EVALUATION OF FUTURE MUNICIPAL SOLID WASTE PRODUCTION. CASE STUDY IN VALENCIA REGION (SPAIN)

Tuesday, 5 May 2020, 14:00–15:45

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EGU General Assembly 2020

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CONTENT

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1. OBJETIVES

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- The objective of the work was to carry out an **evaluation of the future production of (MSW)** within the V5 production area inside Valencia Region (Spain) in 2012-2034

Figure 1.-Map of Spain

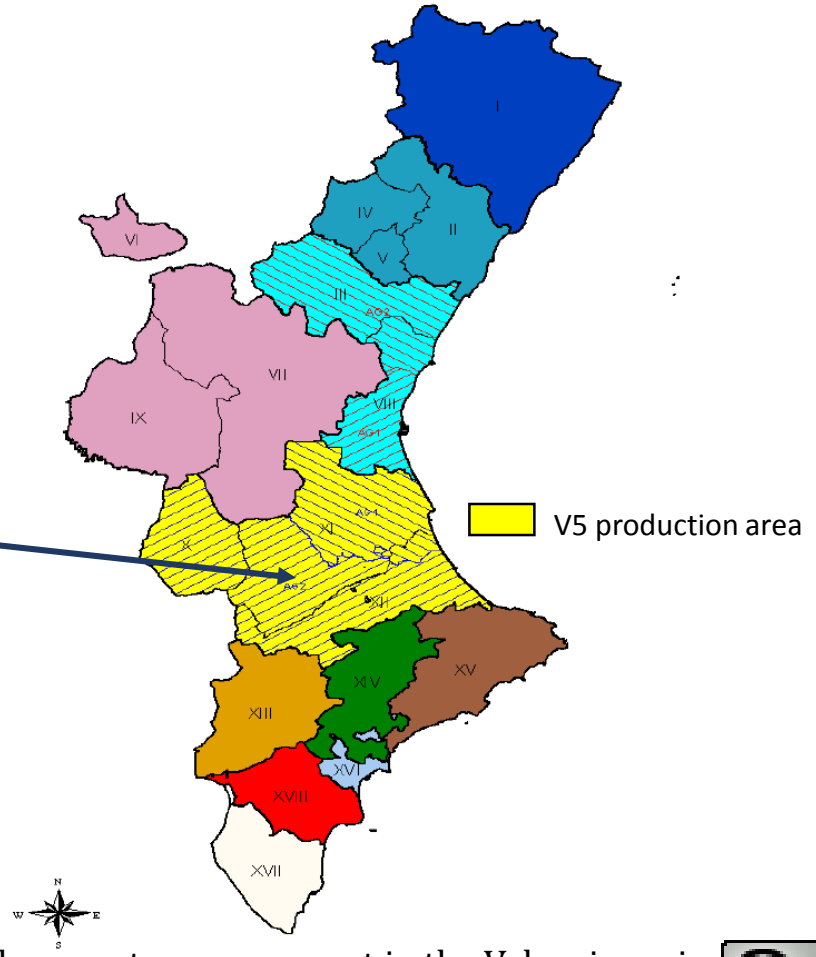

Figure 2.- Zoning of urban waste management in the Valencia region (Spain) Source: Integral waste plan of the Valencian Community

1. OBJETIVES

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- Demonstrate the existence of **correlations between socio-economical parameters (GDP) and MSW production**

Figure 3.-GDP Illustration
Source: shutterstock

Figure 4.- USW-container
Source: shutterstock

2. METHODOLOGY

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- **Analysis of the evolution of the population in the area during the analysis period**

Estimation of the population evolution in Valencia Region

Data: Valencian Institute of Statistics (IVE) providesthe estimation of the evolution of the population registered on the basis of the data obtained from the last municipal census carried out in 2011.

- **Waste generation forecast for 2012-2034**

Determine the rate of waste production per capita (kg/inhab/yr)

Determine the annual waste production based on the population and MSW production rate (kg/year)

Data: Types and quantities of waste collected in the Valencia Region in the period 2000-2013

2.1. ESTIMATION OF THE POPULATION EVOLUTION IN VALENCIA REGION

REGISTERED POPULATION + NON-RESIDENT POPULATION + TOURIST POPULATION = POPULATION GENERATING WASTE

Figure 5.-Methodology for the projection of the waste-generating population load. Source: RIP

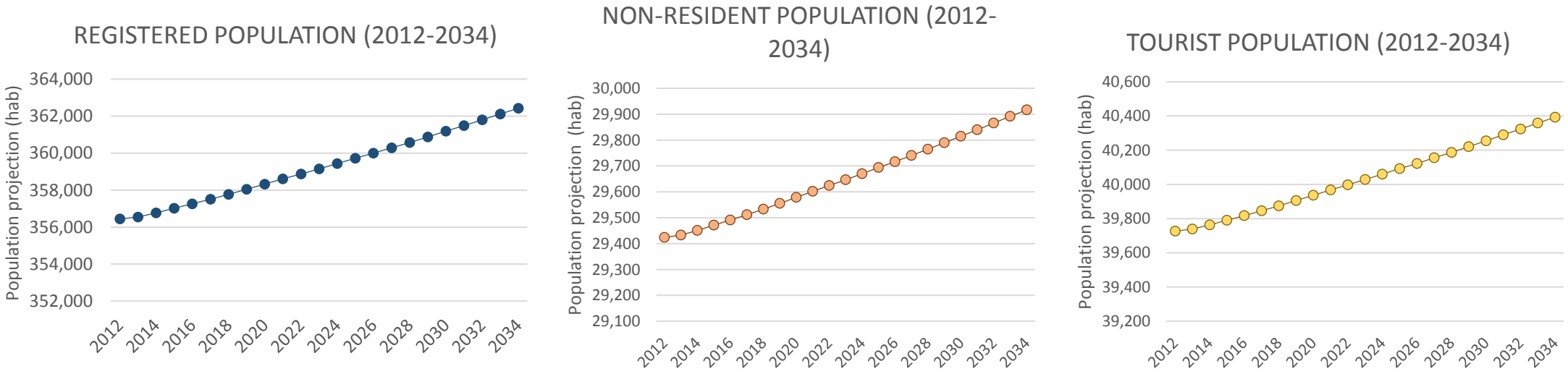
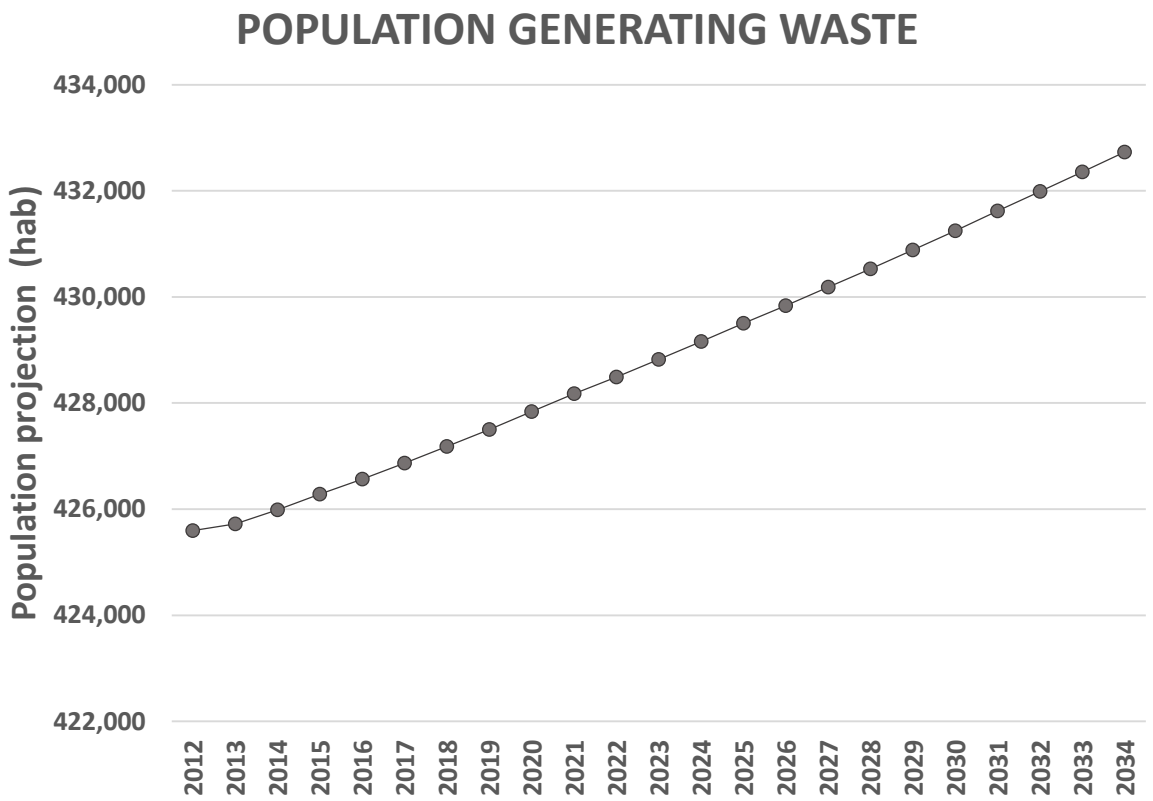


Figure 6.- Evolution of the population in Valencia Region (2012-2034) Souce: IVE

2.1. ESTIMATION OF THE POPULATION EVOLUTION IN VALENCIA REGION

POPULATION GENERATING WASTE



According to the calculations made based exclusively on the official databases provided by the IVE and INE, it is estimated that the population will increase as shown in Figure 7, increasingly between 425,516 habitants in 2011 and **432,731 habitants in 2034.**

This is only an increase of **7,215 habitants.**

Figure 7.- Evolution of the resident population (2012-2034) in Valencia region. Source: IVE

2. METHODOLOGY

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- **Analysis of the evolution of the population in the area during the analysis period**
  - Estimation of the population evolution in Valencia region
    - **Data: Valencian Institute of Statistics (IVE) providesthe estimation of the evolution of the population registered on the basis of the data obtained from the last municipal census carried out in 2011.**

- **Waste generation forecast for 2012-2034**
  - Determine the rate of waste production per capita (kg/inhab/yr)
  - Determine the annual waste production based on the population and MSW production rate (kg/year)
    - **Data:** Types and quantities of waste collected in the Valencia Region in the period 2000-2013

2.2. ESTIMATE OF THE ANNUAL WASTE PRODUCTION RATE PER CAPITA

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
10.1.1 Residuos domésticos y similares	2,349,064	2,314,496	2,483,958	2,428,190	2,355,713	2,125,428	2,136,842	2,226,822	2,155,056	1,862,736	1,869,060	1,805,042	1,811,419	1,798,999
10.1.2 Residuos domésticos voluminosos mezclados	41,151	58,751	68,792	64,720	72,262	73,993	67,619	68,122	88,698	38,598	59,550	91,753	45,969	28,634
06 Residuos metálicos	1,631	26,455	17,601	10,520	16,699	10,187	5,526	2,873	5,488	6,381	3,290	842	1,533	1,663
07.1 Residuos de vidrio	58,986	56,371	43,876	46,748	49,367	52,238	58,981	66,777	75,269	78,434	77,146	74,444	79,540	80,869
07.2 Residuos de papel y cartón	42,873	44,761	33,128	55,083	55,763	57,224	93,027	110,309	109,203	98,722	75,158	66,658	60,294	54,032
07.4 Residuos de plásticos	2,050	27,353	23,699	8,133	14,730	33,410	42,694	47,099	54,763	25,910	26,006	16,978	6,270	1,687
07.5 Residuos de Madera	771	14,622	9,028	7,111	4,584	9,707	13,272	10,909	24,436	2,476	9,244	5,800	6,967	11,331
07.6 Residuos textiles	8	18	24	35	95	186	594	110	2	326	291	146	1,164	963
08.2 y 08.43 Equipos eléctricos desechados y Componentes de equipos eléctrónicos desechados	17	899	1,897	1,774	2,069	2,437	1,664	721	810	198	1,192	328	1,881	1,214
08.41 Residuos de pilas y acumuladores	207	3,663	1,446	754	287	473	423	199	1136	465	652	59	78	2,564
09. Residuos animales y vegetales	107,359	5,825	14,025	26,142	36,342	49,239	203,619	172,542	134,552	149,727	88,836	70,792	70,675	52,175
10.2 Envases mixtos y embalajes mezclados	17,086	53,533	35,205	0	83,002	79,232	84,392	79,085	112,892	59,971	41,120	41,815	40,158	39,796
11 Lodos comunes (secos)	0	0	0	0	0	6,401	70	0	260	964	949	1,852	0	0
12 Residuos minerales (incluye residuos de construcción y demolición)	0	0	28,766	25,865	121,090	141,993	124,937	289,224	167,459	11,029	47,837	44,919	21,457	65,539
18 Otros	7,571	42,406	3,467	7,616	15,780	40,945	20,205	9,509	5,448	5,873	4,484	365	1,557	2,142
TOTAL RESIDUOS MEZCLADOS	2,390,215	2,373,247	2,552,750	2,492,910	2,427,975	2,199,421	2,204,461	2,294,944	2,243,754	1,901,334	1,928,610	1,896,795	1,857,388	1,827,633
TOTAL RESIDUOS DE RECOGIDA SELECTIVA	238,559	275,906	212,162	189,781	399,808	483,672	649,404	789,357	691,718	440,476	376,205	324,998	291,574	313,975
	2,628,774	2,649,153	2,764,912	2,682,691	2,827,783	2,683,093	2,853,865	3,084,301	2,935,472	2,341,810	2,304,815	2,221,793	2,148,962	2,141,608

Table 1- Types and quantities of waste collected in the Community of Valencia in the period 2000-2013 (Source: INE)

2.2. ESTIMATE OF THE ANNUAL WASTE PRODUCTION RATE PER CAPITA

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Figure 8.- Estimation of waste production per habitant

Kg OF WASTE PER INHABITANT = Kg OF WASTE COLLECTED IN VALENCIA REGION / POPULATION GENERATING WASTE

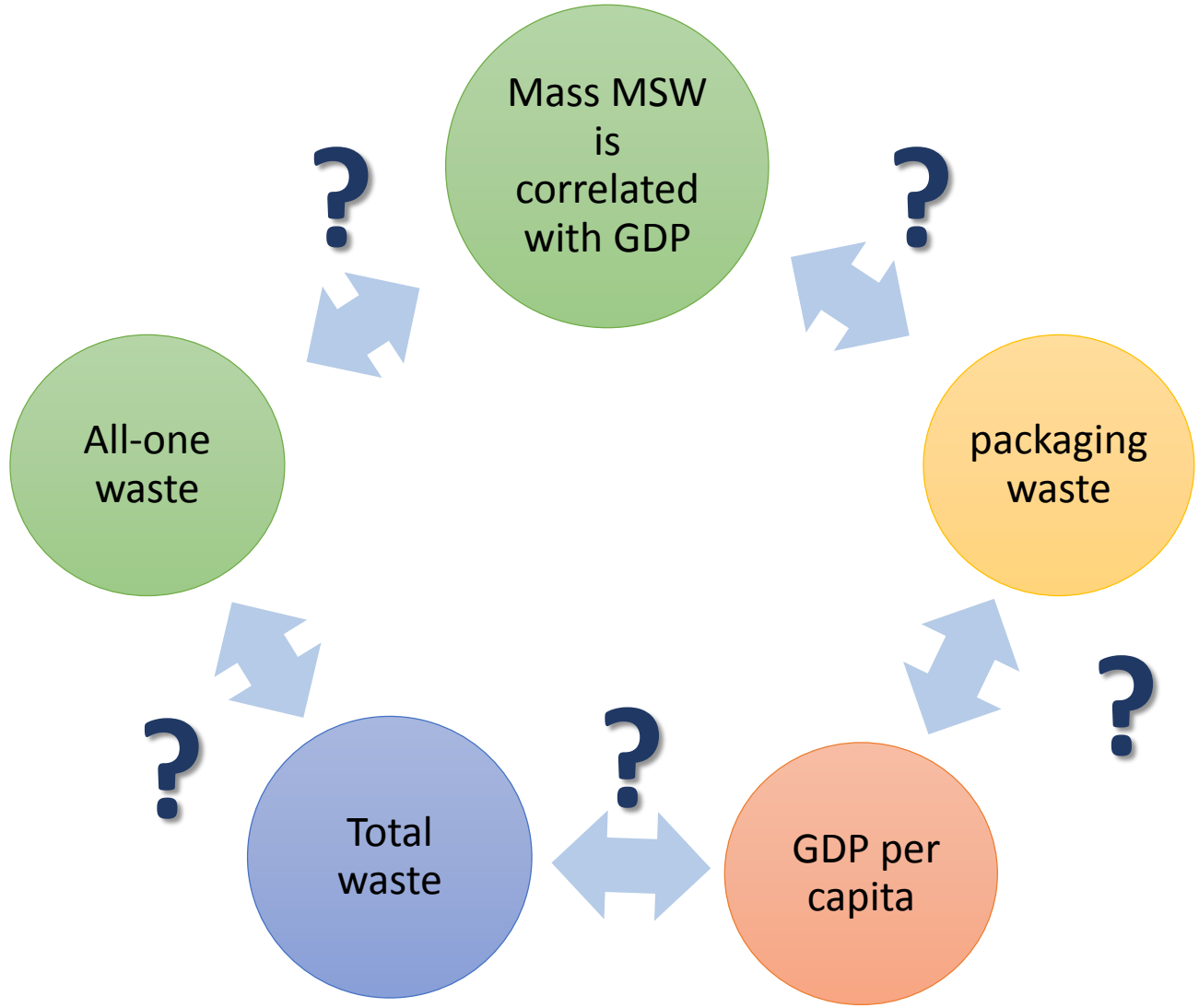
Comunidad Valenciana	kg/hab						
	2013	2012	2011	2010	2009	2008	2007
Residuos en masa	274.1	274.2	273.1	283.5	282.8	328.9	346.2
Residuos voluminosos	4.4	7.0	13.9	9.0	5.9	13.5	10.6
Residuos animales y vegetales	8.0	10.7	10.7	13.5	22.7	20.5	26.8

Figure 9.- Waste production per habitant in the Valencian region

Therefore, we will take as a starting point in our analysis these values of the annual per capita waste production rate for 2011:

- *Annual per capita production rate of waste by mass =* ***273.1 kg/hab/yr***
- *Annual per capita production rate of bulky waste =* ***13.9 kg/hab/yr***
- *Annual per capita production rate of animal and vegetable waste =* ***10.7 kg/hab/yr***

3. EVALUATION OF THE REAL PRODUCTION OF WASTE IN VALENCIA REGION CONSIDERING A VARIABLE ANNUAL PRODUCTION RATE PER CAPITA



3. EVALUATION OF THE REAL PRODUCTION OF WASTE IN VALENCIA REGION CONSIDERING A VARIABLE ANNUAL PRODUCTION RATE PER CAPITA

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The analysis of the correlation between the evolution of economic growth indicators and waste production indicators has been done

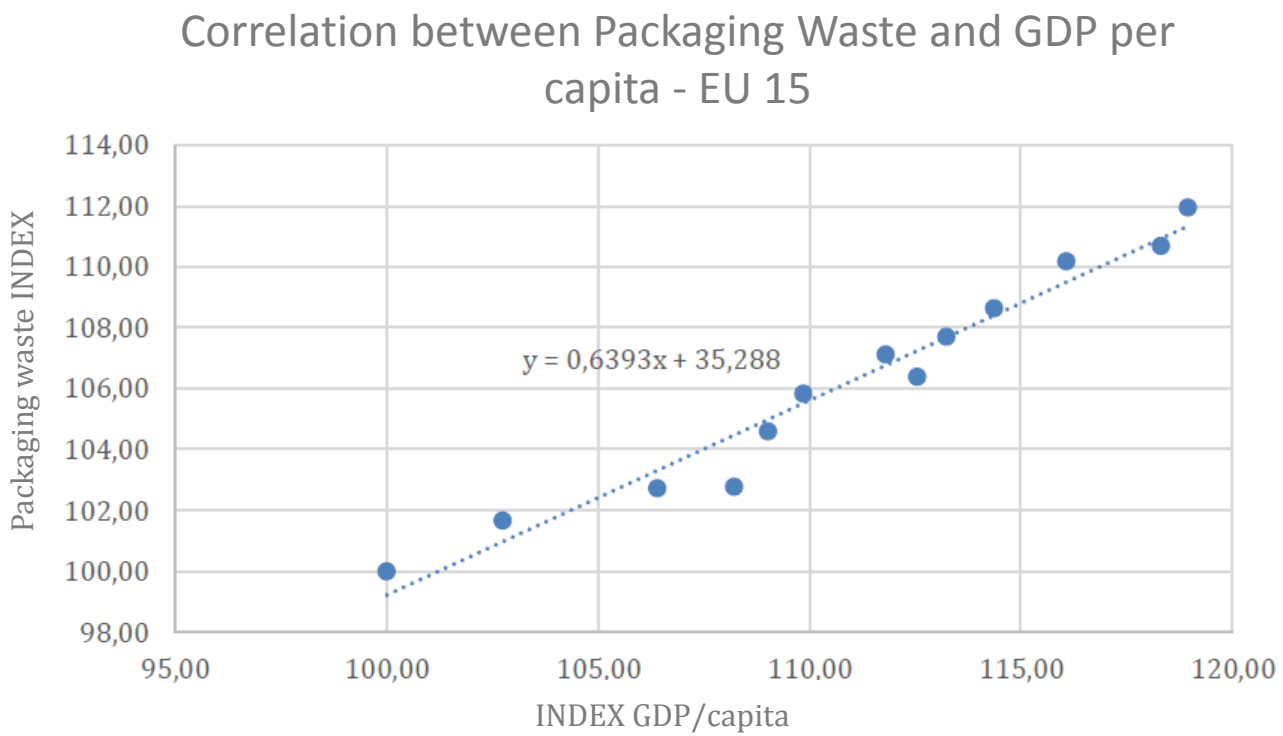

Figure 10.- Correlation between packaging waste and GDP per capita - EU15. Source European Environment Agency (EEA)

In Figure 10 the correlation between the production of packaging waste and GDP per capita is shown → perfectly linear.

3. EVALUATION OF THE REAL PRODUCTION OF WASTE IN VALENCIA REGION CONSIDERING A VARIABLE ANNUAL PRODUCTION RATE PER CAPITA

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Comparison between the **variation in the production of packaging waste** and the **variation in the production of total MSW** in Valencia region in the period 2005-2013.

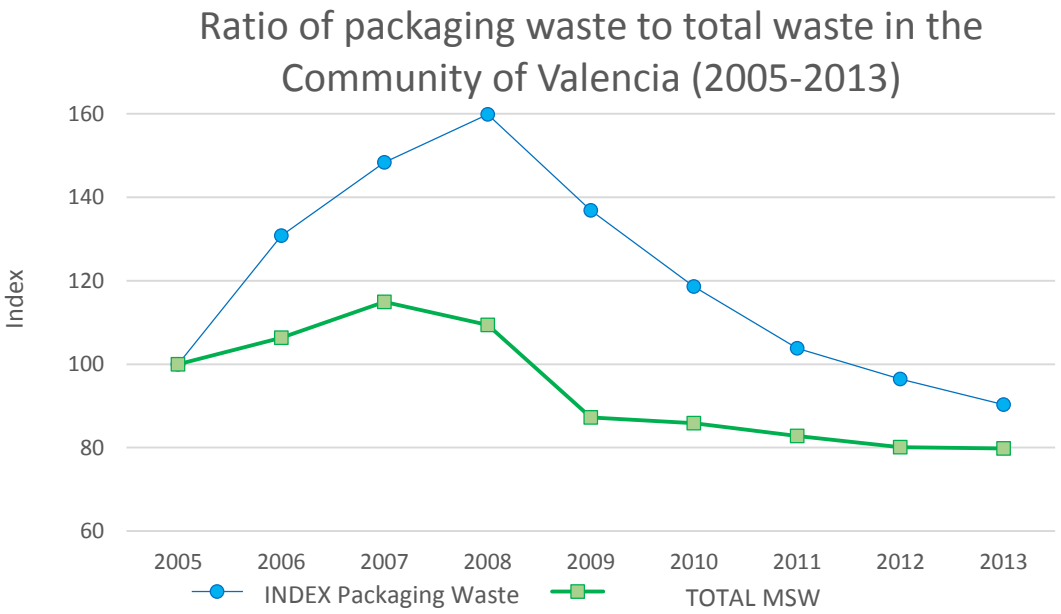

Figure 11.- Relationship between packaging waste and total waste in the Valencia region (2005-2013)

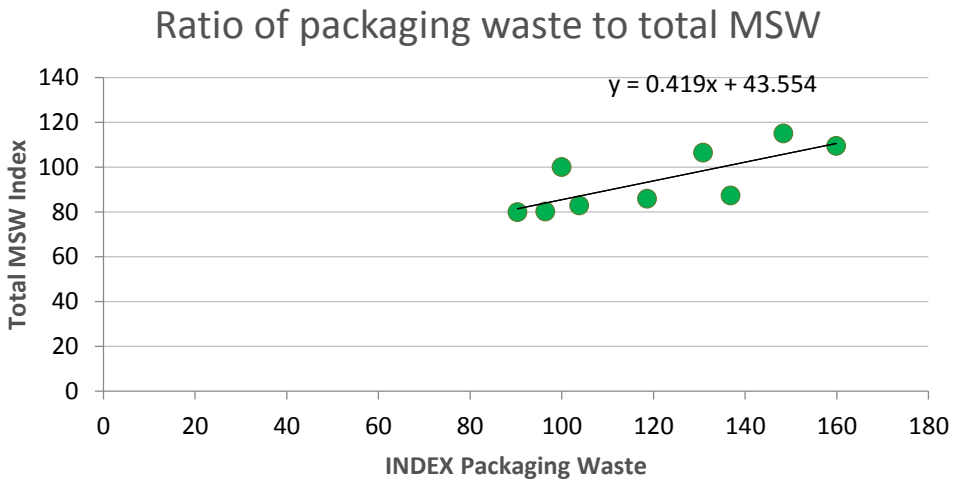

Figure 12.- Correlation between packaging waste and total waste in the Valencia region(2005-2013)

The correlation between the production of packaging waste and the production of total MSW is also **linear.** The trends in the variations in the production of both types of waste in the scope of the Valencian Region are similar.

3. EVALUATION OF THE REAL PRODUCTION OF WASTE IN VALENCIA REGION CONSIDERING A VARIABLE ANNUAL PRODUCTION RATE PER CAPITA

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Comparison between the **production of mixed waste (grey bag)** and **total MSW** in Valencia Region in the period 2005-2013

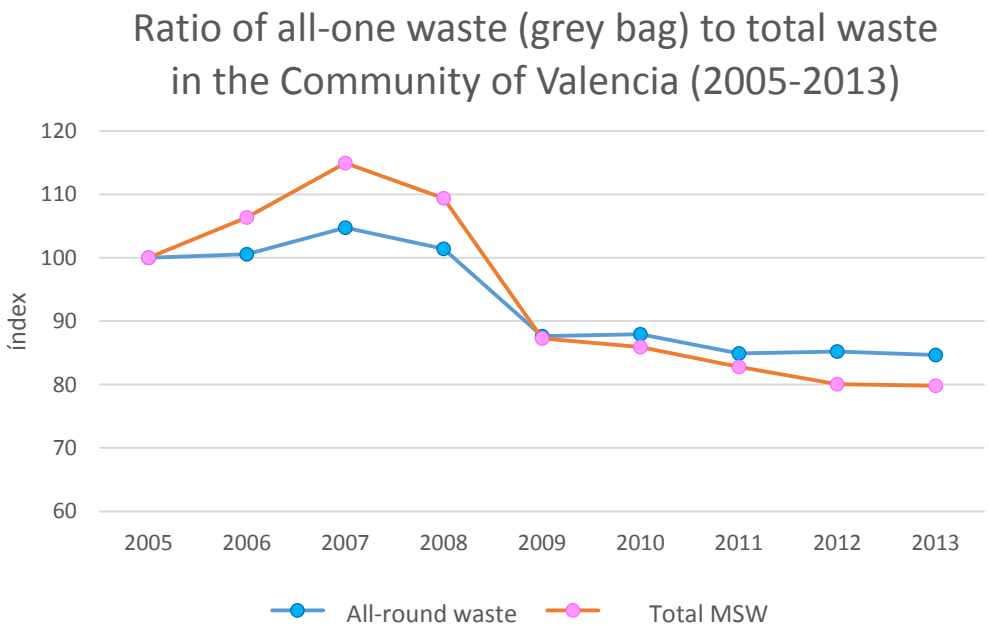

Figure 13.-Ratio of all-one waste (grey bag) to total waste in the Valencia region (2005-2013)

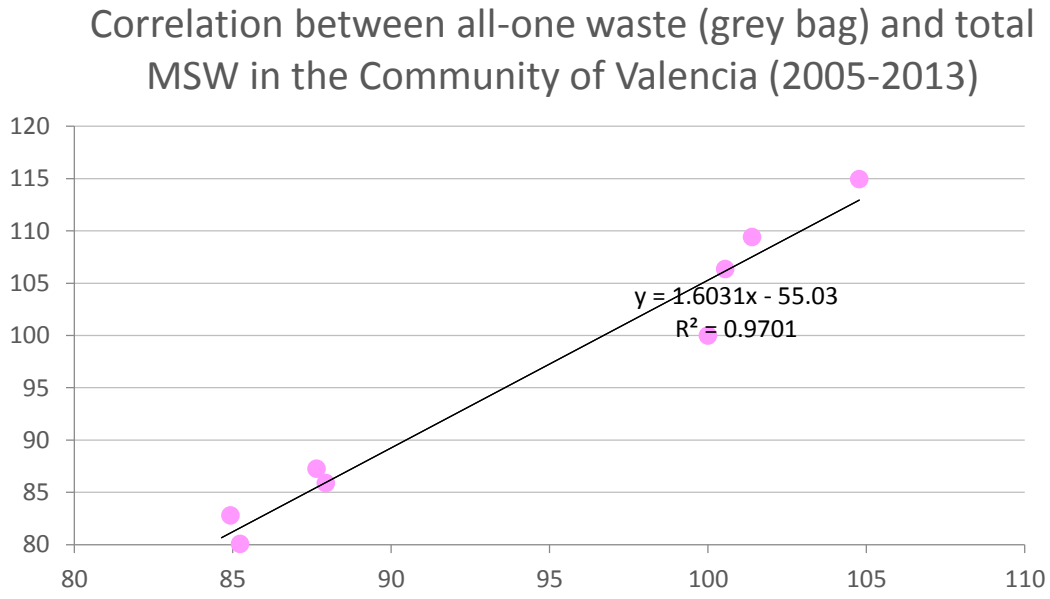

Figura 14.- Correlation between all-one waste (grey bag) and total waste in the Valencia region (2005-2013)

4. RESULTS

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Rate of change of GDP in the Valencian Community, Spain and the EU-27

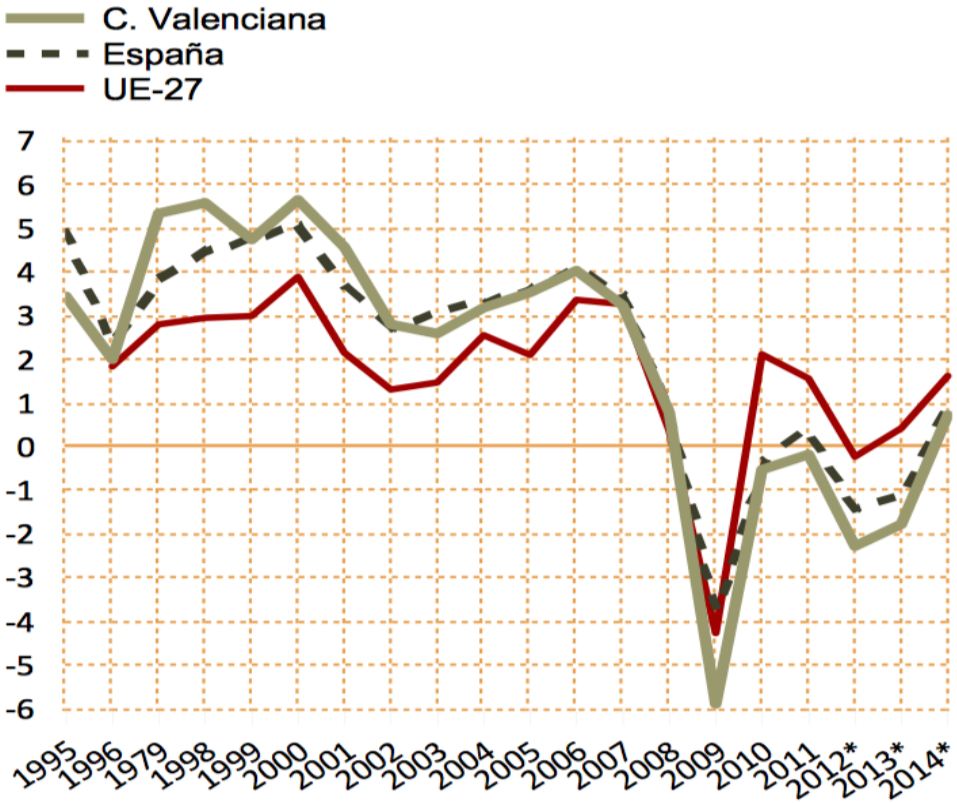


Figure 15.-Rate of change of GDP in the Valencian Community, Spain and the EU-27
Source: Eurostat, INE and BBVA Research

Comparative evolution of the GDP with respect to the production of all-one RSW (grey bag) in the Valencia region

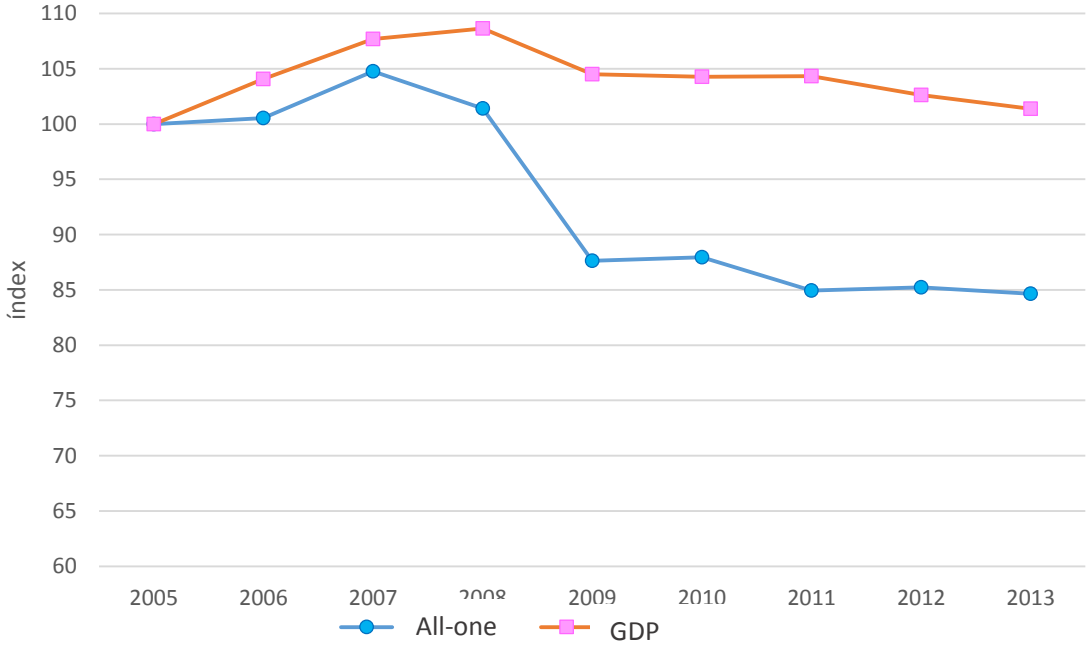


Figure 16.-Comparative evolution of GDP with respect to the production of all-one MSW (grey bag) in the Community of Valencia.
Source: INE and OECD

4. RESULTS

VARIATION IN MASS PRODUCTION OF MSW AS A FUNCTION OF GDP PER CAPITA

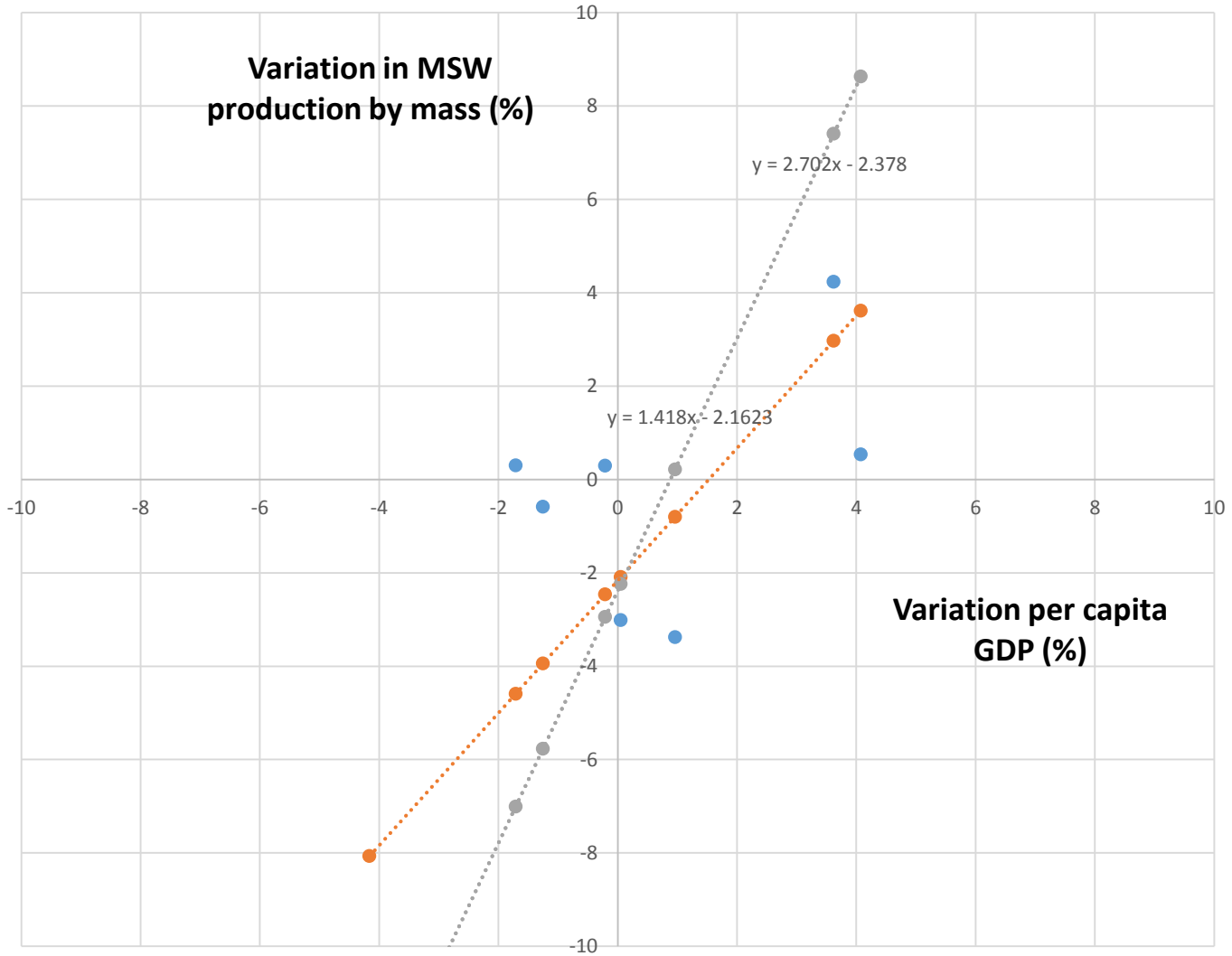


Figure 17.-Variation in mass production of MSW as a function of GDP per capita

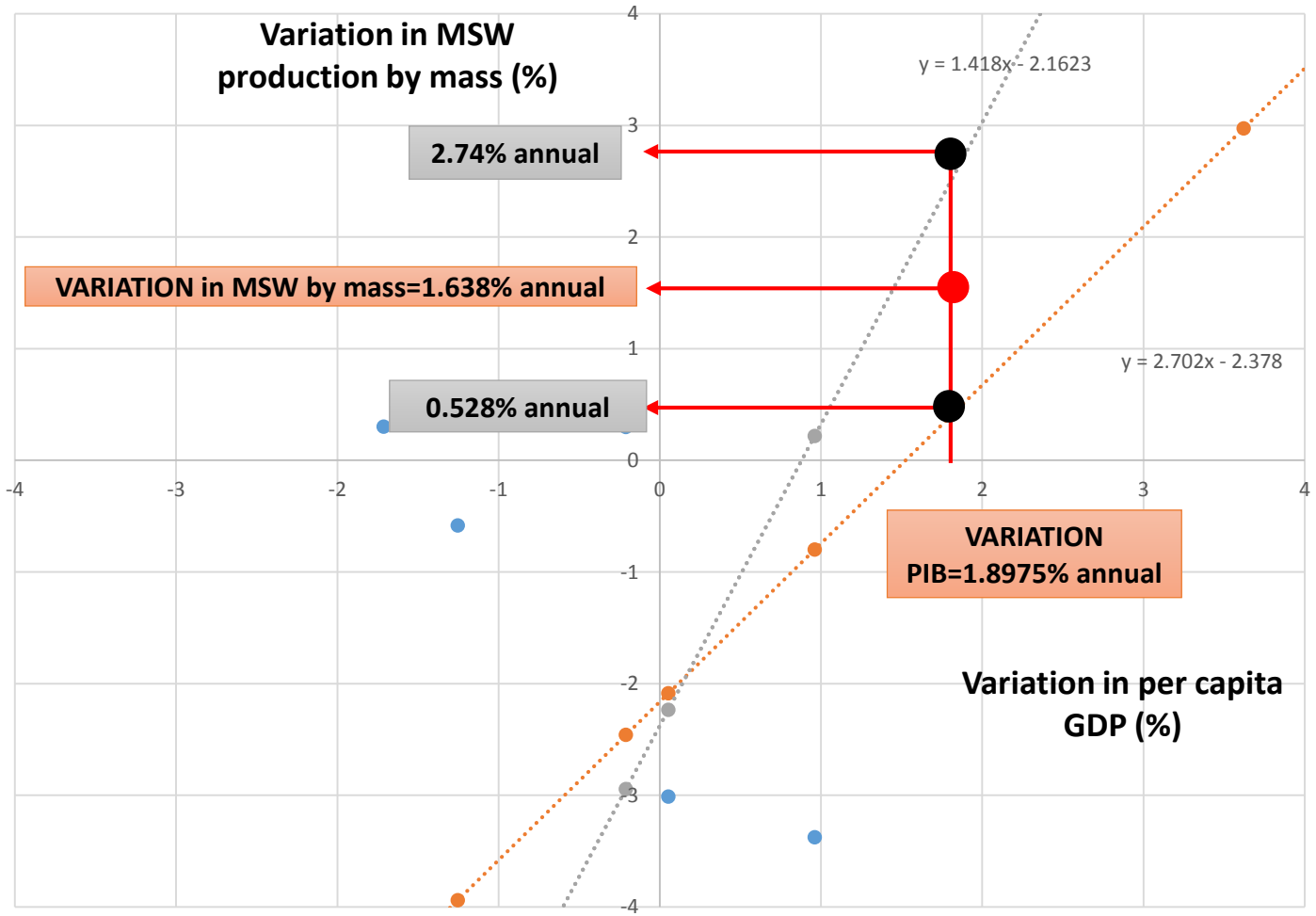
The equations of the least-squared linear regressions have been obtained.

The proportionality factor between GDP and mass MSW production is obtained as the average value of the estimations of each of the regression lines.

The annual GDP variation for Spain in the period 2012-2034 is equal to 1.8975% (OECD estimations)

4. RESULTS

VARIATION IN MASS PRODUCTION OF MSW AS A FUNCTION OF GDP PER CAPITA

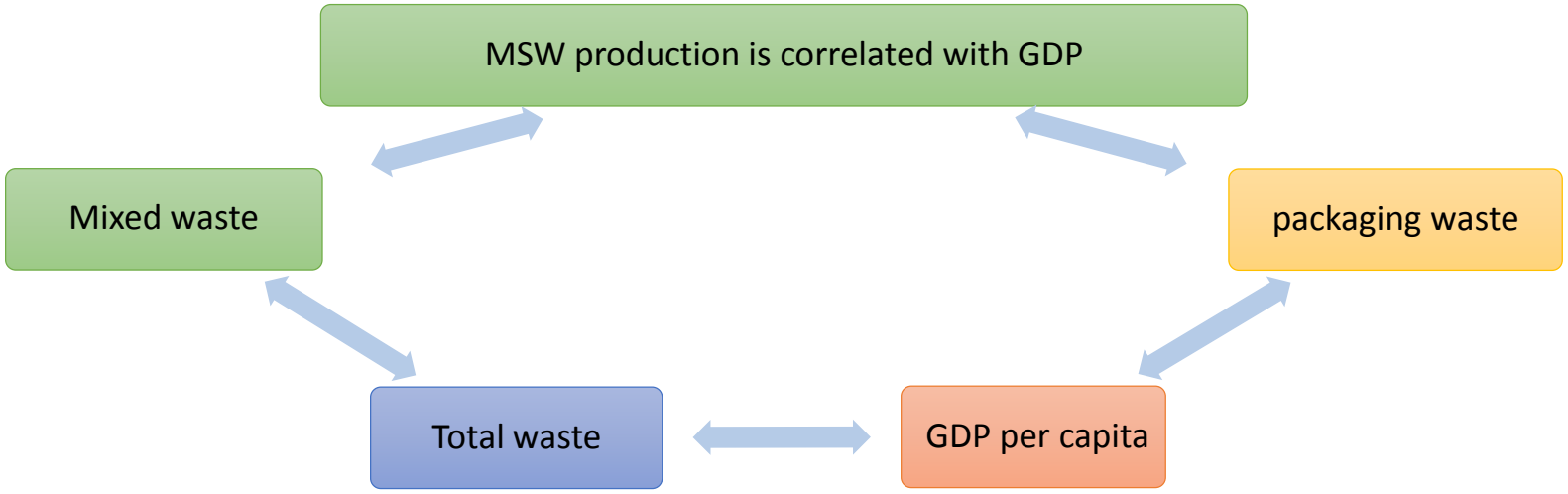


For an annual GDP growth equal to 1.8975%, the estimate of MSW annual growth is between 0.528% and 2.749%.

Therefore, the best estimate of the variation in annual mass production of MSW in the period 2012-2034 is 1.6387% per year (which corresponds to the mean value of the two estimates corresponding to each of the regression lines.

Figure 18.-Determination of the variation in mass MSW production for annual growth equal to 1.8975%

5. CONCLUSIONS



The greater the increase in GDP, the greater the rate of waste production

Therefore, in the following, we will take as a starting point in our analysis these values of the annual per capita waste production rate for 2011:

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