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# Case study: Management and use of Water and Water Resources in the European Union

**Speaker:** Rosina Girones

## Short summary

The management and use of water and water resources has been the focus of European Union (EU) water policy for many years. Regulations like the Nitrate Directive (91/676/EEC) or the Urban Waste Water Directive (91/14/EEC) to name only two were complemented and integrated latter on by the Water Frame Directive (2000/60/EC) which acted as an umbrella piece of legislation that embraced all the water Directives. These Directives targets the quality of water bodies with the aim of ensuring a sustainable use of water resources protecting the ecosystems and the human health.

It is well known that improperly treated wastewater may lead to the transmission of human viruses that are excreted in feces and urine at high concentrations. Distribution and burden of several infectious diseases may shift and human exposure may differ under the predicted climate change scenarios. Integrated river basin management is a key tool to mitigate the possible impacts of future climate change on the quality of water resources.

## Key words:

*Reducing pollution ; Eliminating dumping of hazardouse waste ; Minimising release of hazardous chemicals and materials - achieve sound management of chemicals through their life cycle ; Reducing untreated wastewater ; Increasing recycling and safe reuse ; Protect, restore and sustainable use of inland freshwater related ecosystems ; Increase water use efficiency accross sectors ; Ensure sustainable withdrawals ; Ensure supply of freshwater to address water scarcity ; Implement IWRM ; Water cooperation ; Reduce number of deaths and number of affected people ; Reduce economic losses ; Protection of the poor and vulnerable*

# Issues addressed:

**Water resources management (water-use efficiency, integrated water resources management, transboundary cooperation, sustainable extraction and supply of freshwater)**

Integrated water resources management. Watershed management of wastewater. Move toward more treatment for virus control. Water reuse needed under climate change.

**Water quality (pollution, dumping of toxic materials, wastewater management, recycling, reuse, restore ecosystems and aquifers)**

Inadequate sewage treatment. Pathogens in water. Impacting ecosystem services (drinking water, recreational water, food security, economic development).

**Risks (mortality, economic losses caused by natural and human-induced disasters)**

Illnesses, malnutrition

# Tools for implementation:

**Governance: Institutions / legal framework:** Watershed Compact

**Technology:** Source tracking

**Capacity development:** Training of water quality professionals. Establish global education network.

# Lessons Learned:

**Triggers**: The utility of the viral MST tools and the prevalence and abundance of specific human and animal viruses in the five river catchments and adjacent seawater, which is impacted by riverine contributions from the upstream catchments, were examined. The results concerning human and animal targets presented in this study demonstrate the specificity and applicability of the viral quantitative parameters developed to widely divergent geographical areas and their high interest as new indicators of human and animal fecal contamination in water and as MST tools.

**Drivers**: Managers, utilities, municipalities, NEED Watershed coalitions or compacts.

**Barriers**: Analysis of risk associated to the contamination by viral pathogens, data on viral contamination and stability
Wastewater management would be the key to prevent environmental dispersion of human fecal pathogens

Acceptable water quality levels may be guaranteed only if wastewater containment and treatment are fully operational when floods or extreme rainfalls occur
Application of viral MST tools for the identification of the main sources of contamination in water

**What has worked well?**

The results observed on the dissemination of the virus showed high genome copy numbers of human adenovirus (HAdV) and JC polyomavirus (JCPyV) in urban wastewater. Human Merkel Cell polyomavirus (MCPyV) was detected in 75% of the raw wastewater samples. This virus was found in 29% and 18% of river water and seawater samples, respectively. A seasonal distribution in the norovirus genogroup II (NoV GGII) occurrence was observed. Presence of human hepatitis E virus (HEV) in wastewater samples was 10% when analyzed by nested PCR (nPCR). The data obtained indicates that human fecal contamination is widely dispersed in the environment despite sanitation. In climate change scenarios for the Mediterranean region, wastewater management would be the key to prevent environmental dispersion of human fecal pathogens. Acceptable water quality levels may be guaranteed only if wastewater containment and treatment are fully operational when floods or extreme rainfalls occur. Projections for the Llobregat River catchment, estimate general warming and an increase of total precipitation amounts during the winter months and persistent decreases from May to October. Thus, river- and sea-water quality appears vulnerable when considering climate scenarios for the Mediterranean region.

**What can be improved?**

Improving wastewater management and the recycle/reuse.

Using sustainable energy sources /treatments for the reduction of viral pathogens in wastewater and secondary effluents

Protecting and restoring water-related ecosystems.

Using viral MST tools for the identification of the source of contamination and for defining suitable management strategies.

A second recommendation will be related to the previous, acceptable water quality levels may be guaranteed only if wastewater containment and treatment are appropriate for the population and fully operational when floods or extreme rainfalls occur.

**The way forward**:

**Links:**

www.ub.edu/microbiologia_virology/