

# THE LOCAL SOLUTIONS FOR WATER SECURITY IN UKRAINE



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## THREE STATES OF UKRAINE



UKRAINE IS THE BIGGEST COUNTRY IN EUROPE

Territory – 603 700 km<sup>2</sup>  
Population – 42,76 million

### PEACEFUL UKRAINE

Territory – 557 500 km<sup>2</sup> (92,3%)  
Population – 38,76 million (90,6%)

### WARRING UKRAINE (DONBAS AREA)

Territory – 46 200 km<sup>2</sup> (7% of total)  
Population – 3,4 million (7,95%)

### OCCUPIED TERRITORY (THE CRIMEA)

Territory – 26 100 km<sup>2</sup> (4,3%)  
Population – 2 million (4,7%)



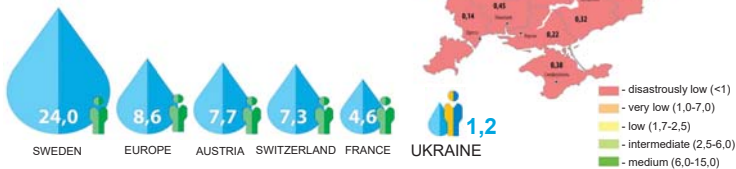
## WATER CONSUMPTION IN UKRAINE



### WATER SUPPLY OF EUROPEAN COUNTRIES AND UKRAINE

thousand m<sup>3</sup>/person/year

Ukraine is the least-water-rich country in Europe



## WATER CONSUMPTION IN UKRAINE



### DISTRIBUTION OF CONSUMED WATER BETWEEN SOURCES OF INTAKE IN UKRAINE

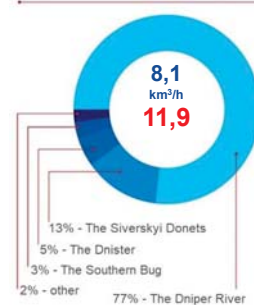
Distribution of consumed water between sources of water intake



Amount of water consumed by Ukraine

- without occupied territory: 9,9 km<sup>3</sup>/h
- with Crimea and Donbas: 14,6 km<sup>3</sup>/h

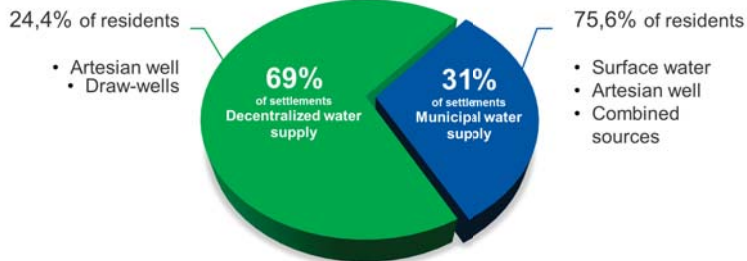
Distribution of water intake from main rivers



## WATER CONSUMPTION IN UKRAINE



### COVERAGE BY CENTRALIZED WATER SUPPLY

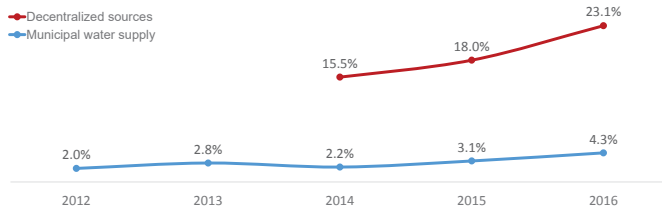


## DRINKING WATER QUALITY



Part of non-standard drinking water samples according to sanitary-bacteriological indicators according to National report about the quality of drinking water and drinking water supply in Ukraine

### Sanitary Norms and Regulations 2.2.4-171-10

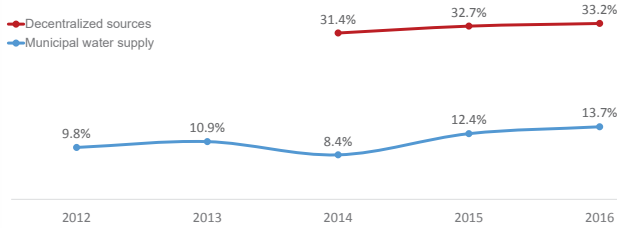


## DRINKING WATER QUALITY



Part of non-standard drinking water samples according to sanitary-chemical indicators according to National report about the quality of drinking water and drinking water supply in Ukraine

### Sanitary Norms and Regulations 2.2.4-171-10



## DRINKING WATER QUALITY



Drinking water quality according to data of NGO "WaterNet"  
(Total amount of analysis **31917**;  
Tap water – 5482, Artesian well – 21687, Draw-well – 4748)

Parameter	Source of water		
	Tap water	Artesian well	Draw-well
Turbidity (≤0.58 mg/L)	42	72	48
Color (≤20 degree)	54	21	19
Oxygen demand (≤5 mg O <sub>2</sub> /L)	33	7	11
TDS (≤1000 mg/L)	1	4	21
Iron (≤0.2 mg/L)	21	62	17
Manganese (≤0.05 mg/L)	45	70	34
Nitrates (≤50 mg/L)	2	10	56
Hardness (≤7 meq/L)	7	25	71

■ - part of samples that contain components in amounts exceeding the requirements, %

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## ECOLOGICAL WATER RISKS IN THE WARRING UKRAINE



### RISKS

1. Destruction of water infrastructure and sewage system due to the shooting attacks and bomb threat



Main sources of drinking water:

The River Siverskiy Donets

The River Kalmius

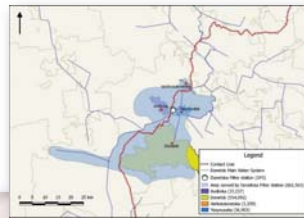
Contact line

## ECOLOGICAL WATER RISKS IN THE WARRING UKRAINE



### RISKS

2. Violation of operating of municipal water filtration stations because of the shooting attacks, untimely reagent supply (chlorine, coagulant) etc.



Total – **20** filter stations

On the occupied territory – **5** filter stations

## ECOLOGICAL WATER RISKS IN THE WARRING UKRAINE



### RISKS

3. Mine flooding

Mine situation in Eastern Ukraine

Coal mines	Whole Donbass	Uncontrolled territory
In the process of flooding	36	35
<b>Total</b>	<b>227</b>	<b>190</b>

Water from flooded mines pollute ground and surface water sources with heavy metals and cause their salinization.

90 % of whole coal industry of Ukraine is concentrated in Donbass.



## ECOLOGICAL WATER RISKS IN THE WARRING UKRAINE



### RISKS

#### 4. Destruction of industrial plants

Due to these, toxic chemical substances including mercury, copper, nickel, chromium and others get into sources of drinking water.

### INDUSTRY OF DONBASS

On the territory of Donetsk and Lugansk regions are located

**20** chemical plants

**8** power plants

**6** steel plants

**some** military plants

## ECOLOGICAL WATER RISKS IN THE WARRING UKRAINE



### RESULTS

Parameter	Source of water		
	Tap water	Artesian well	Draw-well
Turbidity (≤0,58 mg/L)	40 (0,6-0,9 mg/L)	50 (1,8-99 mg/L)	100 (3,1-10,15 mg/L)
TDS (≤1000 mg/L)	100 (1200-1300 mg/L)	100 (up to 4000 mg/L)	100 (2200-6160 mg/L)
Nitrates (≤50 mg/L)	0	100 (150-360 mg/L)	100 (up to 994 mg/L)
Hardness (≤7 meq/L)	100 (7,2-14 meq/L)	100 (11-51 meq/L)	100 (up to 57 meq/L)

■ - part of samples that contain components in amounts exceeding the requirements, %, according to data of NGO "WaterNet"

Surface and ground water is polluted with heavy metals and radioactive substances, bacteriological pollutants, pesticides and nitrates.

*"THERE ARE NO LINES OF DISTINCTION FOR CHEMICAL THREATS"  
coordinator of OSCE projects in Ukraine V. Verba*

## WARRING UKRAINE



### NUMBER OF PEOPLE UNDER THE RISK:

- Separate districts of Donetsk and Lugansk regions – **3,4 million**
- Donetsk and Lugansk regions controlled by Ukraine – **2.1 million**
- Number of military people in the war zone – **34 thousand**

Contact line



## DRINKING WATER QUALITY



### SUMMARY

- Ukrainian municipal water treatment plants and infrastructure are not capable to provide the required level of safe drinking water.
- It is also high level of risk to use water from decentralized sources for drinking.
- Situation with the access to safe drinking water in warring Ukraine is tremendous.



## WHAT IS THE WAY TO WATER SECURITY?



### OPTIMAL SOLUTIONS FOR UKRAINE

➤ **Local systems** for post-treatment of tap water

➤ **Local systems** for water purification from decentralized sources



## COMPARISON OF THE EFFECTIVENESS OF DIFFERENT METHODS OF LOCAL WATER TREATMENT



Method	Pollutant			
	Sanitary-bacteriological	Main sanitary-chemical	Chlorine and its' derivatives	Organic micropollutants
<b>Oxidizing</b>	++	+	-	+
Reagent	+	+	+	+
Thermal	+	-	+/-	-
<b>Adsorption</b>	-	+	++	+
Ion exchange	-	++	-	-
Ultrafiltration	+++	+	-	-
<b>Reverse osmosis</b>	+++	+++	+++	+++

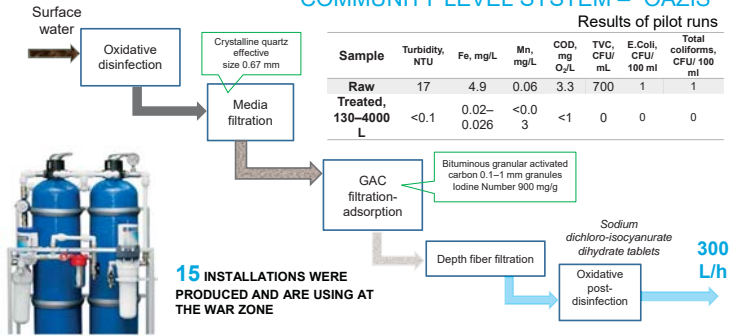
## THE WAY TO WATER SECURITY



### COMMUNITY LEVEL SYSTEM – “OAZIS”

Results of pilot runs

Sample	Turbidity, NTU	Fe, mg/L	Mn, mg/L	COD, mg O <sub>2</sub> /L	TVC, CFU/mL	E. Coli, CFU/100 ml	Total coliforms, CFU/100 ml
Raw	17	4.9	0.06	3.3	700	1	1
Treated, 130–4000 L	<0.1	0.02–0.026	<0.03	<1	0	0	0



15 INSTALLATIONS WERE PRODUCED AND ARE USING AT THE WAR ZONE

## THE WAY TO WATER SECURITY



### DOMESTIC REVERSE OSMOSIS

Indices of the physiological usefulness of the mineral composition of water

Requirements of Sanitary Norms and Regulations 2.2.4-174-10 to artificially demineralized water

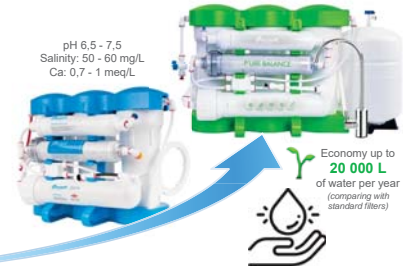
pH 6-8	TDS > 100 mg/dm <sup>3</sup>	TOTAL HARDNESS 1 - 7 meq/dm <sup>3</sup>
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pH 5-6  
Salinity: 7-10 mg/L

pH 6-7  
Salinity: 20-30 mg/L

pH 6.5 - 7.5  
Salinity: 50 - 60 mg/L  
Ca + Mg: 0.7 - 1 meq/L

pH 7-8  
Salinity: 80-100 mg/L  
Ca + Mg: 1 - 1.2 meq/L



Economy up to 20 000 L of water per year (comparing with standard filter)

## THE WAY TO WATER SECURITY



### COMMERCIAL REVERSE OSMOSIS FILTERS

— ideal solution for HoReCa, schools, hospitals



Capacity of the systems from 6,5 to 24 m<sup>3</sup> per hour



**ROburst1000**  
1000 L/day



**ROburst3000**  
3000 L/day

**ROburst**

## THE WAY TO WATER SECURITY



### VENDING MACHINES

9 stages

of water purification to achieve the highest quality

remote control of the operation



## THE WAY TO WATER SECURITY



### ECOSOFT MODUL

Water treatment station for emergency situations and seasonal enterprises

- ✓ Capacity from 50 to 600 m<sup>3</sup> per day
- ✓ Total amount of produced systems is 10 units



## THE WAY TO WATER SECURITY



### ECOSOFT MODUL-9

Drinking water for city Kurakhove

Source: Kurakhove Reservoir  
Capacity: up to 24 m<sup>3</sup>/hour

**Problem:**

In 2014 the pump station that supplied the city Kurakhove with water from the Seversky Donets-Donbass canal went out of order. As a result, there was a critical situation with the provision of drinking water to the population of Kurakhove and neighbourhood.

**Solution:**

A water purification system using reverse osmosis in a 40-foot container with insulation and electrical heating.

