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TASKS, ASPECTS AND BASIC PRINCIPLES OF ENVIRONMENTAL PROTECTION IN WATER UTILITIES IN MILITARY CAMPS

Absztrakt/Abstract

Az ivóvízzel való takarékoskodás fontos feladat a Földön, mert a népesség és a vízigények növekedése mellett a vízkészletek egyre korlátozottabban állnak rendelkezésre. Dolgozatomban azokkal a lehetőségekkel és megoldásokkal foglalkozom, amelyek a vízellátást és a csatornázást biztosítják katonai táborokban. Publikációmban azokkal a lehetőségekkel és megoldásokkal foglalkozom, amelyek a szennyvizek tisztítás utáni újrafelhasználását biztosítják katonai táborokban.

Owing to challenges represented by a rapidly growing population and aqua stocks continually decreasing, economizing on drinking water has become an important worldwide task. My essay is meant to highlight the possibilities and solutions that may enable military camps to water supply and canalisation. Economizing on drinking-water is important task on the Earth, because the population's is growing and the aqua stocks are continually decrease. I analysing in my essay that possibilities and solving, which make waste water recycling possible in military camps.

Kulcsszavak/Keywords: *Víztakarékosság, vízellátás, csatornázás, szennyvíz újrafelhasználása, katonai tábor ~ economizing on drinking-water, water supply, sewage system, recycling water, military camp*

INTRODUCTION

Man has been interfering in the natural environment more and more aggressively and to a greater and greater extent. While doing so, however, the limits of Nature's potential for self-renewal have often been ignored, which means our environment is rather abused than put to good use. By now, pollution caused by industry, agriculture and urbanization has generated irreversible changes in the atmosphere, the hydrosphere and the geosphere, respectively. As a result of human interference, the natural water cycle as well as the characteristic features (either in terms of quality or quantity) of the various forms of water have been modified or changed.

The drinking water supply of our planet tends to be more and more valuable, which means the protection of water resources is to be regarded as a long-term task of high priority. The present paper is on the characteristic features of Hungary's water supplies and the possible ways of their defence.

The effects of development

In terms of life, water is one of the most important substances. Apart from the hydrosphere, it can be found in the atmosphere and the lithosphere, too. Owing to its chemical, physical and biological properties, it is indispensable to life as well as social and economic activities. It is also the most often used compound.

With social, industrial and agricultural development, demand for water has been continuously increasing. However, the amount of available water has not grown and, to make things worse, water quality has definitely suffered. As a result protecting the environment and making water suitable for human consumption tend to be a crucial but rather costly task these days.

Water in nature

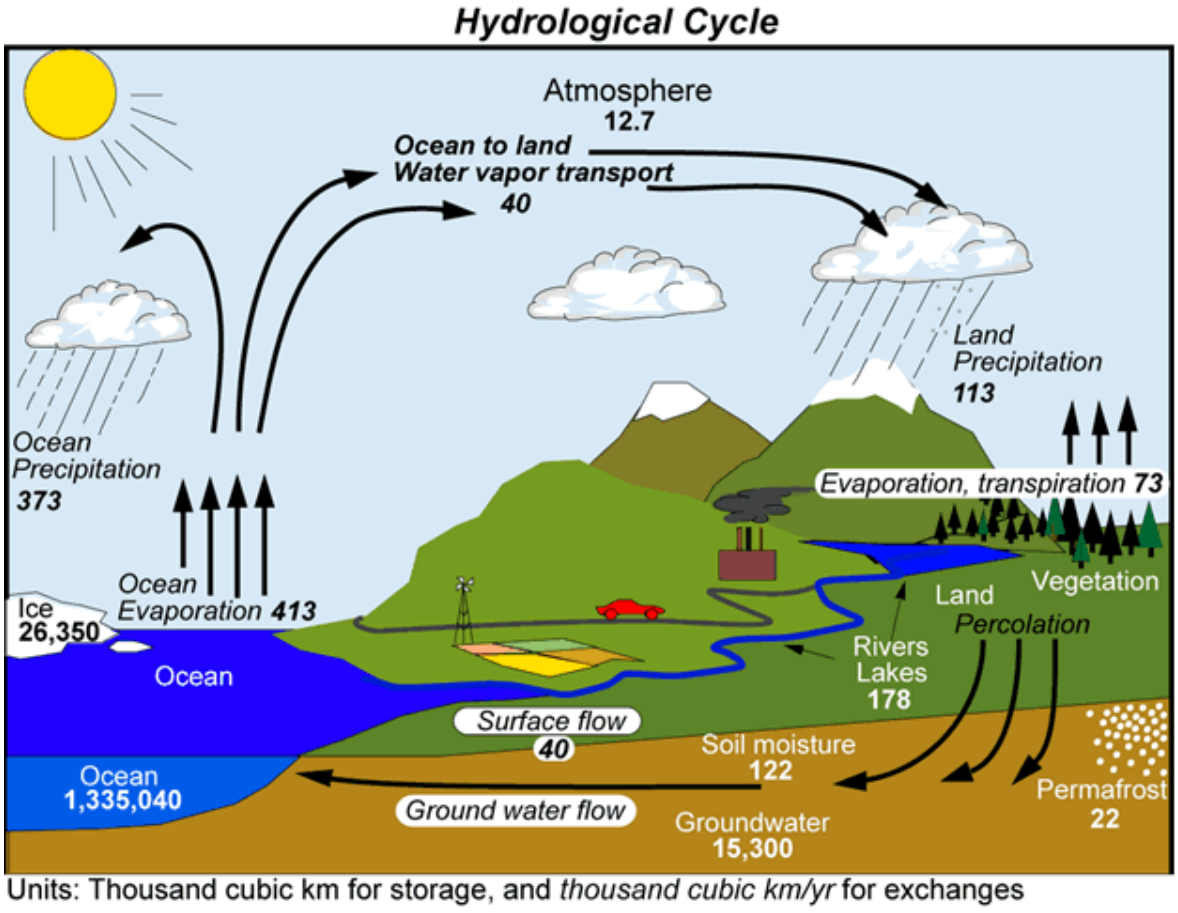

Figure No.1. Hydrological cycle[1]

Water in nature is meant to be water in its typical forms in the atmosphere, the hydrosphere and the lithosphere.

[1] from: http://waterdropblog.files.wordpress.com/2008/06/01_hydrologicalcycle.gif 2011.01.26.

Water in the hydrosphere can be found in the form of vapour, which is the most important element of the water cycle and, at the same time, it is a way of water purification. Evaporation can be specified by the amounts of water varying in space and time as well as its impact on macro- and micro-climate, its influence on useable water supplies and its purifying effect.

Some of the precipitation becomes surface water while the rest turns into subterranean. Water on the surface can be found in natural or artificial lakes or rivers of various lengths and discharge.

As far as subterranean water is concerned, compared to the surface waters of lands, the amount of water held by the water-bearing bed is bigger. It is less mobile with slower reproduction. It is normally water above the first impermeable formation that contains living creatures, most of them being pathogenic micro organisms. The temperature of subterranean water from great depth is high with a considerable amount of dissolved minerals and gases, which enables them to be made use of as mineral, thermal or medicinal water.

As a result of the recent changes in security-related geopolitical conditions as well as the current challenges, the Hungarian defence forces arc faced with new requirements. While the possibility of warlike conflicts tends to be decreasing, addressing natural disasters and terrorism as well as peacekeeping activity in accordance with alliance-based requirements have gained momentum.

The above-mentioned tasks are typically performed from temporary military camps - rather than using permanent army posts. Securing the necessary water supply and a healthy environment is a crucial part of stationing military establishments and keeping up their effectiveness. Successful military manoeuvres and the readiness of troops require drinking water as well as water for other purposes - both in sufficient quality and quantity. An epidemic brought about by infected water is regarded as the most devastating weapon, even suitable for making the whole military personnel, for considerable time, unfit for fighting.

Figure No. 2. Military camp[2]

[2] from: http://www.nato.int/shape/graphics/2006/sfjg06/0620/b060620h.jpg 2011. 01. 26.

FEATURES OF WATER SUPPLIES

Surface water:

- frequent changes in quality – as for some component, periodically
- unexpected pollution of quick development and pass-off may happen
- constantly changing temperature

Subterranean water:

- permanent, slowly changing quality
- constant temperature
- several years' usage may change quality

Water from precipitation/rain water

WATER POLLUTION

Water contaminators:

- pathogenic factors (bacteria, viruses, protozoas, parasites);
- waste decreasing the amount of oxygen dissolved in the water
- (household sewage water, manure and other biologically decomposing organic substances);
- inorganic soluble substances (acids, toxic heavy metals and their compounds);
- inorganic fertilizers (nitrates and phosphates);
- organic compounds (oils dissolvable or insoluble in water, oil derivatives, pesticides, detergents, etc.);
- silt or suspended substances
- (insoluble grains of soil and other organic or inorganic substances);
- radioactive matter;
- heat;

Possibilities of protecting water supplies

Parts of the system designed to ensure quality of water:inner protecting area;

- outer protecting area;
- area of hydrological protection;

The pollution of water supplies means effects changing the quality of surface and subterranean water to such an extent that its suitability for life and human usage decreases or ceases to exist.

Regarding the origin of contaminating substances, water pollution can happen in two ways. It can be:

- point sources:
  (such as discharges from urban wastewater, industry and fish farms;) [1]
- diffuse sources:
  such as background losses (e.g. forests), losses from agriculture, losses from scattered dwellings and atmospheric deposition on water bodies (e.g. marine areas or lakes). [2]

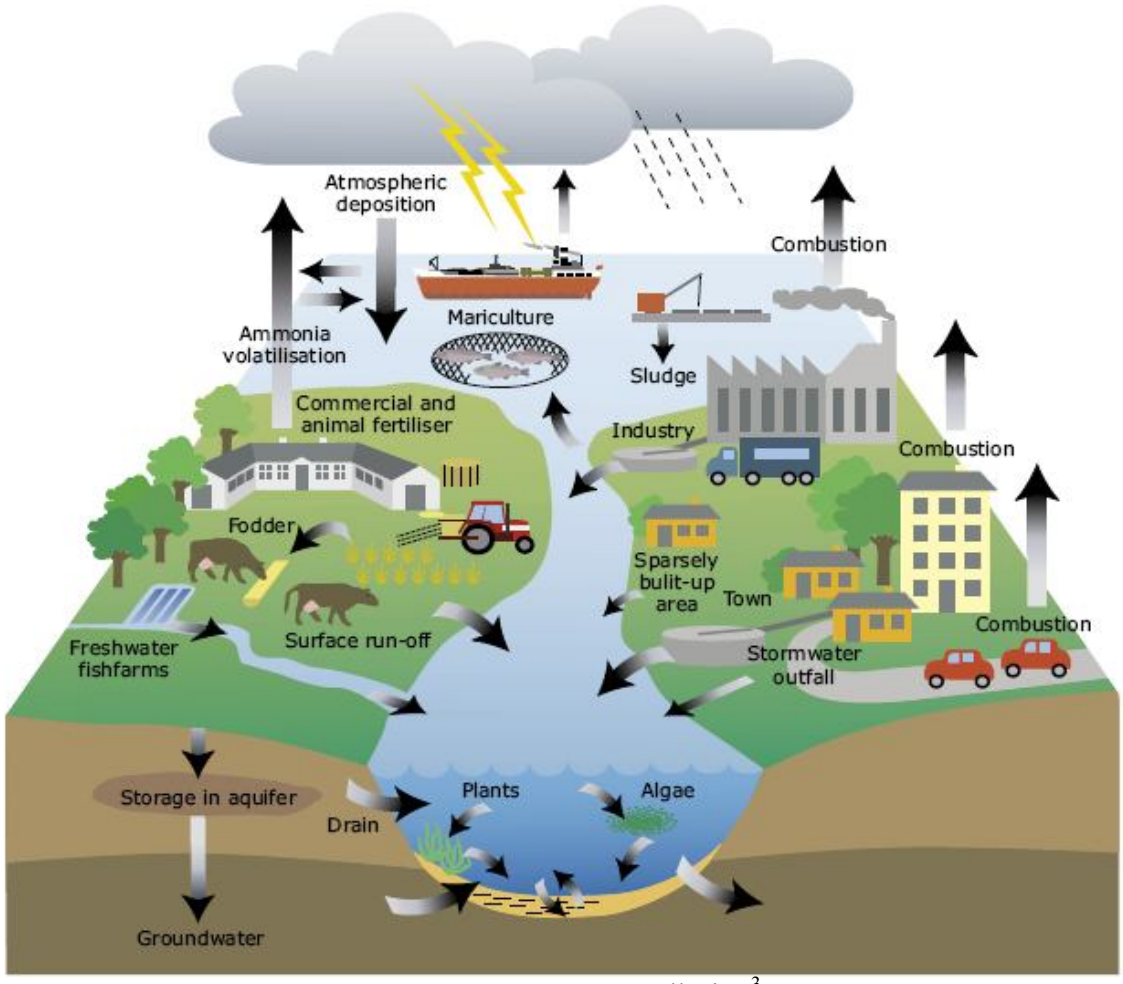

Figure No. 3. Water pollution[3]

Point-like pollution gets from its source into surface or underground waters through pipelines or open canals. This is what happens when sewage water leaves a factory or when oil leaks from a damaged pipeline.
When, for instance, chemical fertilizers are washed out of the soil into a lake by a heavy shower or, due to precipitation, toxins from waste yards get underground, *diffused pollution* i.e. extensive contamination takes place.

Both surface and subterranean waters may get contaminated. Emission is the first stage of pollution followed by transmission of various extents. Depending on rate and extension, pollution can be:

- local;
- fluvial (affecting the catchments area);
- regional;
- continental;

A special kind of pollution called havaria occurs when local and serious pollution results from an accident, an unforeseen technical failure or negligence.

Although the safe handling of sewage and the protection of the environment arc considered as of equal importance, even at present it is common practice in the Hungarian

[3] from: http://www.eea.europa.eu/themes/water/water-pollution/figures-and-maps/sources-of-pollution/image_view_fullscreen 2011.01.26.

defence forces to deem them to be independent of each other. My research aims to handle the two sides of the issue as inseparable.

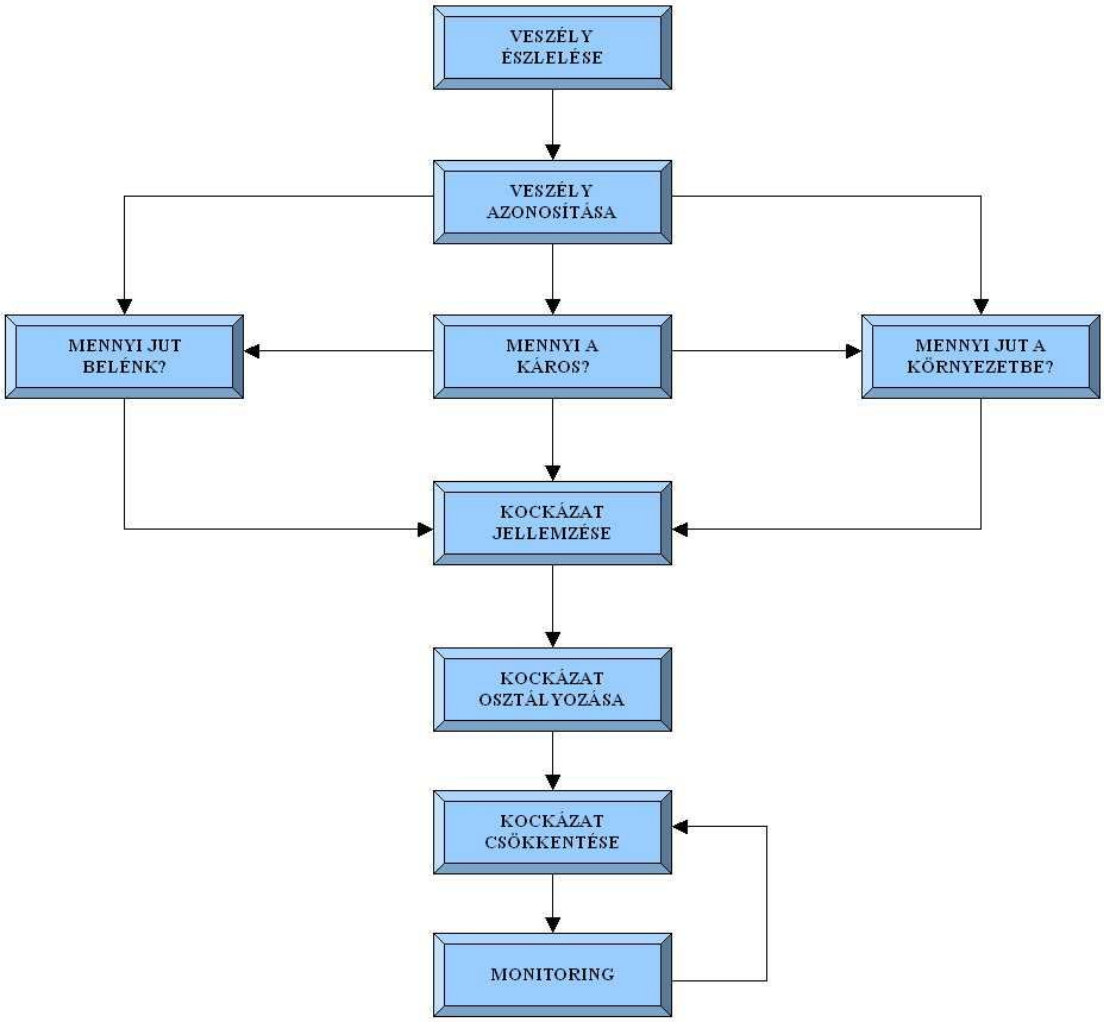

Figure No. 4. Environmental risk analysis in military camp[4]

Due to the changes in safety during last decade as well as the new challenges and risks of our days, requirements and expectations regarding to the Hungarian Defense Forces have changed considerably. While the possibility of warlike conflicts is decreasing, disasters relief, anti-terrorism as well as allied peacemaking and peacekeeping military tasks gain priority. Hungarian Defense Forces carry out these military tasks not only from permanent barracks, but temporary or permanent military camps are used as headquarters. [3]

A military camp is a semi-permanent special facility established in the field, together with the necessary infrastructure, and designated to accommodate military personnel for short or longer period of time, and ensure their necessaries.

Supply, especially water supply and shape of healthy environment are the most important in order to accommodate military forces and keep their fighting efficiency. For successful accomplishment of military tasks and efficiency of personnel we have to produce the potable water, water for domestic purposes in necessary quantity and quality, and also have to deal with the sewage water and environmental protection. Contaminated water is one of the most

[4] DÉNES Kálmán okl. mk. őrnagy

devastated weapon, the whole personnel can make unfit for fighting for a short or a longer period of time.

Location of application (homeland, foreign areas) and forms (armed combat, terrorism hazard) of the armed forces significantly determines the characteristics, supply and safety of military camps and importance of environmental protection tasks.

In peacetime, in case of accommodation in barracks, particularly national laws and regulations are authoritative for water supply, process of sewage systems and environmental protection.

In case of war, the successful completion of mission is the main consideration, therefore everything is subordinated to this. In compliance with it, regulations of national or international laws, orders NATO STANAGs do not have so strict requirements concerning for hygienic, infrastructure development, process of sewage water and environmental protection, as well as for water quality.

Such unified NATO specification is e.g. STANAG 2885 [5] that determines emergency water supply of NATO forces in wartime. This document declares that essentially the civilian water pipes can be used for water supply of NATO forces in wartime until its breakdown. Nation ratified this STANAG can use emergency measures only after this breakdown, based on regulations of STANAG 2136 [6]. STANAG also determines minimal daily quantity of water per head, and it deals with water requirement of medical and logistic troops. (Table No. 1)

Serial	Use	Requirement (litres/individual/day) Under Normal Conditions
1.	**Unit sin actions:**	
	Drinking and cooking only (individual soldiers)	25
	General consumption	70
2.	**Medical Troops:**	
	Battalion Aid Station	50 + 70
	Clearing Station (Brigade-Corps Level)	170
	Evacuation Hospital	200 + 70
3.	**Temporary or Semi-Permanent Camps:**	
	Drinking, cooking and laundries	100
	As above, plus domestic water	150

Table No. 1. Water requirement of medical and logistic troops [4]

NATO STANAG 2136 determines the minimal requirements against potable water supplied in the theatre of war, and frequency of examinations on water quality during the course of technological process. These regulations are limiting values of water quality, and defer from the civil rules in the field of frequency of control.

During peace support operations lawfulness and respect of regulations are exactly as important as the successful completion of the mission. (Armed fight might be an exception.) Development, supply of military camps built for this reason and execution of environmental protection tasks essentially based on national civilian and military laws, standards, technical directives and accepted NATO STANAGs. These regulations, rules and norms concerning the water quality and quantity have to respect during execution of tasks.

Ones of the most important national laws are 201/2001. (X.25.) [7] and 47/2005 (III. 11.) [8] Governmental regulations, that declares quality requirements of potable water and the order of water quality control.

Respect of regulations of national laws and military directives is always mandatory when supply of our own troops (including water supply, too) is realized by the supply system of the Hungarian Defense Forces. If we develop a military camp for accommodation of NATO troops and their supply, or we pay for a service of a NATO camp, the application of NATO STANAGs is mandatory.

During accommodation in a camp, the afore mentioned national and NATO rules influence the tasks of supply and their accomplishment. Difference between permanent or temporary military camps can base on their expectable employments that have an influence on their structure and accomplishment of the supply system.

We use mobile, easily installable equipment for supply of military camps in the event of temporary application. Hungarian Defense Forces brought into service ZENON mobile water purification equipment for supply of water demands. It can produce 5 m^3 potable water during normal conditions.

Permanent solutions, systems and equipment are used for supply of military camps in the event of permanent application. The water supply and sewage system, if it is possible, should be in connection with the civilian pipe networks.

Although the safe handling of sewage and the protection of the environment arc considered as of equal importance, even at present it is common practice in the Hungarian defence forces to deem them to be independent of each other. My research aims to handle the two sides of the issue as inseparable.

Most of the sewage water in military camps is produced by human metabolism. Apart from an average of 2–3 litres/person! day (mostly urine and faeces), it tends to contain 50 times as much liquid waste like washing, flush and bath water – all these considerably diluting it. It results in sewage water of various kinds and compound appearing mixed at a sewage farm. Consequently, the technology is to be adjusted so that even sewage water of rather mixed origin can be cleaned in compliance with official standards – this is the approach commonly regarded as up-to-date these days - mainly for financial, economical and technical reasons. The reasons for as well as the benefits of collecting and cleaning sewage water are as follows.

Unfortunately, recycling sewage water is still not common practice either in civilian or military water management, which is due to the fact that Hungary is known to be rich in high quality water. However, as a result of the current global population boom and the diminishing water supplies/resources, economizing on drinking water is equally urgent and crucial. Not only is the number and capacity of water resources decreasing – unfortunately, urbanization along with the current economic tendencies is deteriorating into worse and worse water quality. Although Hungary is not deeply affected by that at the moment, preventive steps arc to be taken in order to prevent the process from becoming irreversible. The protection of our

water resources has to involve economizing on drinking water as well as purifying and recycling sewage water.
Regarding military tasks, economizing on drinking water and recycling sewage water gain momentum if:

- there is no opportunity to join any public water facilities;
- in lack of sufficient water from public facilities, an independent way of obtaining and purifying water is needed;
- for safety reasons, no public facility Is to be used in wartime, which means that self water supplies are a must;
- there is no access to a sufficient amount of water,
- no water purifier of reasonable capacity is available.

In case of a definite need of economizing on water for technical, economical or military security reasons, technologies involving:

- collecting and using rainwater (and purifying it, if need be),
- clarifying and recycling certain kinds of sewage water,
- applying up-to-date and economical equipment, and
- changing consuming habits are strongly required.

It is obviously rather a complex task, which is likely to trigger considerable changes in the current ways of ensuring water supplies in military camps. In compliance with the relevant national law and NATO STANAG:

- drinking water (mostly it means bottled mineral water in foreign countries),
- drinking water for cooking, bathing, washing, washing up, e. t. c. purposes,
- utility water, and
- technological water is to be provided.

On certain occasions, rainwater or purified sewage water can economically and safely substitute drinking water. Independently of the amount of pollution in crude water, the currently used water purification technologies are suitable for producing drinking water. However, they are rather costly. Security is a basic requirement – all the quality-related requirements made by the relevant regulations have to be satisfied - independently of quality and availability. In other words, under no circumstances is bad water quality allowed to endanger personnel health and the success of completing military tasks. According to Decree 201/2001 (X.25.) water suitable for drinking, cooking, making food or being used in the process of making food qualifies as drinking water, independently of its origin or whether it is obtained from water pipes or containers. Based on this, what is to be identified is all the fields where a considerable amount of water (not necessarily drinking water) can be provided.

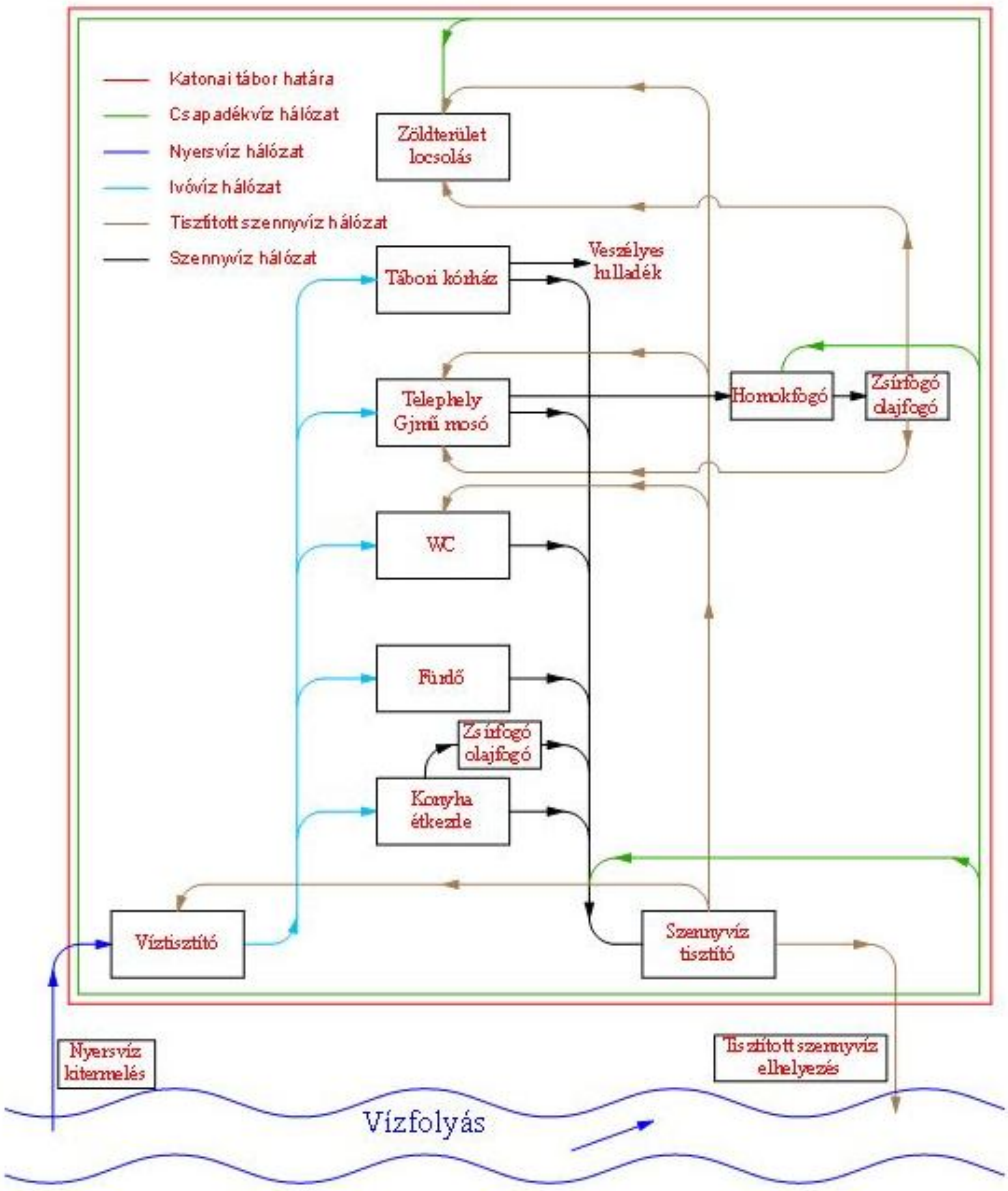

Figure No. 5. Water utilities in military camp (version)[5]

Regarding all that, in my opinion purified sewage water can be used:

- as utility water (flush water in toilets),
- technological water (e.g. for cleaning vehicles),
- maintenance water (when watering greenery or cleaning streets and/or parking places), and
- extinguishing water

Although the list above is rather short, regarding the fact that, for example, flushing needs 30–60 litres/person/day, cleaning a car requires about 200–300 litres while 1 m of greenery may need 1.5–3 m of water, they represent considerable water consumption. The main point is that none of them require drinking water. Using rainwater and recycling sewage water means that, besides a rainwater collecting system, a minimum of two water supply networks

[5] DÉNES Kálmán okl. mk. őrnagy

and two sewage water networks are necessary. Apart from all that, several sewage farms have to be built and run so that the required water quality can be provided. These solutions obviously mean extra costs. However, in case of several military camps and military tasks, the security of the personnel and a successful completion of military tasks take priority over costs.

ENVIRONMENTAL TASKS IN MILITARY CAMPS

When establishing military camp:
- protection of water resources;
- application of sensible technologies;
- protection of environs;
- protection of vegetation;
- protection of wildlife;

When Running and maintaining military camps:
- protection of water resources;
- application of sensible technologies in utilisation;
- continuous development of sewage systems;
- collecting, handling and delivering dangerous waste;
- establishing recycling opportunities;

When eliminating military camps:
- rehabilitation;
- storing waste in accordance with relevant regulations;

SUMMARY

To summarize the statements above we can declare, that due to the changes of tasks of the Hungarian Defense Forces, several national and NATO requirements have to be respected during development of military camps, concerning the water supply, sewage system and environmental protection tasks. The goal of the current transformation is that the Hungarian Defense Forces should be capable to fulfil requirements mentioned above; even if the basis of an execution is a temporary or permanent military camp. Taking health, security and task-related issues into consideration, it is advisable to create independent water supplies. In order to achieve this aim, recycling sewage water with the best possible purification technology is inevitable.

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