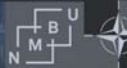


CYBERWATER

Preparedness in the Eurasian water sector

**Water Critical Infrastructure preparedness in the Countries with Transition Economies**



Dr Zakhar Maletskyi  
REALTEK, NMBU  
Norway

Dialogue and Cooperation

International Understanding

Peaceful Relations



**FORGING PARTNERSHIPS**

Trust

Prevention of Conflicts

**Facing new security challenges together**

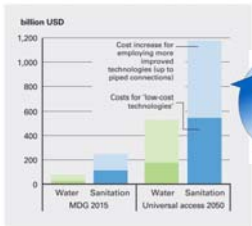
[1]



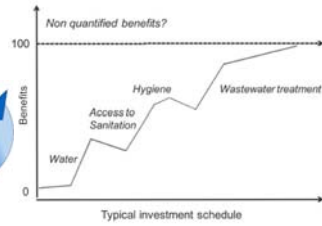
Economy – Infrastructure – Security

Capital cost range for improved access to water supply and sanitation

Source: Frontier Economics calculation based on several data sources



[2]



The water and sanitation benefits curve

[3]

Water sector financing needs

Subsector	The numbers
Water infrastructure and services	US\$ 777–1,756 billion annually (UNU-INWEH et al., 2013)
SDG targets for WASH to achieve universal and equitable access to safe and affordable drinking water and access to adequate and equitable sanitation for all and to eliminate open defecation	US\$ 114 billion annually (Hutton and Varughese, 2016)
Global costs for maintaining, rehabilitating and expanding irrigation infrastructure	US\$ 198–248 billion annually (UNU-INWEH et al., 2013)
Predicted investment in hydropower over the period 2012 to 2020	US\$ 75 billion total (GlobalData, 2013)
WRM and climate change cost of adapting to a 2°C increase in global average temperature between 2010 and 2050	US\$ 70–100 billion annually (World Bank, 2010)
Developed countries' 2010 commitment to mobilizing Green Climate Fund by 2020	US\$ 100 billion annually (UNFCCC)

[8]

Transition Economies

Command Economy



Free Market



- CIS & Georgia
- South-Eastern Europe

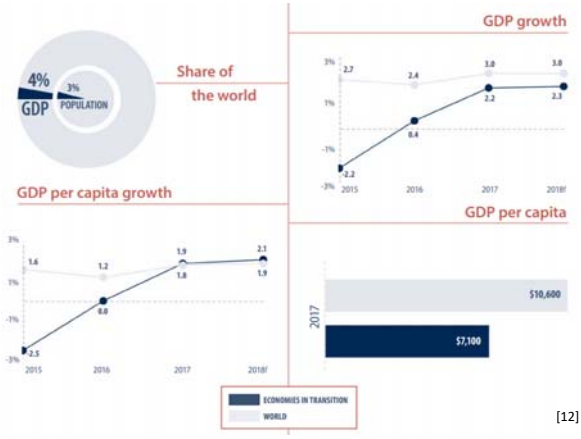


[4]



[1]

www.nato.int



[12]



[13]

## Water Conflicts

## Transition Environment

- Privatization
- Reduction of subsidies → unemployment, inflation
- Legal & banking reforms
- Corruption
- Lack of entrepreneurship and skills
- Brain drain

## Privatization

- Negative attitude and adverse reactions towards privatization of critical infrastructure – protests of NGOs and politicians
- No clear statistics on private partnerships
- Conflicts between private waterworks and state organizations
  - Electricity supply
  - **Quality control**
- Tariffs – huge protests
- “Cheap privatization”
- **Competition for governmental support rather than private investments**



## Privatization

**Table 2 Public-private sharing of water provision**

Option	Ownership	Management	Investment	Risk	Duration (years)	Examples
Service contract	Public	Shared	Public	Public	1–2	Finland, Maharashtra (India)
Management contract	Public	Private	Public	Public	3–5	Johannesburg (South Africa), Monagas (Venezuela), Atlanta (United States)
Lease (afterage)	Public	Private	Public	Shared	8–15	Abidjan (Côte d'Ivoire), Dakar (Senegal)
Concession	Public	Private	Private	Private	20–30	Manila (Philippines), Buenos Aires (Argentina), Durban (South Africa), La Paz-El Alto (Bolivia), Jakarta (Indonesia)
Privatisation (state divestiture)	Private	Private	Private	Private	Unlimited	Chile, United Kingdom

Source: Adapted from United Nations Development Programme (UNDP), *Human Development Report 2006, Beyond Scarcity: Power, Poverty and the Global Water Crisis* (New York: Palgrave Macmillan, 2006).

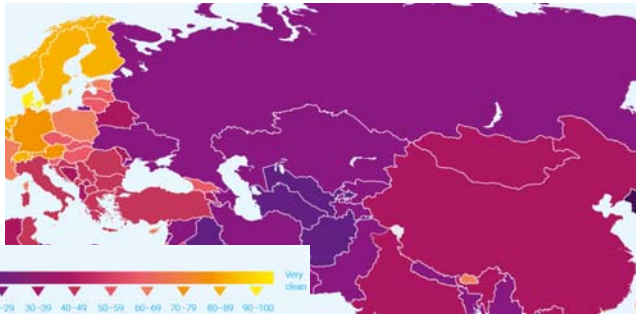
[11]

## Legal & banking reforms

- Vague responsibility
  - Shift to “water as product”
  - Deregulation of economy – Unclear control functions
  - No assurance of standards execution
  - No “cheap” loans for infrastructure development

## Corruption

Corruption Perceptions Index 2014



[11]

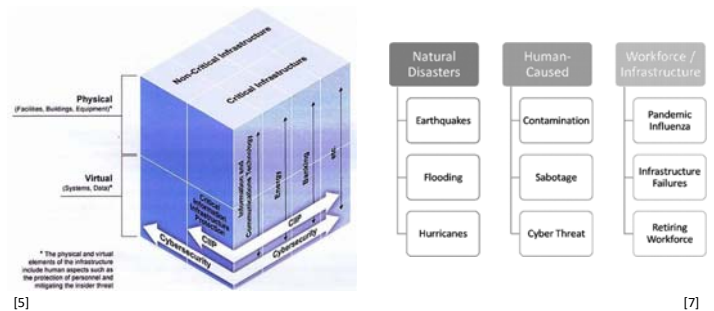
**Whatever its form, corruption in the water sector ultimately leads to higher costs and reduced access to water, especially for the poor and most vulnerable.**

- **Bribery**
  - **Collusion in tenders**
  - **Theft**
- ILLEGAL**
- Constructions close to water reservoirs
  - Water infrastructure
  - Discharges
  - Supply of inadequate materials
- Discouraging investments**

## Challenges related to corruption in water sector

- Unclear public-private sharing of water provision
- Non-transparent tariffs
  - Cost is not clear
  - **No clear investment component foreseen**
- Monopoly supply of chemicals
  - Unexpected increase of prices
- Decentralization is used to remove responsibility

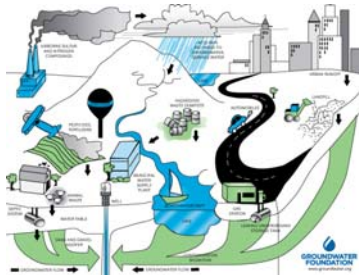
## Water critical infrastructure



## Physical Disruption Scenarios

- Water Distribution System
  - Storage tanks or reservoirs
  - Pipe network
  - Valves
  - Pumps
  - Hydrants
  - Other appurtenances

### Combined systems with agricultural and industrial users



## Physical Disruption Scenarios

- Aging infrastructure ← temperature, pressure swings, vibration from traffic, hammer effects
- Long replacement time of old and custom-designed equipment
- Many systems still have valves that can cause hammer effects

- Planning is done based on historical experience
- Above-ground structures
  - Perimeter controls
  - Doors, hatches, and vaults
  - Locks and keys
  - **Access control, motion detection, CCTV are not always available**

## Dual Threat

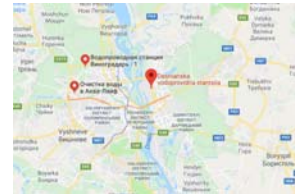
### Aging Infrastructure + Aging Workforce



## Physical Disruption Scenarios

Disinfection with chlorine gas

- Location of treatment plants



## The Threat of Terrorism

- Physical Countermeasures
- Contamination Warning System
  - Online Water Quality Monitoring
  - Consumer Complaint Surveillance
  - Public Health Surveillance
  - Enhanced Security Monitoring
  - **Routine Sampling and Analysis**

## Cyber Security

- SCADA
  - A human-machine interface (HMI)
  - A supervisory (computer) system
  - Remote terminal units (RTUs)
  - Programmable logic controllers (PLCs)
  - Communication infrastructure
  - Various process and analytical instrumentation

## Transition Economies are at risk as they are adopting broader use of ICTs

- Lack of concern about security and authentication in the design, deployment, and operation of some existing SCADA networks
- Believing that SCADA systems have the benefit of security through obscurity
- through the use of specialized protocols and proprietary interfaces
- Believing that SCADA networks are secure because they are physically secured
- Believing that SCADA networks are secure because they are disconnected from the Internet

## Preparedness Needs

- Integrity in the water sector: Transparency, Accountability, Participation and Anti-Corruption
- Infrastructure rehabilitation management
  - Outdated equipment
  - Replacement of chlorine-gas disinfection systems
- System of detection, response, and recovery to contamination incidents
- Reserve water supply solutions
  - Centralized
  - Decentralized
- Cyber risk management





## References

1. NATO brochures: "What is NATO?", "NATO member and partner countries"
2. EBRD Transition Report 2017-2018
3. BENEFITS OF INVESTING IN WATER AND SANITATION: AN OECD PERSPECTIVE – OECD 2011
4. UNCTAD-STAT Country Classification
5. CTO Cybersecurity Forum, Yaoundé Edition, Write Up Part 2: Critical Information Infrastructures Protection Workshop
6. Exploring the links between water and economic growth, Frontier Economics
7. Water/Wastewater Infrastructure Security: Threats and Vulnerabilities, Laurie J. Van Leuven
8. WATER: FIT TO FINANCE? CATALYZING NATIONAL GROWTH THROUGH INVESTMENT IN WATER SECURITY. April 2015, OECD
9. Davis J., Whittington D. Challenges for water sector reform in transition economies. Water Policy 6 (2004) 381-395
10. Global Corruption Report 2008: Corruption in the Water Sector. Transparency international
11. WATER INTEGRITY GLOBAL OUTLOOK. Water Integrity Network Association (WIN) e.V.
12. UN World Economic Situation and Prospects 2018
13. Where Will The World's Water Conflicts Erupt? [Infographic]. By Katie Peek June 13, 2014. Popular Science