



F.N. Tsagkas^{1,2}, G.C. Vogiatzis¹, M.P. Maladaki¹, V.K. Lytra¹, C.D. Chatzopoulos^{1,3}, H.I. Chatzopoulou¹ and M.P. Pallis¹
1. Waste Management Authority of Eastern Macedonia - Thrace, DI.A.A.MA.TH, S.A., N. Plastira str. 6, Komotini, Region of Eastern Macedonia - Thrace, 69132, Greece
info@diaamath.gr, www.diaamath.gr
2. Department of Civil Engineering, 3. Department of Environmental Engineering, University of Democritus University of Thrace, Xanthi, Region of Eastern Macedonia - Thrace, 67100, Greece

Correlation of results of packaging waste recycling with GDP in Regions of Greece: Implications for a fairer index considering public's participation in recycling

INTRODUCTION

- ❖ The "blue bin" is the backbone for recycling of packaging waste in Greece. For comparison reasons of the recycling level the use of index of {kg/cap/year} is used and compared to country's mean value.
- ❖ Previous research have showed that Gross Domestic Product has a strong correlation with the production of Municipal Solid Waste. But there is no previous published work about correlation of packaging waste recycling results with the GDP or other economic index of regions of Greece.
- ❖ **An effort is attempted to correlate the available data of results of packaging waste recycling recovered from "blue bin" in 13 Regions of Greece with the Total Gross Value Added of each Greek Region.**
- ❖ A new index {tonnes/TGVA} is proposed that might be fairer to count participation of public and recycling level of Regions than the {kg/cap/year}.

METHODOLOGY

1. Collection of publicly available data of packaging waste recycling (Hellenic Recycling Recovery Company) and data of economic activity in Greece (Gross Domestic Production (GDP) per capita (€/cap) and Total Gross Value Added (TGVA in millions of €) for 13 Greek geographical Regions were collected (Hellenic Statistical Authority) for years 2017, 2018 and 2019.
2. Correlation of these two types of data.
3. After collection and process of data, a new index of tonnes of packaging waste recycled per Total Gross Value Added {tonnes/TGVA} is proposed.

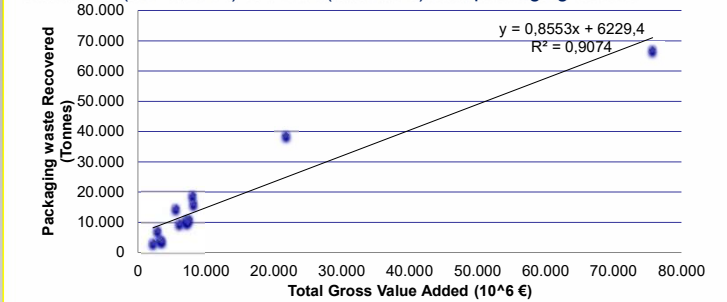
DATA PROCESS

Indicatively data of packaging waste recycling, of Total Gross Value Added and of GDP of the 13 Regions of Greece in 2019.

S/N	Region of Greece (i)	Inhabitants covered by blue bin* (ii)	Packaging waste tonnes/year recovered* (iii)	Index kg/cap/year (iv)=1000*(iii)/(ii)	Total Gross Value Added (10*6 €)/year** (v)	GDP (€/cap)** (vi)	Index (tonnes/TGVA) (vii)=(v)/(iii)
1	Attica	3.756.595	67.044	17,85	75.744	23.341	0,89
2	West Macedonia	283.689	4.412	15,55	3.288	14.284	1,34
3	Epirus	247.445	4.099	16,57	3.493	12.093	1,17
4	West Greece	636.923	10.844	17,03	7.027	12.450	1,54
5	Peloponnese	543.162	10.130	18,65	7.173	14.421	1,41
6	Eastern Macedonia and Thrace	608.182	9.789	16,10	6.045	11.639	1,62
7	Central Macedonia	1.881.869	38.802	20,62	21.800	13.430	1,78
8	Thessaly	713.968	16.103	22,55	8.143	13.071	1,98
9	Central Greece	522.257	11.123	21,30	7.446	15.463	1,49
10	Ionian Islands	203.583	7.496	36,82	2.855	16.147	2,63
11	North Aegean	152.075	3.429	22,55	2.207	11.271	1,55
12	Southern Aegean	206.358	14.615	70,82	5.533	18.655	2,64
13	Crete	621.024	19.885	30,41	8.007	14.695	2,36
	TOTAL	10.377.130	216.771	20,89	158.761		1,03

RESULTS

Indicative figure of correlation of Total Gross Value Added with packaging waste recovered of 13 Regions of Greece for 2019. One can see a strong correlation (R²=0,9074) of TGVA (millions €) with packaging waste.



RESULTS

Indicatively comparison of packaging waste recycling indexes. Region of Eastern Macedonia & Thrace climbs 6 places from 12th to 6th for 2019.

S/N	Region of Greece	Index kg/cap/year	S/N	Region of Greece	Index tonnes/TGVA
1	Southern Aegean Sea	70,82	1	Southern Aegean Sea	2,64
2	Ionian Islands	36,82	2	Ionian Islands	2,63
3	Crete	30,41	3	Crete	2,36
4	Thessaly	22,55	4	Thessaly	1,98
5	North Aegean	22,55	5	Central Macedonia	1,78
6	Central Greece	21,30	6	Eastern Macedonia and Thrace	1,62
8	Central Macedonia	20,62	7	North Aegean	1,55
9	Peloponnese	18,65	8	West Greece	1,54
7	Attica	17,85	9	Central Greece	1,49
10	West Greece	17,03	10	Peloponnese	1,41
11	Epirus	16,57	11	West Macedonia	1,34
12	Eastern Macedonia and Thrace	16,10	12	Epirus	1,17
13	West Macedonia	15,55	13	Attica	0,89

CONCLUSIONS

- ❖ It is concluded that there is a strong correlation of packaging waste recycling (tonnes per year) recovered from blue bins system of the thirteen Regions of Greece with the Total Gross Value Added (millions € per year) in the respective Greek Regions.
- ❖ Results show that the use of a new index {tonnes/TGVA} rather than the index of {kg/cap/year} could be fairer option for comparison reasons of Regions or even Municipalities, since it takes into account also the economic status of the respective Region. That is, a Region that has small economic status can achieve in comparison more higher results in packaging waste recycling.
- ❖ These results can be verified in Municipality level in future work and can have implications for enhancing policy instruments in waste management.