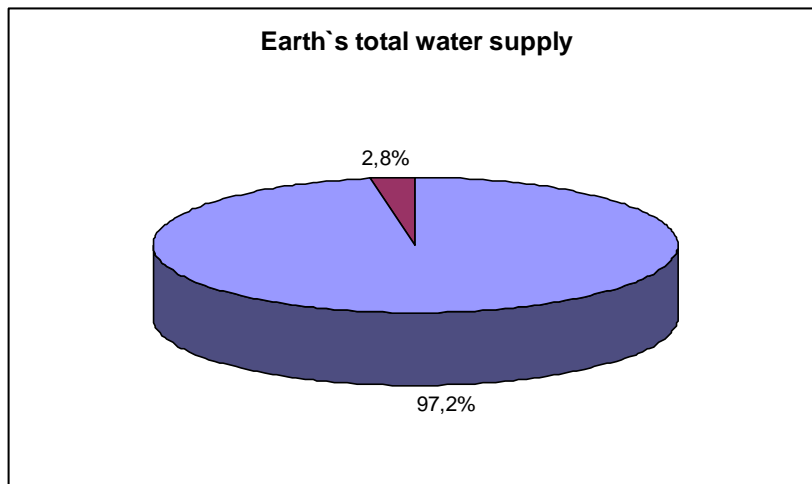|	
Ice caps and glaciers	82.1%
Groundwater (aquifers[*])	14.3%
Surface water (lakes, rivers and streams)	2.4%
Air and soil	1.2%

Figure 1. Earth's total water supply.

Water Pollution. Water pollution is any human-caused contamination of water that reduces its usefulness to humans and other organisms in nature (http://www.epa.gov).

Improper land and water use in urban and rural areas has led to a decline in the health of our watersheds and water quality.

When our water supply is contaminated, it is a threat to human, animal, plant and tree health unless it goes through a costly purification procedure (Bunnag et al 2010).

Pollutants such as herbicides, pesticides, fertilizers and hazardous chemicals can make their way into our water supply (Fleșeriu 2010; Smical et al 2010ab).

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[*] An aquifer is any geological formation containing water (Petrescu-Mag et al 2009), especially one that supplies water for wells and springs. It is like an underground river.

Earth`s fresh water supply

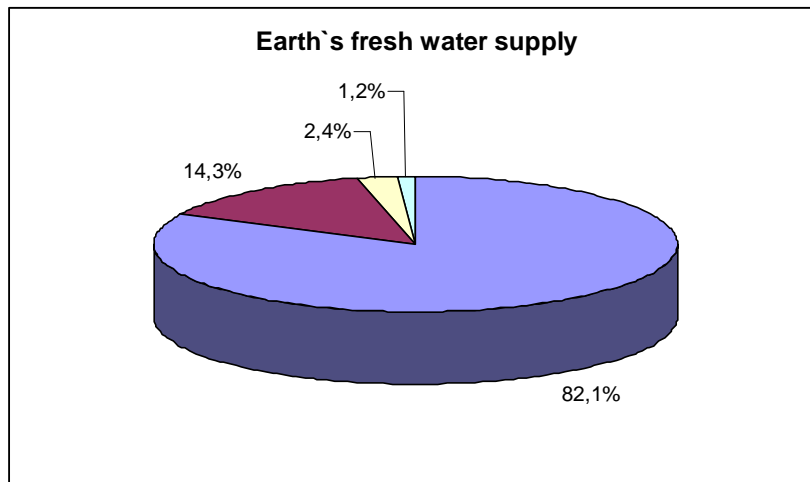14,3%
2,4%
1,2%
82,1%

Figure 2. Earth's fresh water supply.

Industrial impacts on water can be severe when toxic chemicals are dumped or accidentally spilled into waterways. This type of pollution is being called *point source pollution* (Oroian & Viman 2010). Industries must have special permits to discharge waste materials into waterways, usually having to first treat the waterways. Severe fines and penalties may result from non-compliance.

Point source pollution has the following effects on ecosystems:
- Pollutants can come from a specific source such as a pipe that discharges used water or other materials from a factory into a water body. Such discharges can be harmful to the aquatic ecosystems and can affect the forest tree species surrounding the body of water;
- Pollutants can also come from large areas such as agricultural fields that have been covered with fertilizers or pesticides. Fertilizer and pesticide residues can run off or wash into streams and rivers or seep into soil, contaminating underlying groundwater and at the surface it can also reach trees (http://www.tropical-rainforest-animals.com);
- Pollutants can contaminate our drinking water sources, reduce oxygen levels which can kill fish and other wildlife, accumulate in the tissues of fish we catch and eat from lakes and reduce the beauty of the water and even extend to the surrounding environment causing damages to forest tree species around lakes.

Non-point source pollution is a much bigger problem. It occurs when rainfall, snowfall, or irrigation runs over land or through the ground and picks up pollutants and deposits them in bodies of water. Toxic construction materials like paint, solvents, acids, and glues, can also pollute water (http://www.dmww.com).

In urban areas, rainwater that lands on non-permeable streets, sidewalks, and parking lots creates runoff, carrying pollutants into streams. Lawn and garden chemicals like herbicides, insecticides, and fertilizers can seep into groundwater or end up in waterways. Toxic solvents, paints, oils, and cleaners often get poured down the drain rather than being disposed properly. Salt used on icy streets is also a serious pollutant.

Agriculture often has great effects on water quality. Chemicals like herbicides, insecticides, and fertilizers, particularly when more is applied than is needed, can run off into waterways or seep into groundwater.

Non-point source pollution, also called natural pollution has a larger impact than artificial pollution or point source pollution. It has an impact on water sources like surface waters and underground waters and it can be irregular or accidental.

Rivers are being polluted in three stages, out of which two take place in the atmosphere and a third one is due to its falling on ground.

The three water pollution stages are:
1. condensation;
2. rainfall;
3. waste water or residual water.

The degree of urban and industrial development determines the level of artificial pollution or point source pollution. The sources of artificial pollution are domestic, industrial and farm stocking residues. Artificial pollution can be classified after its:
1. way of emitting pollutants;
2. nature.

The way of emitting pollutants can be permanent or accidental and classified after its nature pollution can be physical, chemical and biological.

Livestock manure can also be washed into waterways, particularly when animals have direct access to the water. Improper managed manure, especially on large livestock farms, can lead to increased amounts of bacteria in the water.

Point source and non-point source pollution cause serious problems:
- photosynthesis in aquatic plants may be disrupted affecting ecosystems that depend on these plants;
- terrestrial and aquatic plants and trees may absorb pollutants from water;
- plants and trees may be killed by mud from construction sites and clay;
- plants and trees may be killed by herbicides in water and these are chemicals which are most harmful to plants and forest tree species.

Regulation of pollution that runs off the land with rainfall is much more difficult to overcome than regulation of pollution that comes from an identifiable pipe outlet. Non-point sources of water pollution are typically difficult to identify and to monitor, but there is an increasing interest in methods for controlling non-point sources of water pollution and this is made through planning, cost-share mechanisms, voluntary best management practices and other approaches.

Conclusions. As the world`s population increases, water consumption increases. Preventing water pollution and conserving water are important to assure a continuing abundance of water that is safe to use for ourselves and future generations.

Pollution can be prevented using the following prevention strategies:
- plant forest trees, shrubs and grass to hold soil in place (Malschi et al 2009);
- the use of fertilizers, herbicides and insecticides sparingly. Perform soil tests to determine the correct amounts needed;
- dispose of hazardous chemicals correctly;
- limit impermeable surfaces in the landscape and use more permeable surfaces like wood decks and bricks;
- farmers can use effective conservation practices like building terraces on slopes, planting grass waterways and creating wetlands to slow down pollutants, particularly in areas close to waterways;
- avoid storing chemicals outdoors or provide a cover to keep rain water from contacting them;
- farmers can keep livestock out of waterways and manage manure;
- the use of non-chemical de-icers like sand and ash on pavement (http://www.dmww.com).

It is hard to imagine that people can make a difference in protecting and conserving fresh water supplies on this planet, but each individual can really help the environment.

Pollution can be prevented only if communities are being educated about the effects of dumping waste such as chemicals into waterways and by encouraging individuals to practice water conservation (Petrescu 2008).

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