



# CORFU2022

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## **Improving Waste Management by Providing Audit Capability to the Waste Declaration System**

**Tolga Pilevneli<sup>1</sup>, Elif Kucuk<sup>2</sup>, Ulku Yetis<sup>2</sup>**

<sup>1</sup>Water Management Institute, Ankara University, Ankara, 06135, Turkey

<sup>2</sup>Department of Environmental Engineering, Middle East Technical University, Ankara, 06800, Turkey

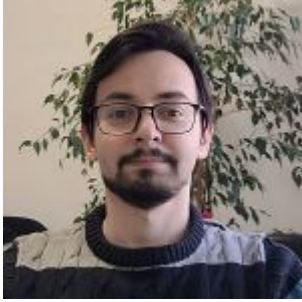
16.06.2022





# Presenter

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**Tolga Pilevneli**



## Education

- B.S., Environmental Engineering, Middle East Technical University, 2008
- M.Sc. Environmental Engineering, Middle East Technical University, 2013
- Ph.D.(c), Environmental Engineering, Middle East Technical University

## Experience

- Environmental Consultant, Private Sector, (2009 – 2014)
- Teaching Assistant, Middle East Technical University, (2014 – 2018)
- Lecturer, Water Management Institute, Ankara University, (2018 - ... )





# Introduction

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- Waste Management in Turkey
  - Current Legislation
  - Categorization and Management of Wastes
- Waste Declaration System
  - Data Overview
  - Limitations of Waste Declaration System
- Methodology
  - Screening of Economic Activities
  - Additional Economic Activity Groups
  - Determination of Waste Generation Factors
- Improvements Made in Waste Declaration System





# Waste Management in Turkey

## Waste Management Regulation – 2015

Most recent  
legislation on  
general waste  
management  
practices

**Aim** is to determine the general procedures and principles regarding:

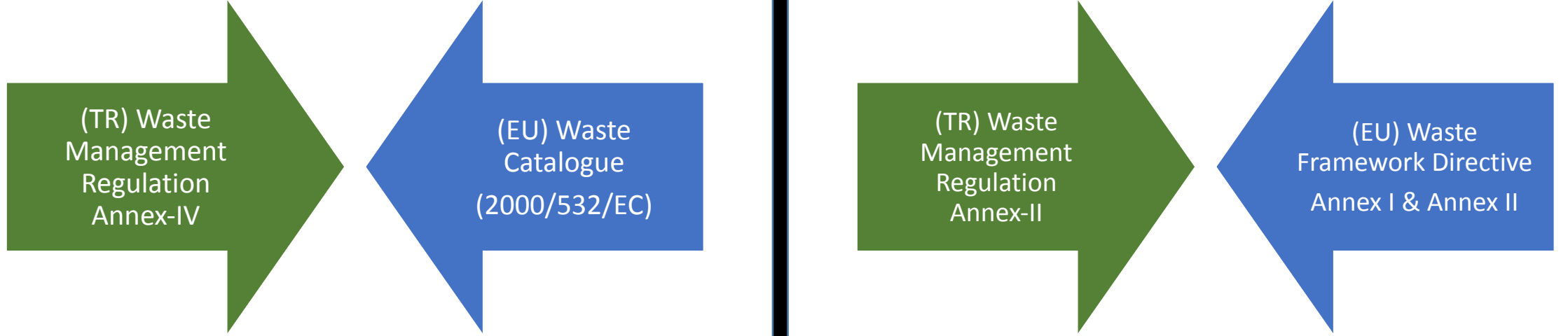
- a) Ensuring the **management of wastes** from generation to disposal without harming the environment and human health
- b) Reducing the use of natural resources and ensuring waste management through ways such as **reducing** waste generation, **reuse, recycling and recovery** of wastes

Waste  
Hierarchy





# Categorization and Management of Wastes in Turkey



- As part of EU harmonization process, Turkey has adopted the European Waste Catalogue and waste management practices





# Categorization and Management of Wastes in Turkey



<b>04</b>	<b>WASTES FROM THE LEATHER, FUR AND TEXTILE INDUSTRIES</b>
<b>04 01</b>	<b>Wastes from the leather and fur industry</b>
04 01 01	Fleshings and lime split waste
04 01 02	Liming waste
04 01 03*	Degreasing waste containing solvents without a liquid phase
04 01 04	Tanning liquor containing chromium
04 01 05	Tanning liquor free of chromium
04 01 06	Sludges, in particular from on-site, effluent treatment containing chromium

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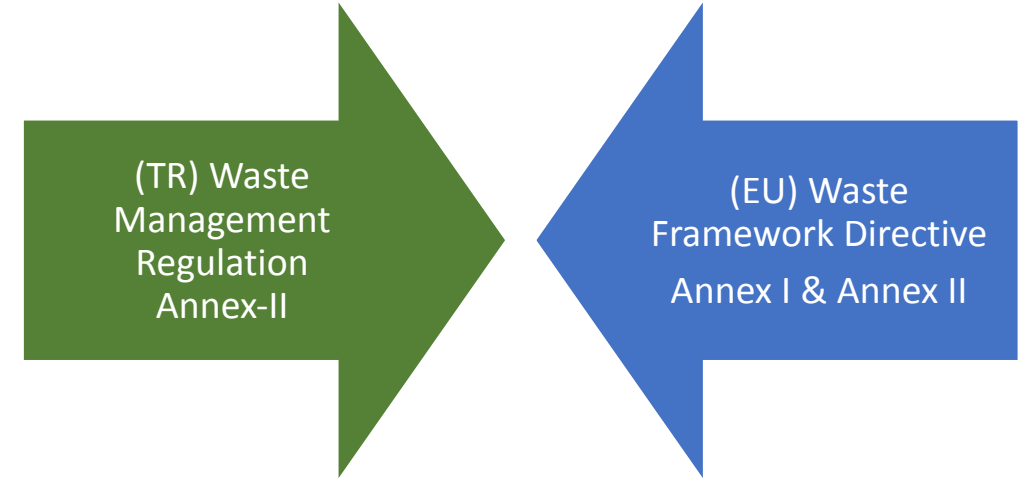


# Categorization and Management of Wastes in Turkey



## RECOVERY OPERATIONS

- R 1 Use principally as a fuel or other means to generate energy (\*)
- R 2 Solvent reclamation/regeneration
- R 3 Recycling/reclamation of organic substances which are not used as solvents (including composting and other biological transformation processes) (\*\*)
- R 4 Recycling/reclamation of metals and metal compounds (\*\*\*)
- R 5 Recycling/reclamation of other inorganic materials (\*\*\*\*)

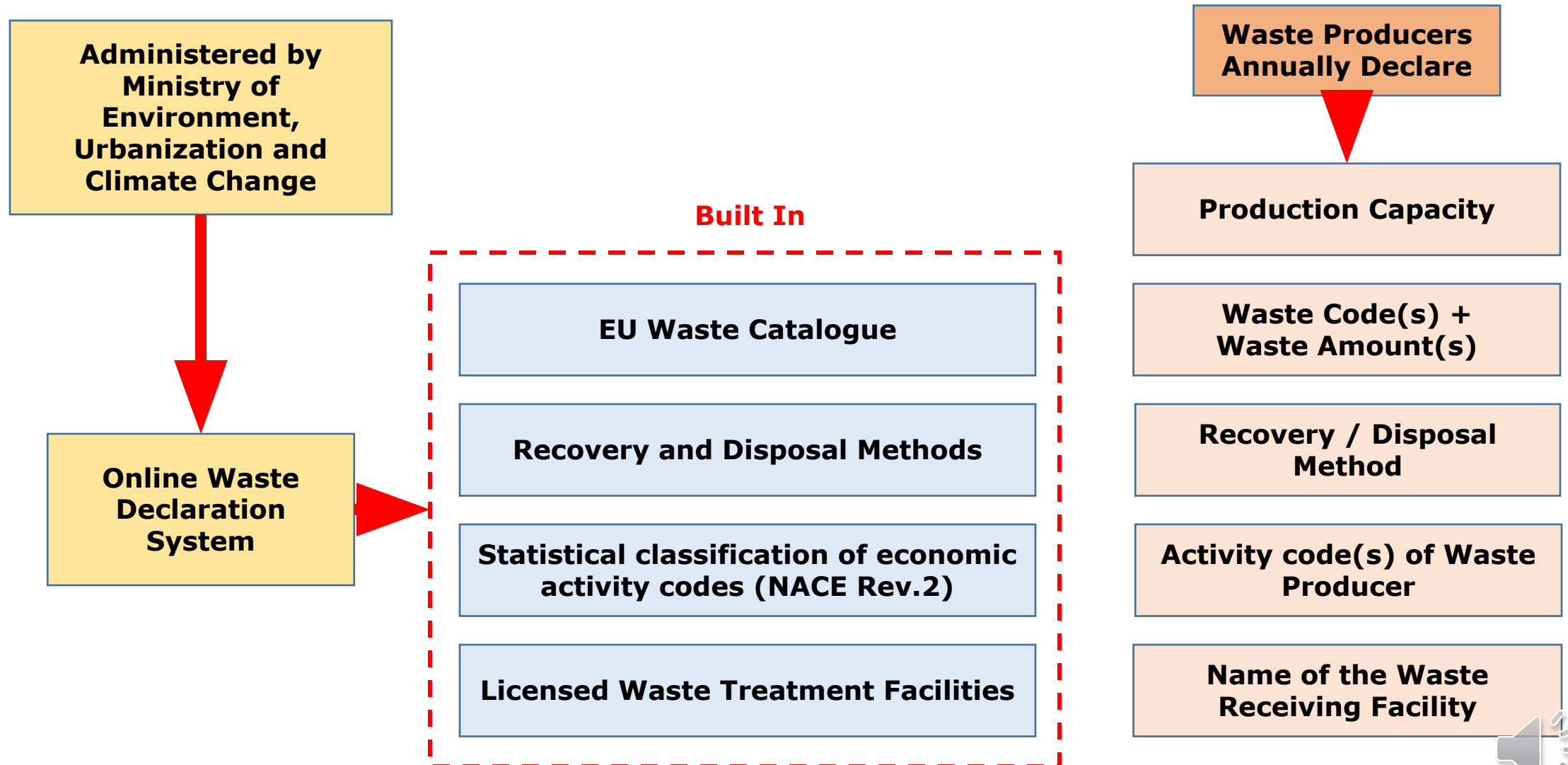


- As part of EU harmonization process, Turkey has adopted the European Waste Catalogue and waste management practices





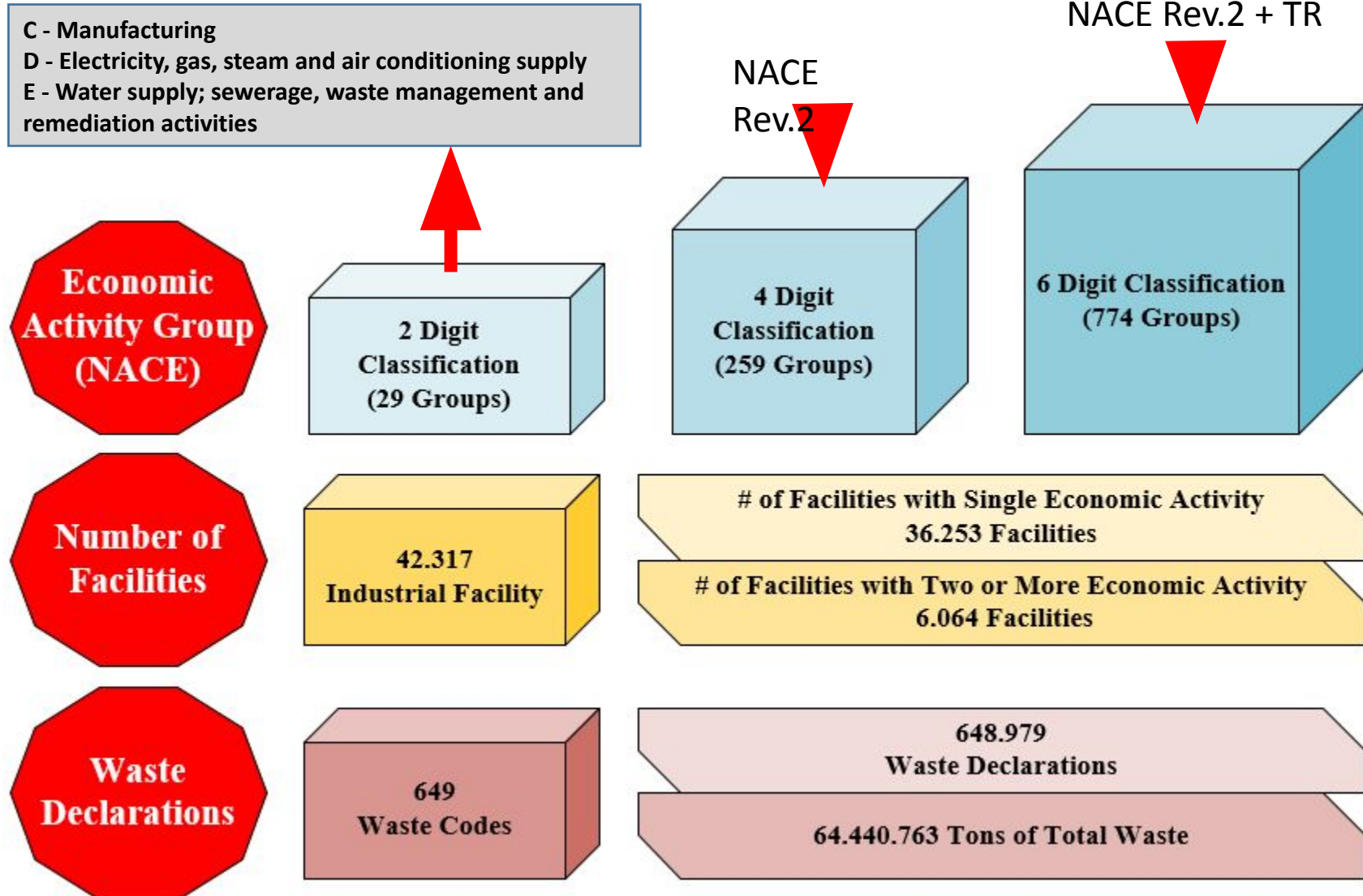
# Waste Declaration System







# Waste Declaration System Data Overview





# Limitations of Waste Declaration System



**Waste Producers  
Annually Declare**

**Production Capacity**

**Waste Code(s) +  
Waste Amount(s)**

**Recovery / Disposal  
Method**

**Activity code(s) of Waste  
Producer**

**Name of the Waste  
Receiving Facility**

- Some waste generators fail to declare their waste codes according to their industry-specific waste catalog

**07 02 Wastes from the MFSU of plastics, synthetic rubber and man-made fibres**

07 02 01\* Aqueous washing liquids and mother liquors

07 02 03\* Organic halogenated solvents, washing liquids and mother liquors

07 02 04\* Other organic solvents, washing liquids and mother liquors

**07 03 Wastes from the MFSU of organic dyes and pigments (except 06 11)**

07 03 01\* Aqueous washing liquids and mother liquors

07 03 03\* Organic halogenated solvents, washing liquids and mother liquors

07 03 04\* Other organic solvents, washing liquids and mother liquors

**07 05 Wastes from the MFSU of pharmaceuticals**

07 05 01\* Aqueous washing liquids and mother liquors

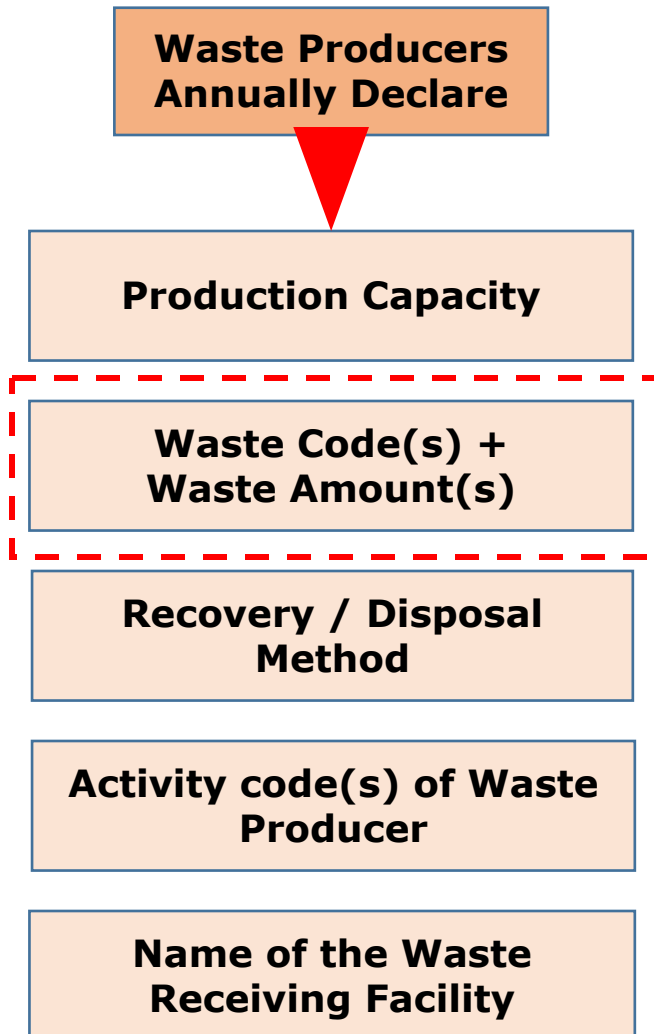
07 05 03\* Organic halogenated solvents, washing liquids and mother liquors

07 05 04\* Other organic solvents, washing liquids and mother liquors





# Limitations of Waste Declaration System

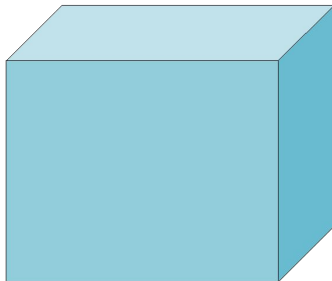
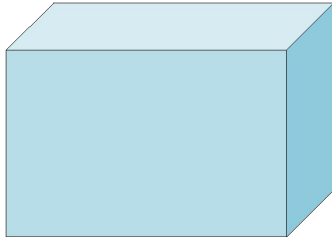
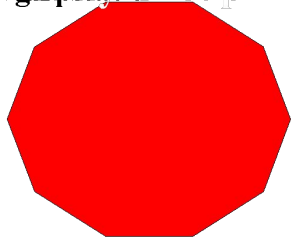


- The current online system depends highly on the declarations of the waste generators, with limited auditing capabilities
  - of waste **type** (waste code)
  - of waste **amount**
- Also, production capacities does not correlate well with the amount of waste generated





# Screening of Economic Activities

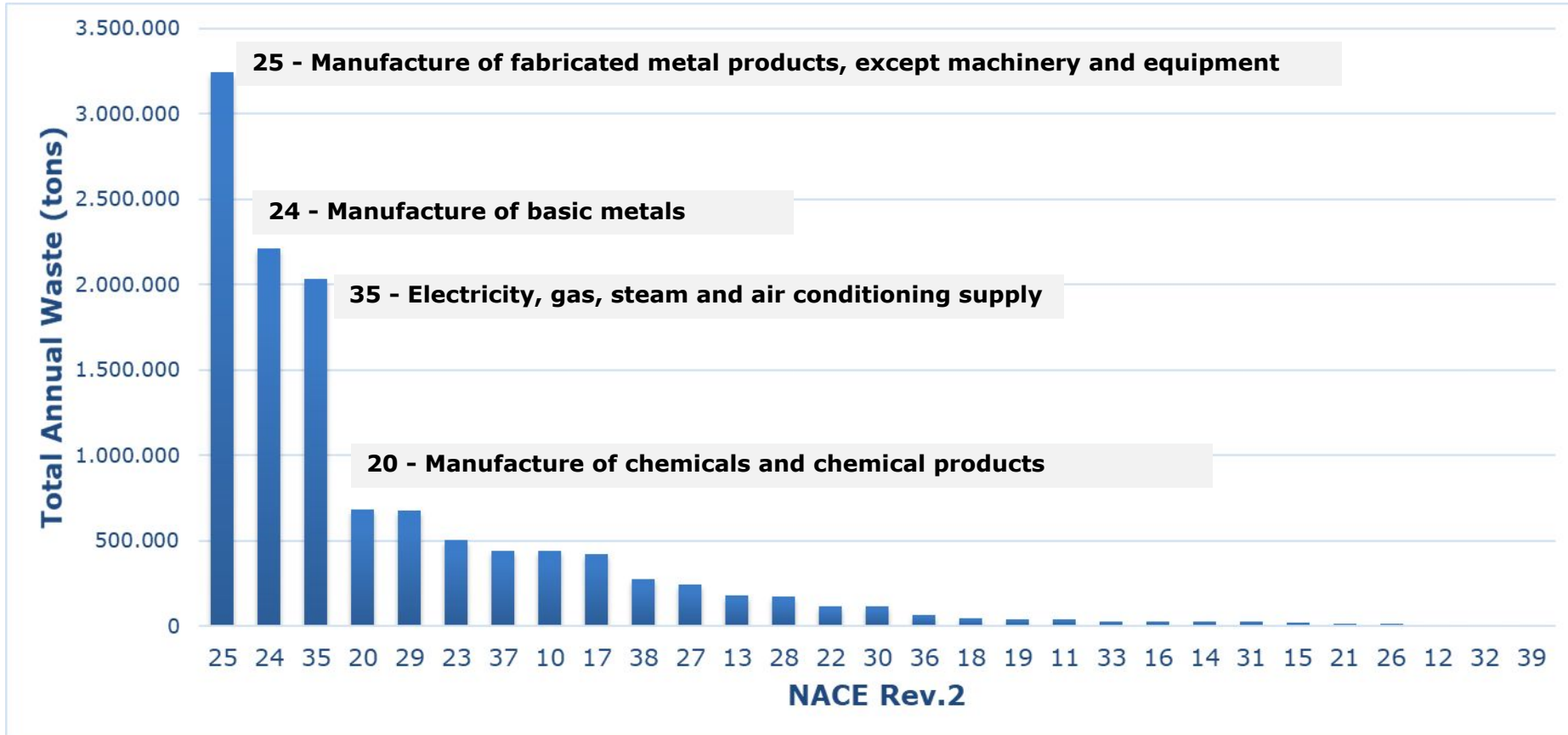


- Due to time and work force requirements, the study was limited to selected industrial activities
  - Field studies were conducted to at least one facility for each selected activity
  - Waste generating processes, type of waste and waste generation factors were evaluated for each selected activity





# Screening of Economic Activities

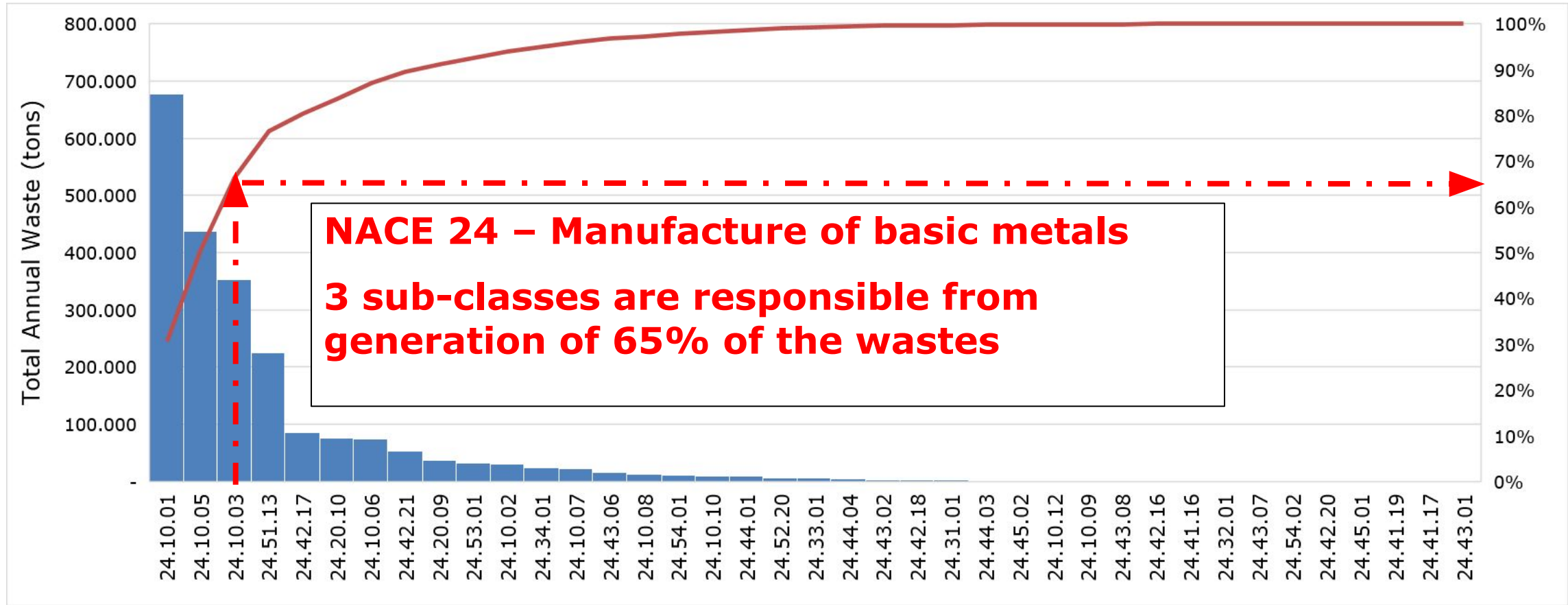


- 4 sectors are responsible from generation of 62% of all wastes by weight (NACE 25 – 24 – 35 – 20)





# Screening of Economic Activities





# Screening of Economic Activities

Division	Percentile	# of sub-class activities (TR)
10		4
11		2
12		1
13		6
.	65 %	.
.		.
.		.
38		4
39		1
Total	78%	66

- By targeting 65% of all waste production in **each NACE Rev.2** division, **78% of all waste** production (by weight) in Turkey was covered
- In other words, total waste of **66 sub-class activities** were evaluated to cover 78% of all waste production from **774** sub-class activities





# Additional NACE Classifications

- In some cases, even the six-digit NACE classification does not allow identification of correct waste codes and generation factors
- Additional categories were created during process analysis

Division	Group	Class	Sub-class (TR)	Description
20	20.1			Manufacture of basic chemicals, fertilizers and nitrogen compounds, plastics and synthetic rubber in primary forms
		20.13		Manufacture of other inorganic basic chemicals
			20.13.90	Manufacturing of Chemical Elements, Inorganic Acids and Compounds Not Elsewhere Classified (Metalloids such as Chlorine, Iodine, Fluorine, Boron, Silicon, Phosphorus, Arsenic, Scandium, Mercury, Oxides, Hydroxides, Hydrogen Chloride etc.)
24	24.4			Manufacture of basic precious and other non-ferrous metals
		24.42		Aluminum production
			24.42.17	Aluminum production (Unprocessed)

**24.42.17.01 - Primary Aluminum Production – From Ore**

**24.42.17.02 - Secondary Aluminum Production – From Recycled Aluminum**

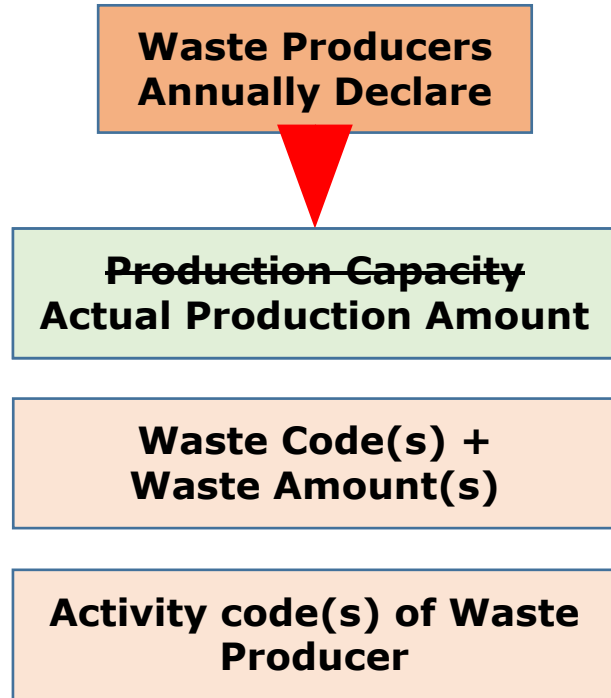
**Same Activity  
Different Production Practices**







# Waste Generation Factor



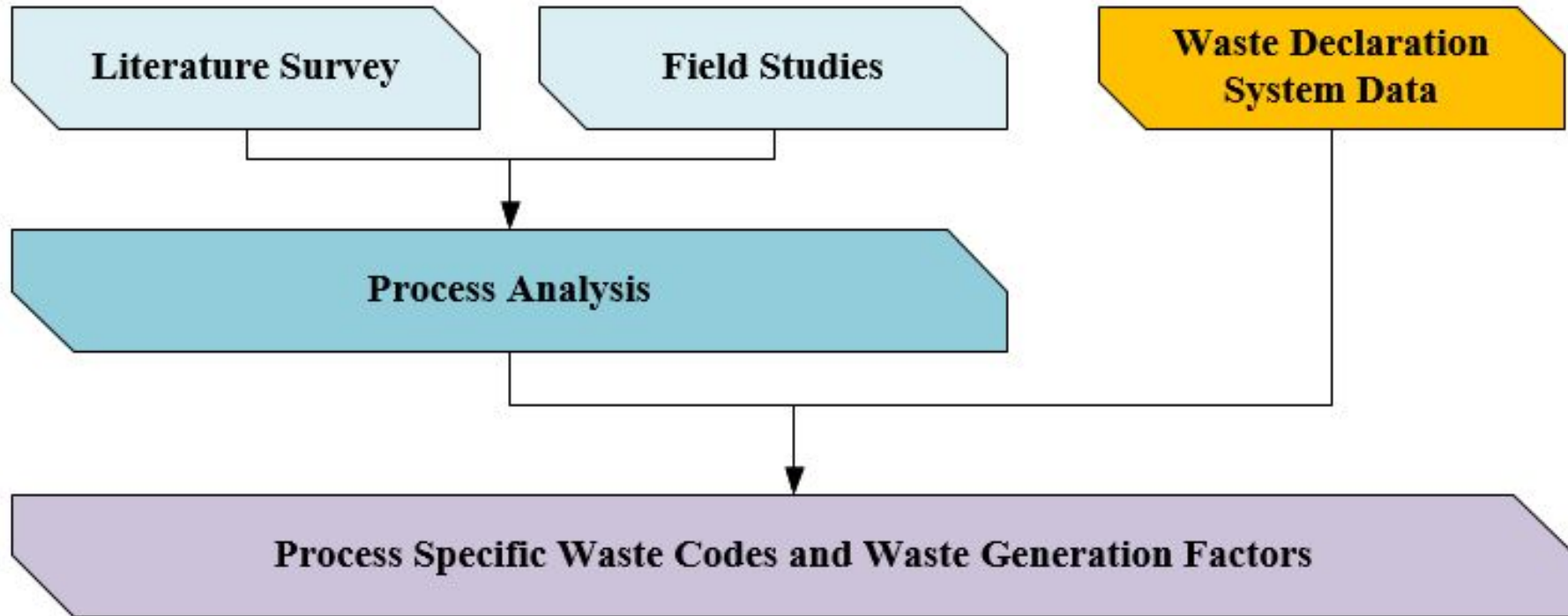
- There must be a relation between:
  - Activity carried out  Waste code
  - Production amount  Waste amount

$$\text{Waste Generation Factor (WGF)} = \frac{\text{Annual Waste Amount (kg)}}{\text{Annual Production Amount (kg, piece, m}^3, \text{m}^2, \text{etc.)}}$$





# Waste Generation Factor

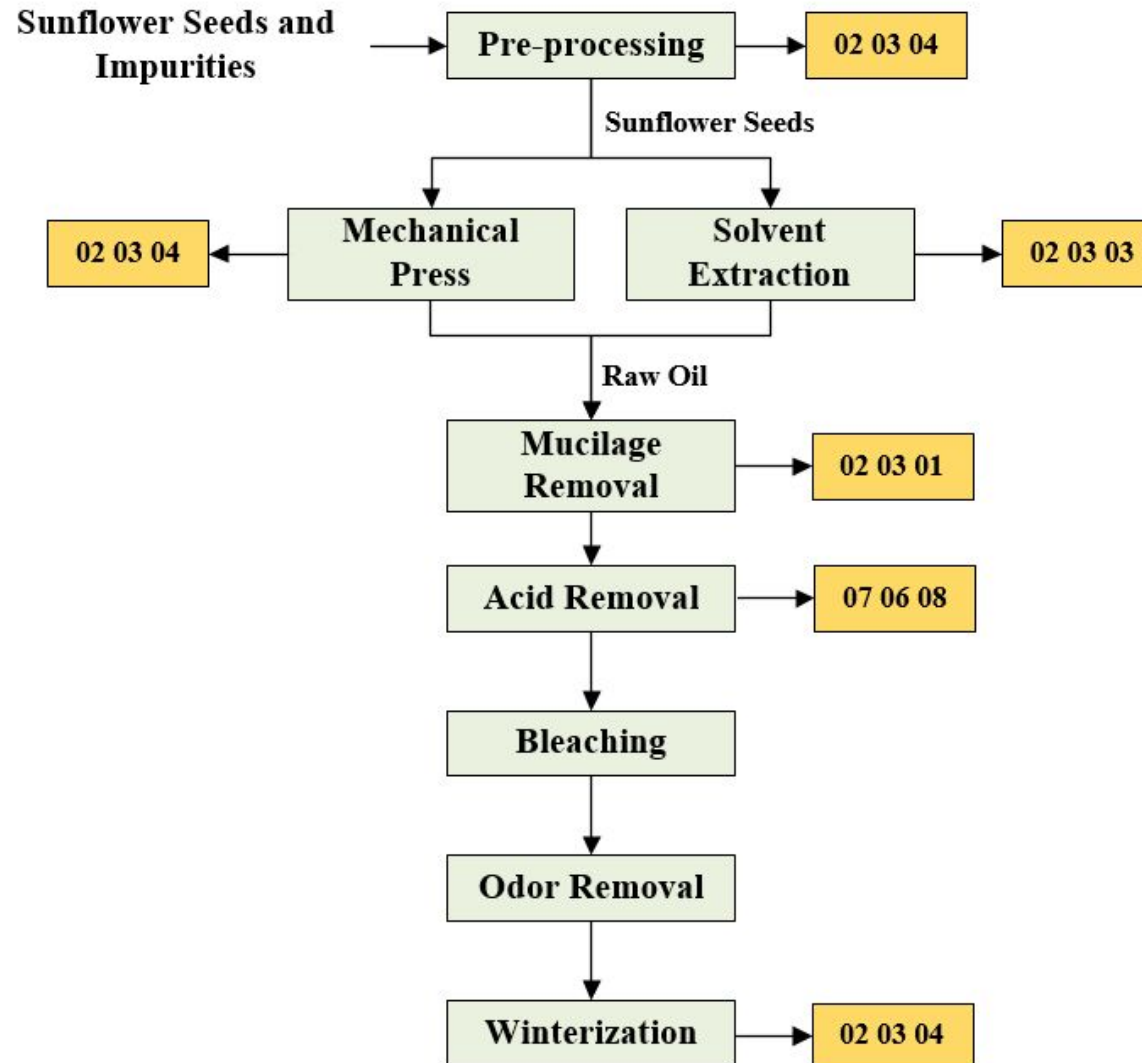


- Process specific waste codes were determined based NACE codes of the facility



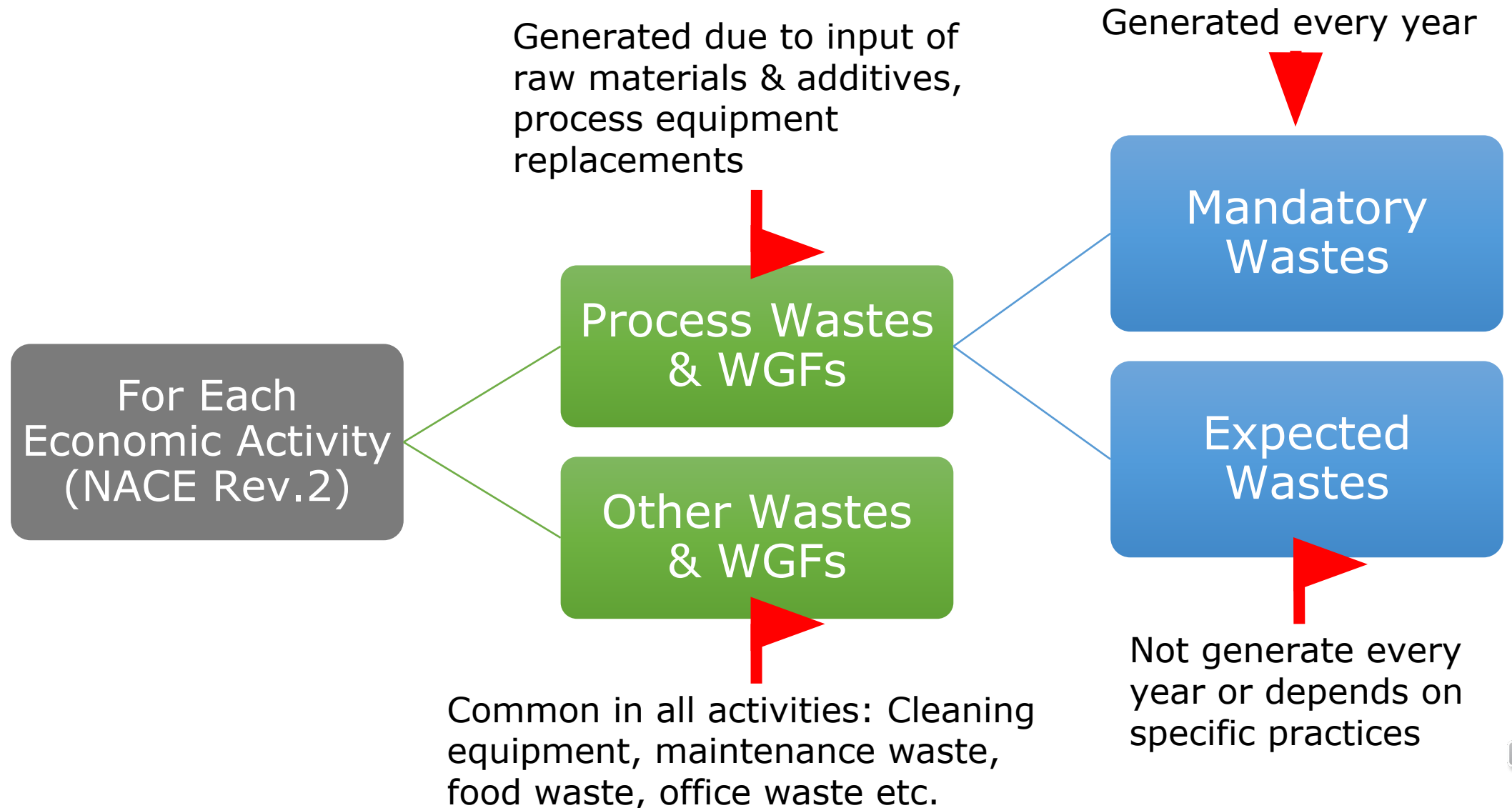


# Example Process Analysis: Sunflower Oil Production





# Waste Groups





# Example Waste Groups & WGFs Sunflower Oil Production



## Mandatory Wastes

Waste Code	Description	Minimum WGF (g/kg)	Maximum WGF (g/kg)
02 03 01	Sludges from washing, cleaning, peeling, centrifuging and separation	0.04	14
02 03 03	Waste from solvent extraction	0.01	2
02 03 04	Materials unsuitable for consumption or processing	0.0035	30

## Expected Wastes

Waste Code	Description	Minimum WGF (g/kg)	Maximum WGF (g/kg)
02 03 02	Waste from preserving agents		
07 01 10 *	Other filter cakes, spent absorbents	0.03	0.044
07 06 08 *	Other still bottoms and reaction residues	0.006	0.023





# Changes in Waste Declaration System

- The list of mandatory wastes, expected wastes and their respective Waste Generation Factors (WGF) were implemented in the Waste Declaration System
- The WGFs will be re-calculated by the system **automatically** every 3 years, and the system will replace old values with the approval of regulatory and supervisory authority





# Changes in Waste Declaration System

- This implementation of WGF will be used for following purposes:
  - 1) If **mandatory wastes** are not declared, the system will not allow **completion of declaration**
  - 2) If the amount of a mandatory waste declared is **below minimum** or **above maximum**, the system will send a warning message to the regulatory and supervisory authorities
  - 3) The system will **compare WGF** of a waste generator with declarations of other waste generators **in the same activity group**. If the declared amounts are outside the limits, the system will send a warning message to the regulatory and supervisory authorities





# Changes in Waste Declaration System

- The Waste Declaration System will ask for three additional information:
  - 1) The **actual production** amount
  - 2) If there are any waste minimization and/or waste re-use/recovery practices in the facility, the system will ask for the **amount of waste before & after recovery/minimization**. The WGF will be calculated based on the amount before recovery/minimization.
  - 3) If there are more than one activity in the facility, the system will ask for an estimate **distribution** of wastes between activities

Waste Code	Waste Amount (ton)	Activity #1	Activity #2	Activity #3
02 03 01	1000	600	200	200
02 03 03	500	100	400	-







# Improvements in Waste Declaration System



To improve waste declaration procedure for waste producers

To relate waste codes to production practices

To audit waste types and quantities from each industrial facility

To add auditing capability to waste declaration system

To measure performance of waste minimization practices

Improved Waste Management

Simplified user interface

Process Analysis:

- Field studies
- Literature
- Workshops

Waste Generation Factor (WGF)

- Field studies
- Literature
- Declaration system information

- Statistical evaluation capability
- Min-Max ranges of WGFs

- On-site waste minimization/recovery information





# Acknowledgement

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**Thank You**

