

WASTE GENERATION PATTERN DRIVERS: THE IMPACT OF ECONOMIC CRISIS, PANDEMICS AND WAR



V. Sousa

CERIS, IST, Universidade de Lisboa

A. Drumond

EMAC, Cascais Ambiente

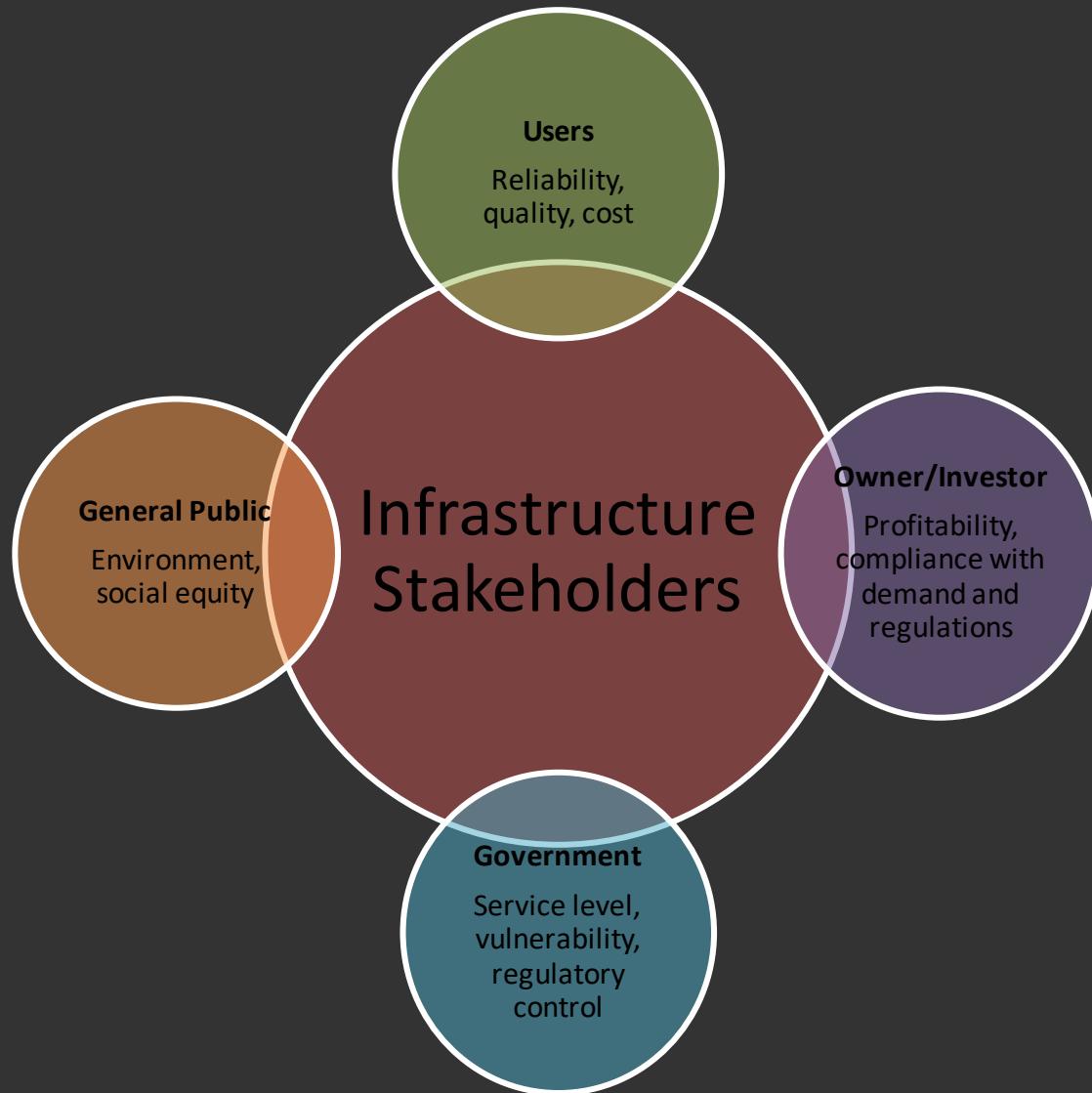
I. Meireles

RISCO, University of Aveiro

C. Dias-Ferreira

Universidade Aberta, CERNAS

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 - 3. Case study**
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1. INTRODUCTION

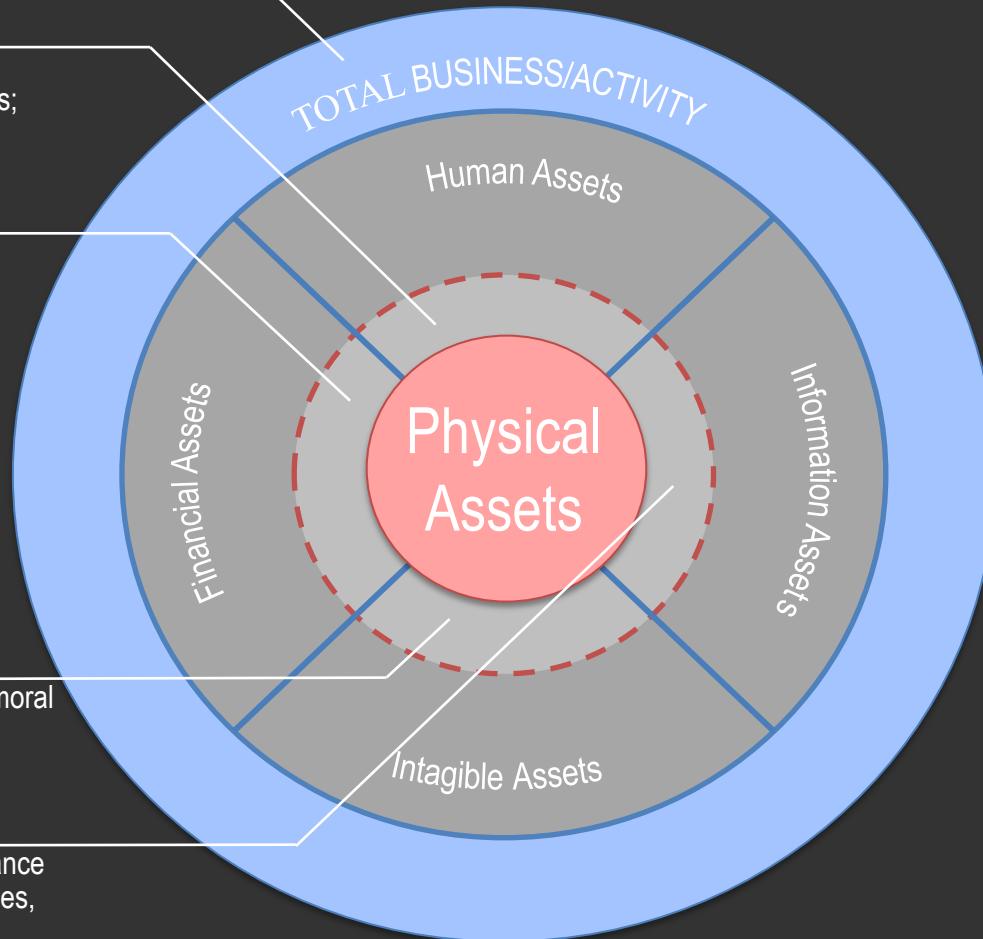
Vital context: business/activity objectives, policies and market; legal and regulatory requirements; socio-cultural context; performance and risk goals

Important interface: motivation; communication; roles and responsibilities; knowledge; experience; competence and capability; leadership; teamwork

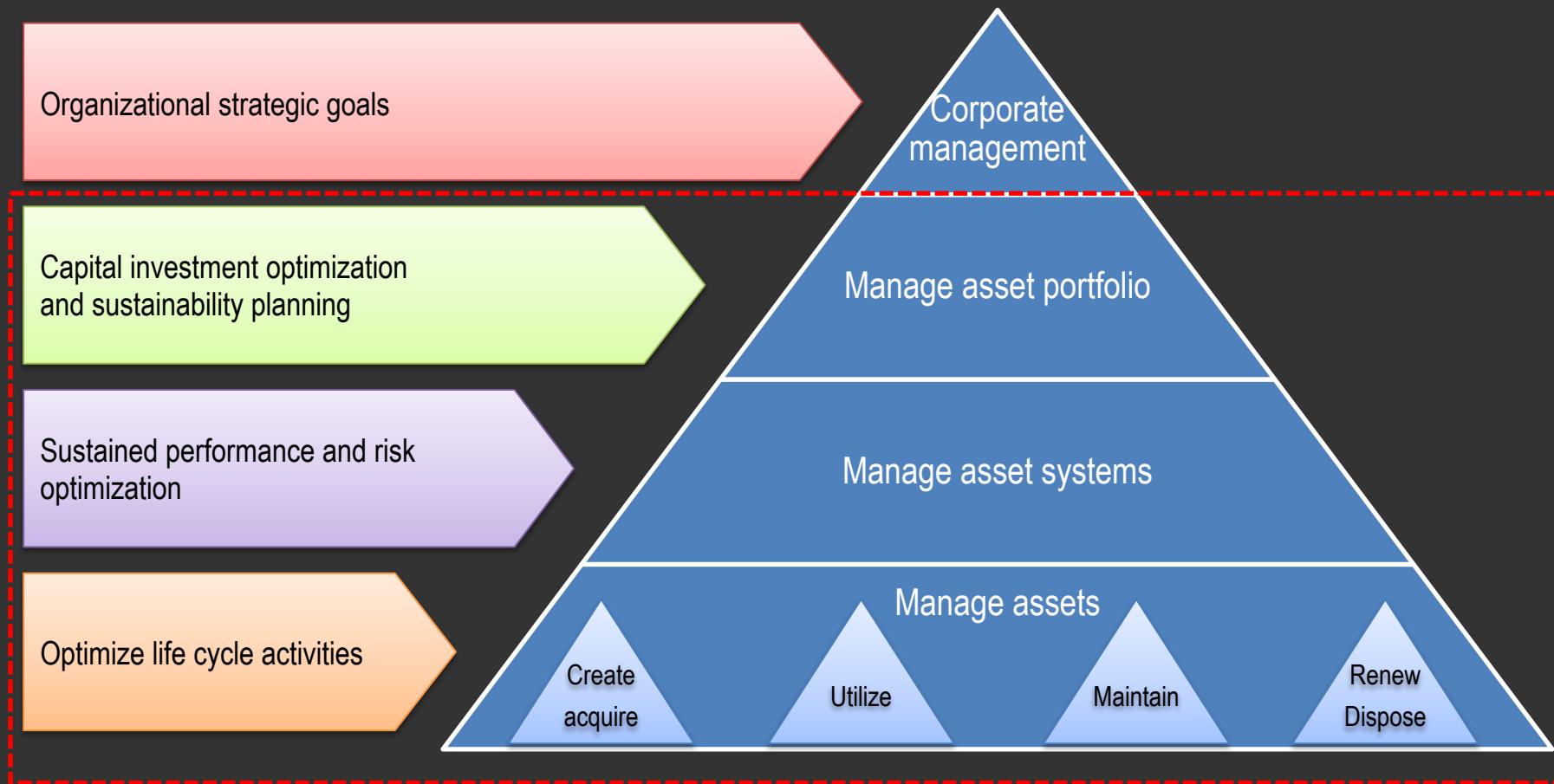
Important interface: life cycle cost; investment criteria, value of asset performance

Important interface: reputation/image; moral and ethics constraints; socio-cultural and environmental impact

Important interface: condition; performance level; hazards and opportunities; processes, protocols and activities



1. INTRODUCTION



2. WASTE GENERATION MODELLING

Modelling waste generation is paramount for waste management, including:

- development of strategies to manage waste (Daskalopoulos et al., 1998)
- estimate land demand for landfilling and other facilities/infrastructures (Leao et al., 2001)
- design waste collection services (Grossman et al., 1974) and infrastructures (Dennison et al., 1996) or treatment facilities and capacities (Chang and Lin, 1997)
- monitoring waste management performance (OECD, 2004)
- estimate personnel and truck needs (Matsuto and Tanaka, 1993) and the corresponding operational costs (Grossman et al., 1974)

3. CASE STUDY



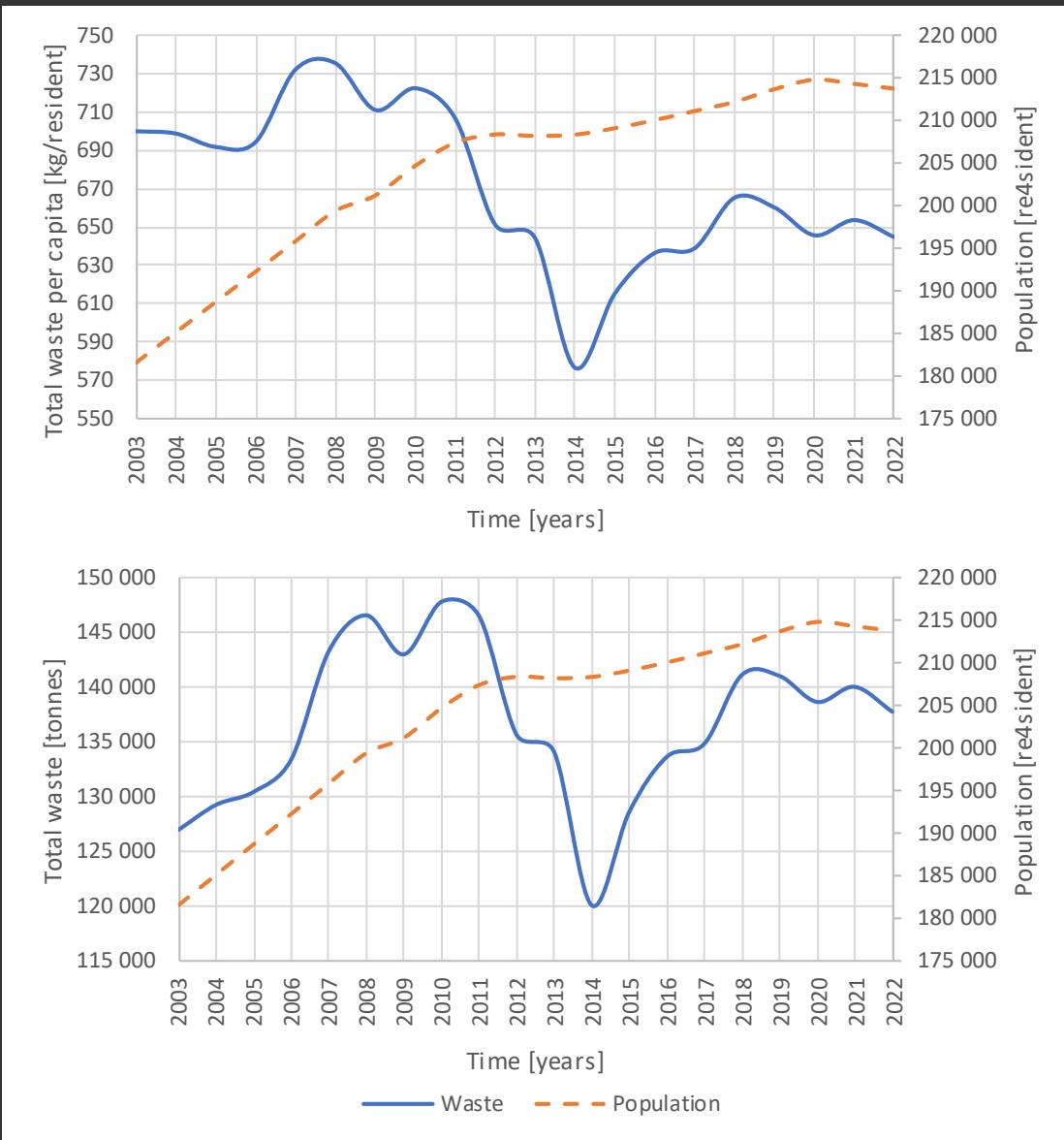
Area: 100 km²

Population: 214 000 inhabitants

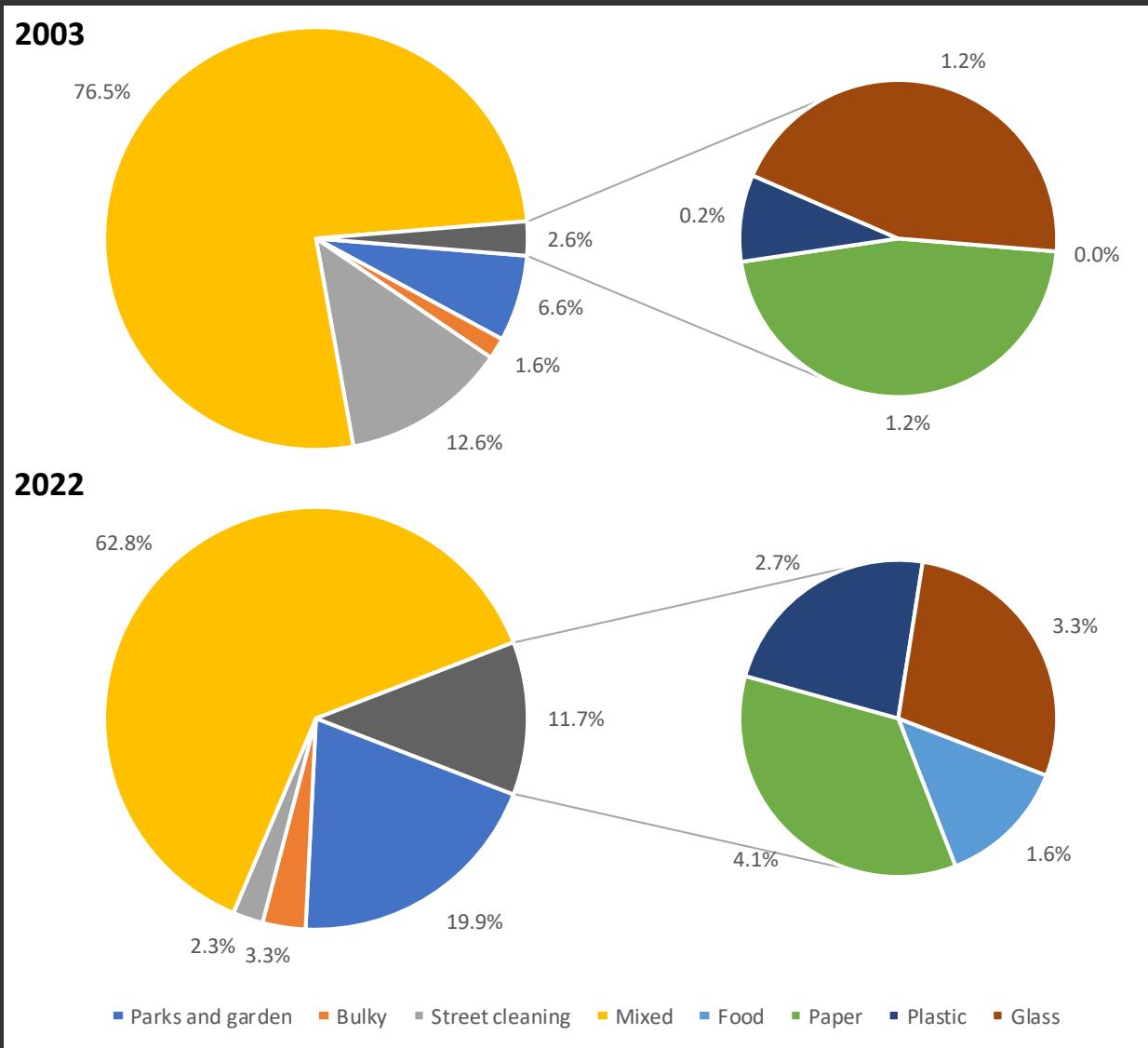
Waste production: 136 000 tonnes per year



4. DATA AND METHODS



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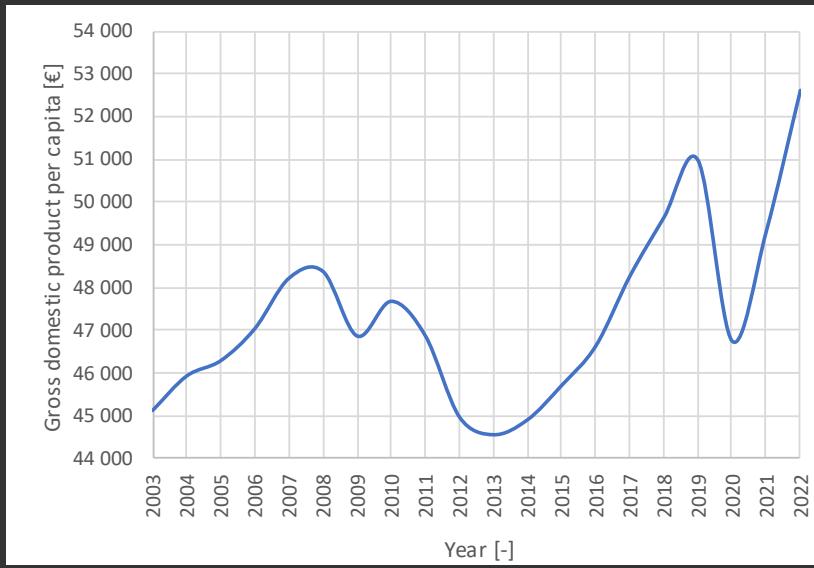
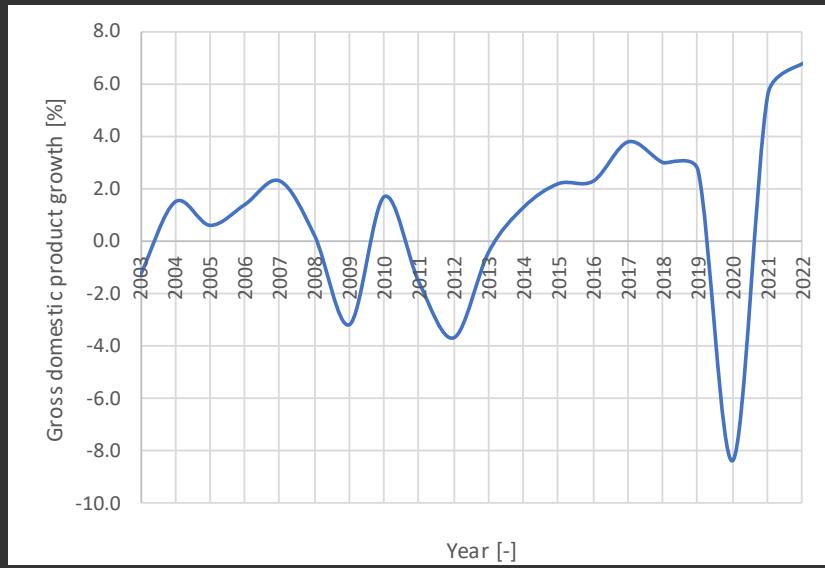
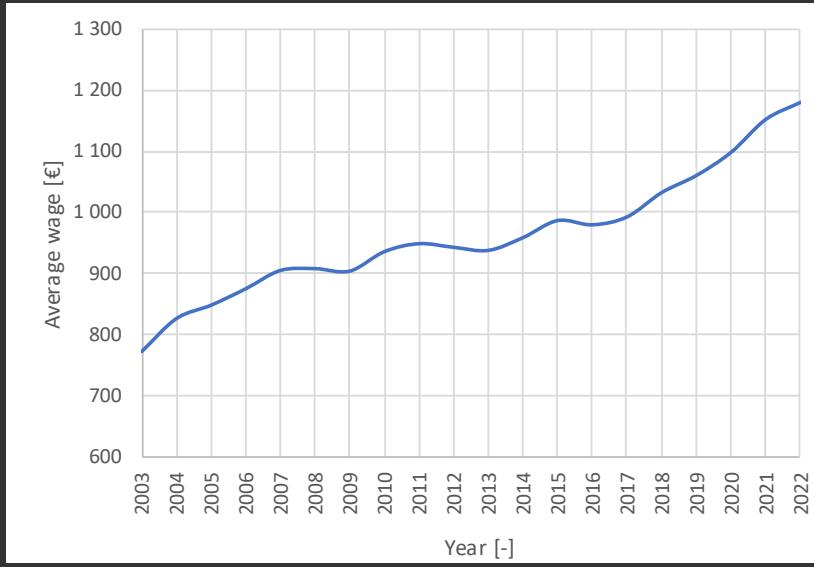
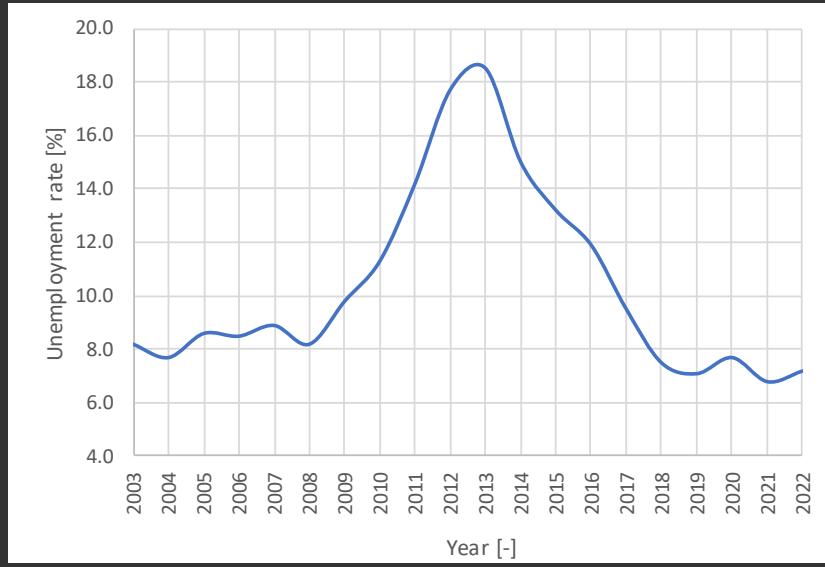
Regression modeling using OLS (Ordinary Least Squares):

$$f(x) = a_0 + \sum_{i=1}^n a_i X_i + \varepsilon$$

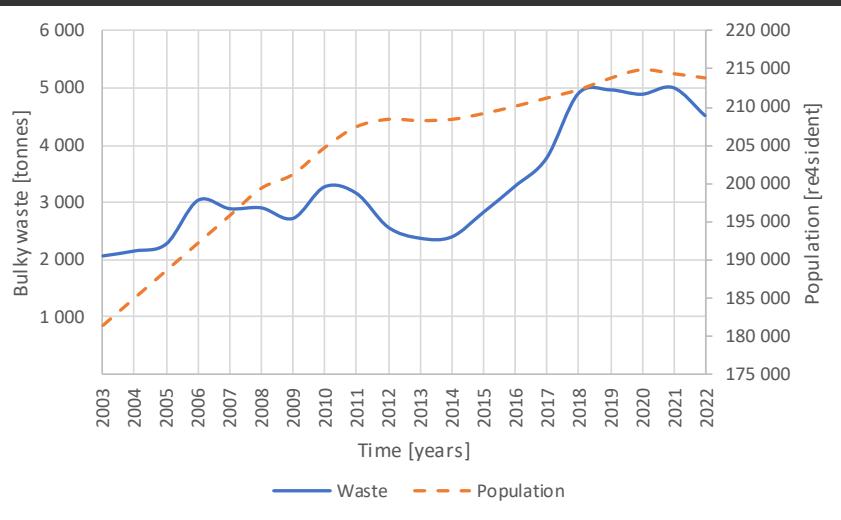
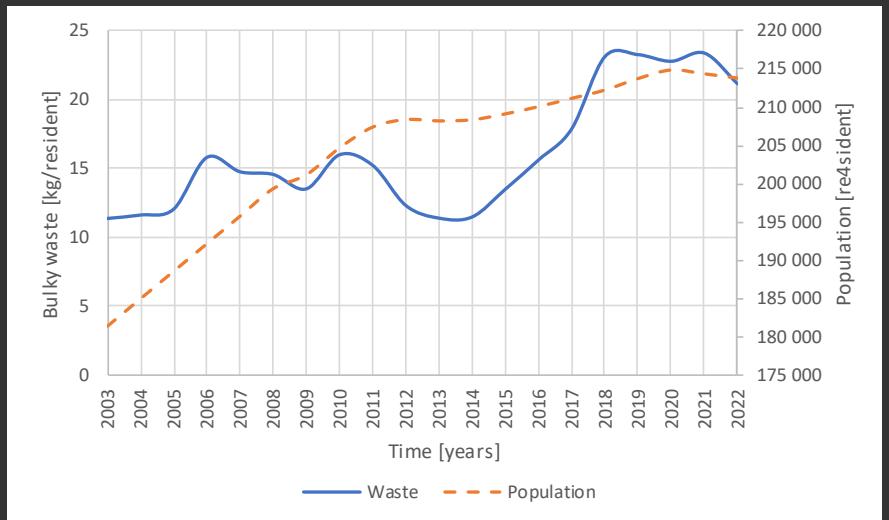
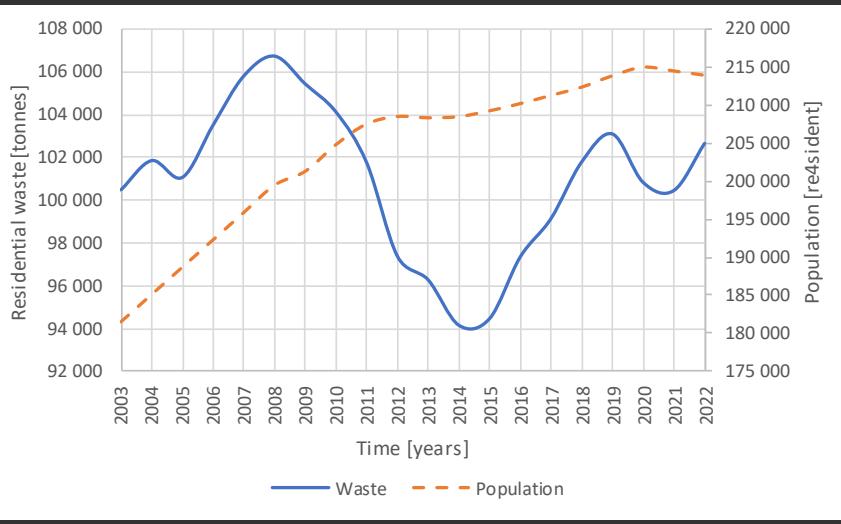
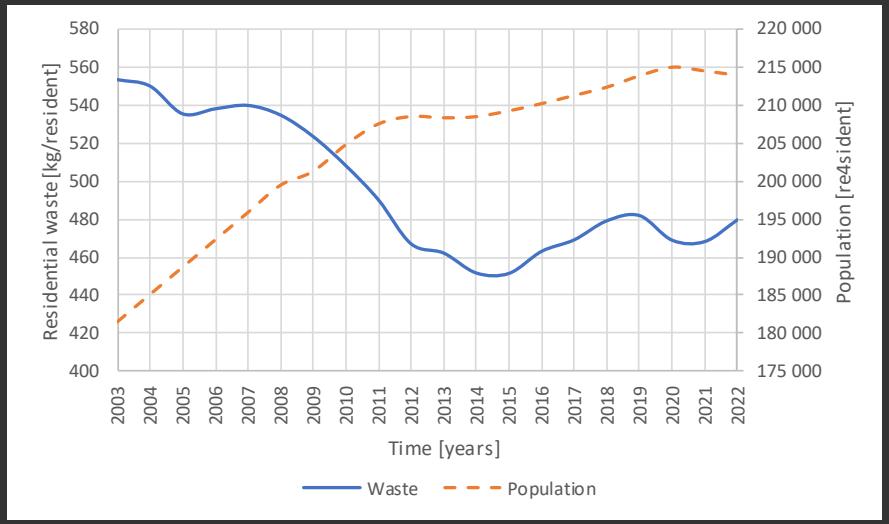
considering

- robust standard errors for determining the coefficients significance;
- best subsets with Akaike Information Criterion and stepwise algorithms to choose the variables to include in the model;
- VIF (Variance Inflation Factor) to assess the variables multicollinearity (threshold 5);
- White, Breuch-Pagan and F-test for assessing heteroskedasticity.

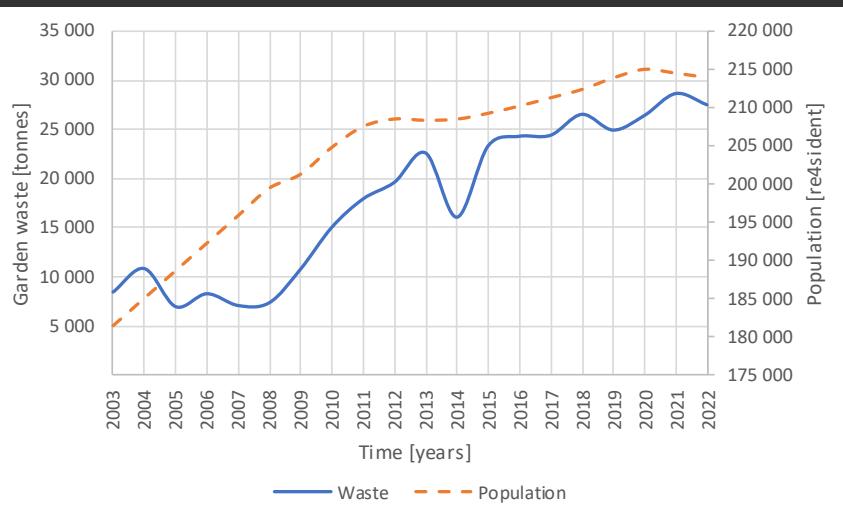
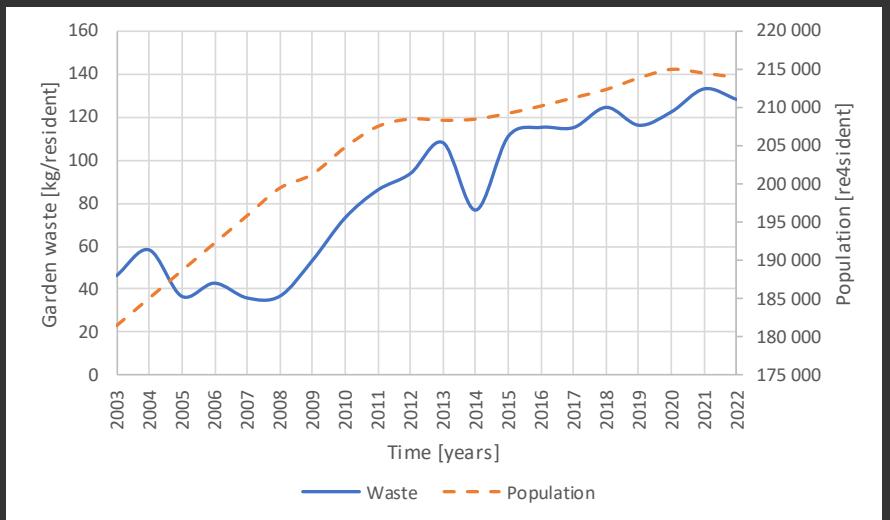
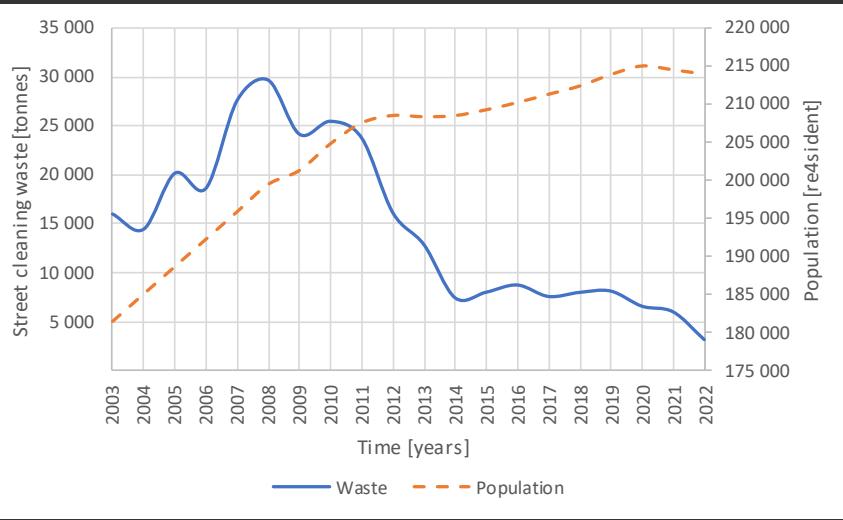
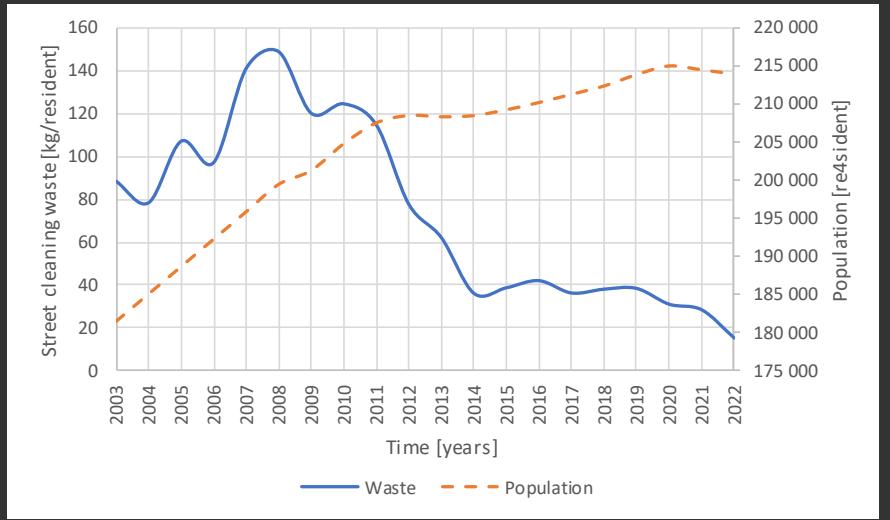
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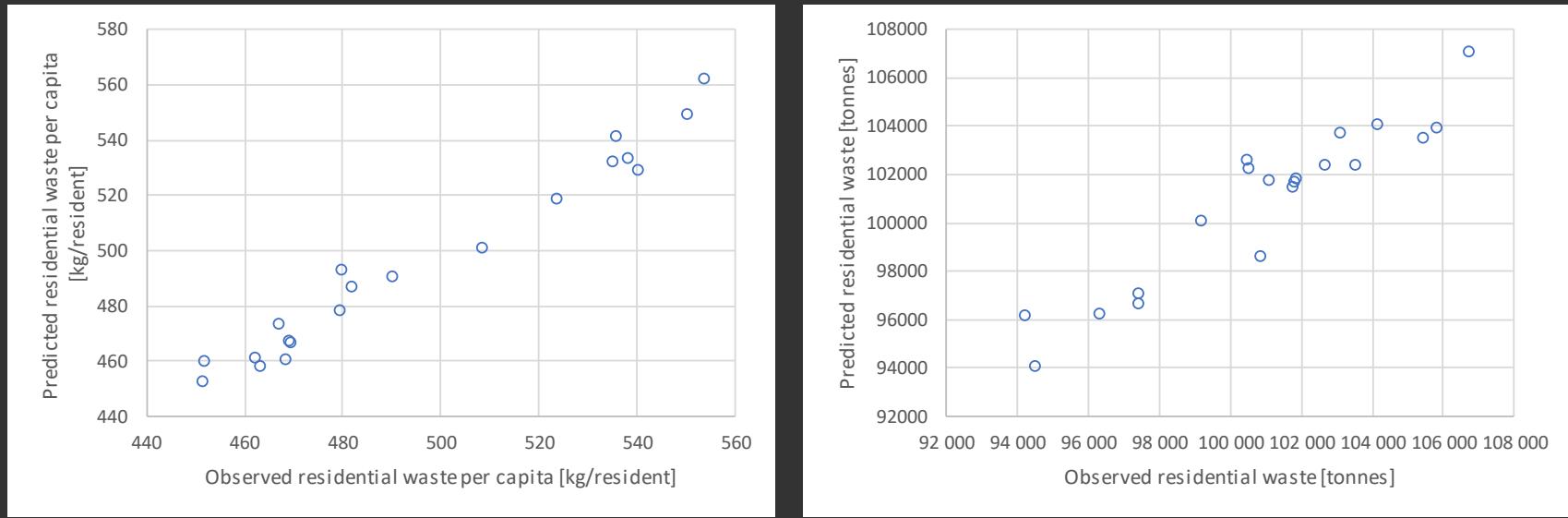
5. RESULTS AND DISCUSSION



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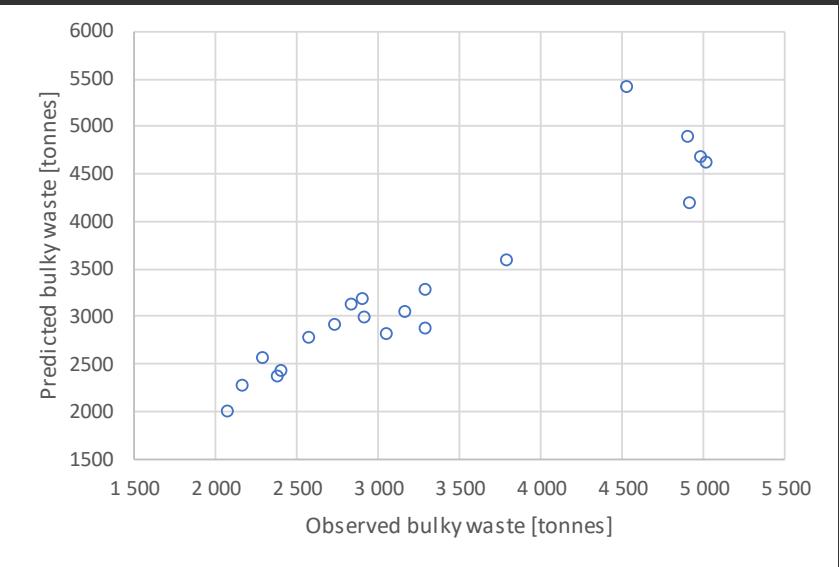
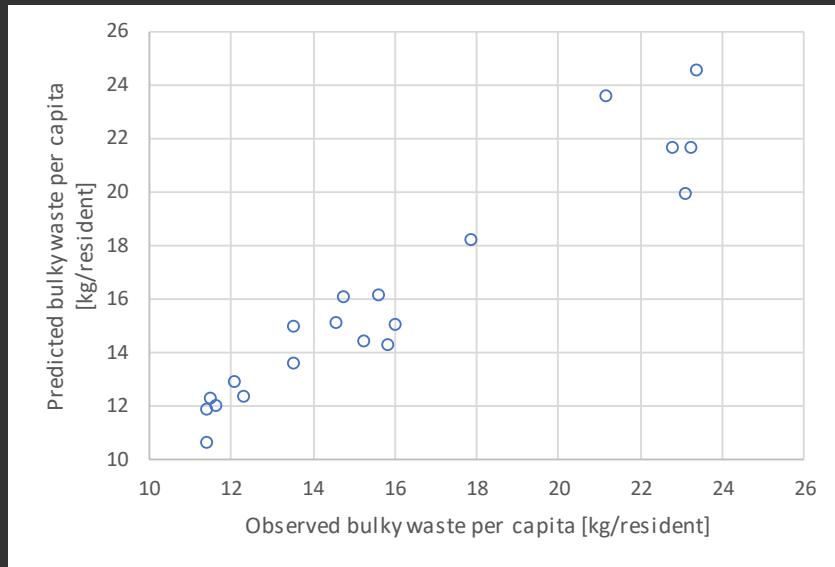
5. RESULTS AND DISCUSSION



Parameter	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Robust Std. Error			
Intercept	811.879	72.014		11.274	0.000
[FinancialCrisis=0]	-10.236	3.541	0.141	-2.891	0.011
[FinancialCrisis=1]	0 ^b				
Population	-0.004	0.000	-1.112	-19.690	0.000
GDPG	-2.489	0.624	-0.237	-3.986	0.001
GDP	0.010	0.002	0.595	6.500	0.000

Parameter	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Robust Std. Error			
Intercept	25310.289	8932.767		3.948	0.001
[COVI9=0]	7086.323	3317.261	0.612	-2.136	0.050
[COVI9=1]	0 ^b				
[FinancialCrisis=0]	2865.979	655.357	0.393	-4.373	0.001
[FinancialCrisis=1]	0 ^b				
GDP	2.477	0.251	1.465	9.876	0.000
Wage	-45.073	5.630	-1.318	-8.006	0.000

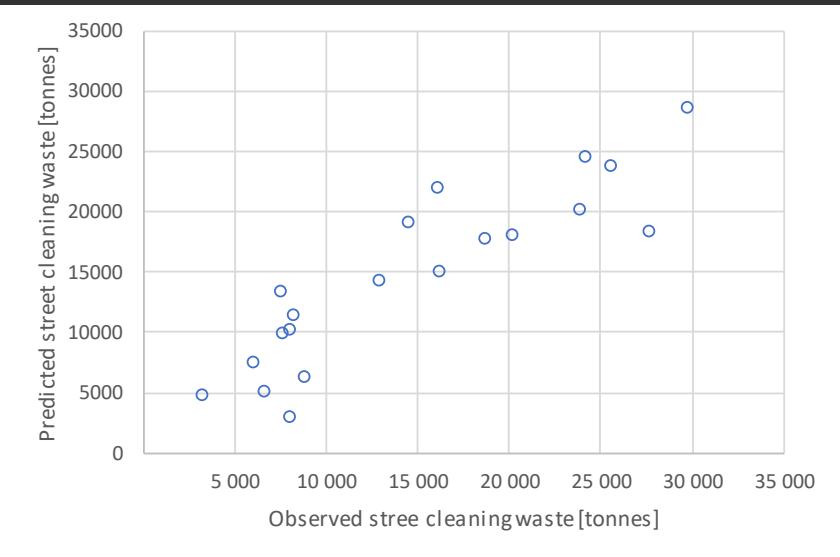
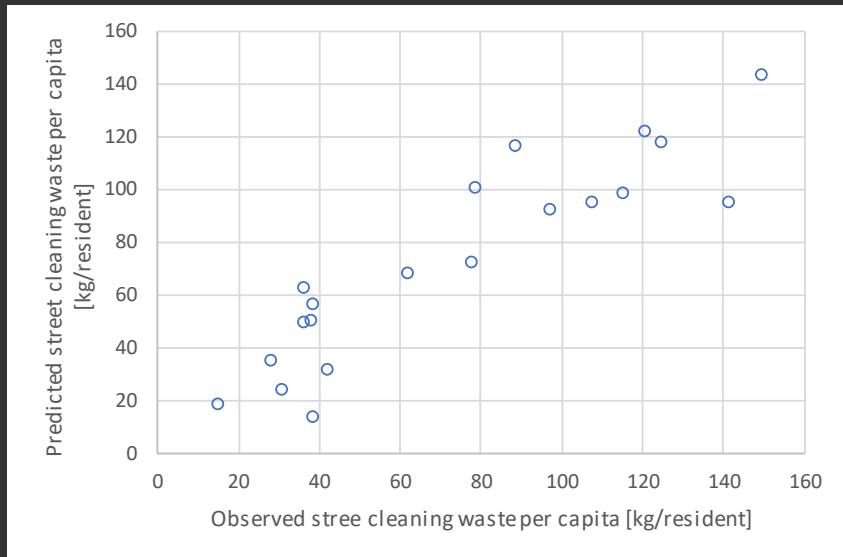
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Parameter	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Robust Std. Error			
Intercept	-62.915	16.496		-3.814	0.002
[FinancialCrisis=0]	1.625	0.735	-0.182	2.213	0.043
[FinancialCrisis=1]	0 ^b				
[COVI19=0]	-4.718	2.021	0.333	-2.335	0.034
[COVI19=1]	0 ^b				
GDP	0.001	0.000	0.564	3.741	0.002
Population	0.000	3.938E-05	0.312	3.353	0.004

Parameter	Unstandardized Coefficients			Standardized Coefficients	t	Sig.
	B	Robust Std. Error	Beta			
Intercept	-13111.383	4034.128			-3.250	0.005
[FinancialCrisis=0]	414.745	139.946	-0.200		2.964	0.010
[FinancialCrisis=1]	0 ^b					
GDPG	-82.651	24.108	-0.275		-3.428	0.004
GDP	0.223	0.082	0.461		2.702	0.016
Wage	5.909	1.110	0.606		5.322	0.000

5. RESULTS AND DISCUSSION



Parameter	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Robust Std. Error			
Intercept	-77.919	124.911		-0.624	0.542
[COVI9=0]	-52.817	20.007	0.385	-2.640	0.019
[COVI9=1]	0 ^b				
[FinancialCrisis=0]	-47.256	10.868	0.548	-4.348	0.001
[FinancialCrisis=1]	0 ^b				
GDP	0.015	0.004	0.772	3.668	0.002
Wage	-0.523	0.105	-1.291	-4.977	0.000

Parameter	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Robust Std. Error			
Intercept	-17884.299	26484.266		-0.675	0.510
[COVI9=0]	-9937.777	4230.640	0.372	-2.349	0.033
[COVI9=1]	0 ^b				
[FinancialCrisis=0]	-10113.481	2257.879	0.603	-4.479	0.000
[FinancialCrisis=1]	0 ^b				
GDP	2.982	0.874	0.765	3.412	0.004
Wage	-96.794	21.936	-1.228	-4.413	0.001

5. FINAL REMARKS

The 2008 economic crisis was particularly harsh in some countries, including Portugal, creating a peculiar context to assess the influence of economic indicators on waste generation.

The COVID-19 pandemics also introduced changes on the peoples' dynamics, in addition to the impact on consumption.

The financial crisis impacted all waste fluxes, but the COVID-19 did not affect the residential waste.

In addition to the exogenous impacts, the wealth governed the waste generation pattern.

In terms of waste consumption per capita, there is a decreasing trend opposed to the increasing trend of the total waste. This may be explained by increasing awareness to the need of reducing waste.