

Sustainable health-care waste management: Public policy making and governance

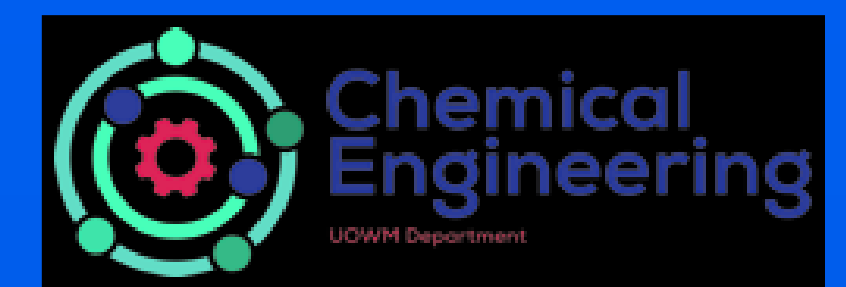
E. N. Lakioti, K. N. Kokkinos**, K. G. Moustakas*** and V. G. Karayannis*****

** Department of Public and One Health, University of Thessaly, Karditsa, Greece
(E-mail: elakioti@uth.gr)*

*** Department of Digital Systems, University of Thessaly, Larissa, Greece*

**** School of Chemical Engineering, National Technical University of Athens, Athens, Greece*

***** Department of Chemical Engineering, University of Western Macedonia, Kozani, Greece*



Introduction

► Climate change has recently increased the frequency of **extreme weather** events, altered the distribution of **disease** vectors, and exacerbated **air pollution hazards**, disturbance, global environmental changes, all of which put pressure on already-existing health vulnerabilities.

The **dangers and effects of climate change on public health**, and consequently on the standard of living, are now widely acknowledged to be quite significant. Especially, the outbreak of COVID-19 led to the **increase of medical services** and the **accelerated use of health-care products** (e.g. surgical masks, medical consumables), which consequently resulted in the **increase of potentially hazardous medical waste**.

► Due to the **potentially infectious properties of health-care/medical waste (HCW)**, its management and treatment are **regulated by environmental and health bodies** and the implementation of **international treaties**.

For HCW transportation, most nations adopt the **agreements concerning hazardous material transportation**, such as the Agreement for the International Carriage of Dangerous Goods by Road (ADR) and other similar ones for different modes of transportation.

Many nations lack the **necessary regulations** or fail to enforce them.

To eliminate risks of transmission of infectious cases taking into account the monotonically increasing quantities of medical waste, special attention must be paid to its **disinfection, segregation, storage, transportation, and final disposal**.

The most prevalent issues with HCW include: lack of **knowledge and public awareness about the health risks** associated with HCW, lack of **safe disposal systems**, **inadequate training** in proper waste management, and **lack of financial and human resources** for that purpose.

Sustainable Management of Health-Care/Medical Waste

► Sustainable management of HCW represents a **top priority** for **environmental** and **public health** concerns, especially in developed nations:

- Choice of the best technique for disposing of HCW: Complex, **multi-criteria decision analysis problem** (qualitative & quantitative aspects)
- HCW treatment technology evaluation may be based on shaky or incomplete data.
- The majority of HCW decision models now in use are unable to account for the linkages among different dimensions and criteria.

► This work focuses on a **sustainability-based multi-perspective strategy** (environment, resilience, societal aspects, economy, transportation):

- in order to identify the involved **key factors** and **criteria**, based on a **multi-participatory** approach
- Risk assessment for management and transportation of potentially hazardous medical materials is seen as a **decision-making problem**.

► A **multi-stakeholder methodology** is used for the analysis:

- Sustainable waste management calls for a **multifaceted strategy including many stakeholders** to increase **interest and knowledge** at several levels (public authorities, healthcare providers, auxiliary actors, etc.), spark **conversation** regarding the adoption of particular **health policies**, and pinpoint the best course of action.
- Understanding how diverse **stakeholder networks** are put together and function and also how to maximize their effectiveness, should be studied
- **Social network analysis** of HCW waste management stakeholders should be carried out and evaluated.
- **Medical stuff** (doctors, nursing professionals etc.) are in a good position to take part as full partners with other **medical and public health emergency communities** because they are a significant element of the healthcare system.
- **Hospitals & health facilities** must choose the best alternative for their HCW among private specialists/companies offering treatment procedures.
- **Governments, municipalities & waste management councils** are significant stakeholders along with some specific international organizations.

► Suggestions for how to make the HCW management stakeholder network more efficient can be made:

- **Health care institutions** having a great interest in HCW management should be **more informed** and develop **broader interconnections**.
- **Networks operation** improvement: by levelling disparities in **perception, awareness & readiness, information exchange & financial access**
- **Implementation of a clear legal framework: positive catalyst** for accelerating the increase of **roles** and **responsibilities** within the system.
- Quick action can be made locally, but **universal and long-term** development requires governance, commitment and assistance, with the ultimate goal of **meeting national and international standards**.

Conclusions - Suggestions

► Long-term process: it will be continued by **incremental advancements**, enlarging **public awareness** of the **hazards** associated with HCW, for promoting:

- **proper procedures** to safeguard the individuals involved from risks when collecting, storing, transporting, treating/processing or disposing of HCW in environment-friendly way and beneficial for public health
- **social behaviors** that **reduce** the amount of waste produced and developing **policies** and **systems** to ensure strict oversight and regulation for improving waste segregation, treatment and disposal practices are key components favoring a more sustainable health-care waste management.

► Furthermore, for the safe management and transportation of HCW, the **creation of a decision support system (DSS)** can be proposed to:

- help the competent authorities to **mitigate the risks** imposed by accident probability and exposure and also
- provide **efficient transportation and management** of such hazardous material.

Appealing **Fuzzy analytic methodologies** can be used for attributing **weights of relevant importance** to the selected **criteria** and **factors**.

The decision on the medical waste management can be assisted with a **Fuzzy Cognitive Mapping (FCM)** modelling investigating **best & worst case analysis** on the **inter-causalities** of the key factors.