



***FORECASTING OF
INDUSTRIAL ROUNDWOOD
PRODUCTION
FOR THE PART OF
SOUTH-EAST EUROPE***

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INTRODUCTION

The South-East Europe area is the most diverse, heterogeneous and complex transnational cooperation area in Europe, made up of a broad mix of countries.

The emergence of new countries and with it the establishment of new frontiers has changed the patterns of political, economic, social and cultural relationships.

The SEE Programme helps to promote better integration between the Member States, candidate and potential candidate countries and neighbouring countries.

The participating countries in this research of Industrial Round Wood (IRW) production beside Croatia include Bosnia and Herzegovina, Macedonia, Montenegro, Serbia and Slovenia (SEE* region).

The key to survival and growth of an organization is in ability to adapt its strategy to rapidly changing environment (Kotler, 2001).

Interpreting economic data and forecasting the future economic values are under the influence of environment and government policies, starting from the basic economic theories that operate in the market (Fair and Case, 1989).

This paper discuss a possibility to predict trends in production of industrial round wood in SEE* region (Croatia and surrounding countries) on the basis of established values of IRW production in period 1993-2013.

Because of a turbulences in this market, as well as a length of the analyzed time series, prediction is limited to the year 2020.

MATERIAL AND METHODS

The data of production values of Industrial Round Wood (IRW) through analyzed period 1993-2013 are gathered from *Croatian Bureau of Statistics, Ministry of Finance and Financial Agency* and *FAO base* (FAOSTAT).

The data of population, land area and forested area in SEE* region are gathered from official websites of the participating countries.

The dynamic economic analysis of time series data was performed for the purposes of forecasting future trends in SEE* region for:

- *IRW production* (in mil. m³);
- *IRW production Per Capita* (in m³/year per 1000 people);
- *IRW production Per Forested Area* (in m³/year per km² of forested area).

Two types of time series models were built:

- models A - based on average rates of change;
- models B - linear trend models.

RESULTS AND DISCUSSION

The **SEE* area** is made up of 6 different countries which cover **245,1 thousand km²**, range in size from 13,8 thousand km² (Montenegro) to 77,5 thousand km² (Serbia).

A total resident population of SEE* countries is almost **20 million people**, range in size from 0,6 million people (Macedonia) to 7,1 million people (Serbia). Shares of population and shares of land area according to total population and total land area of countries in SEE* region are shown in Figure 1.

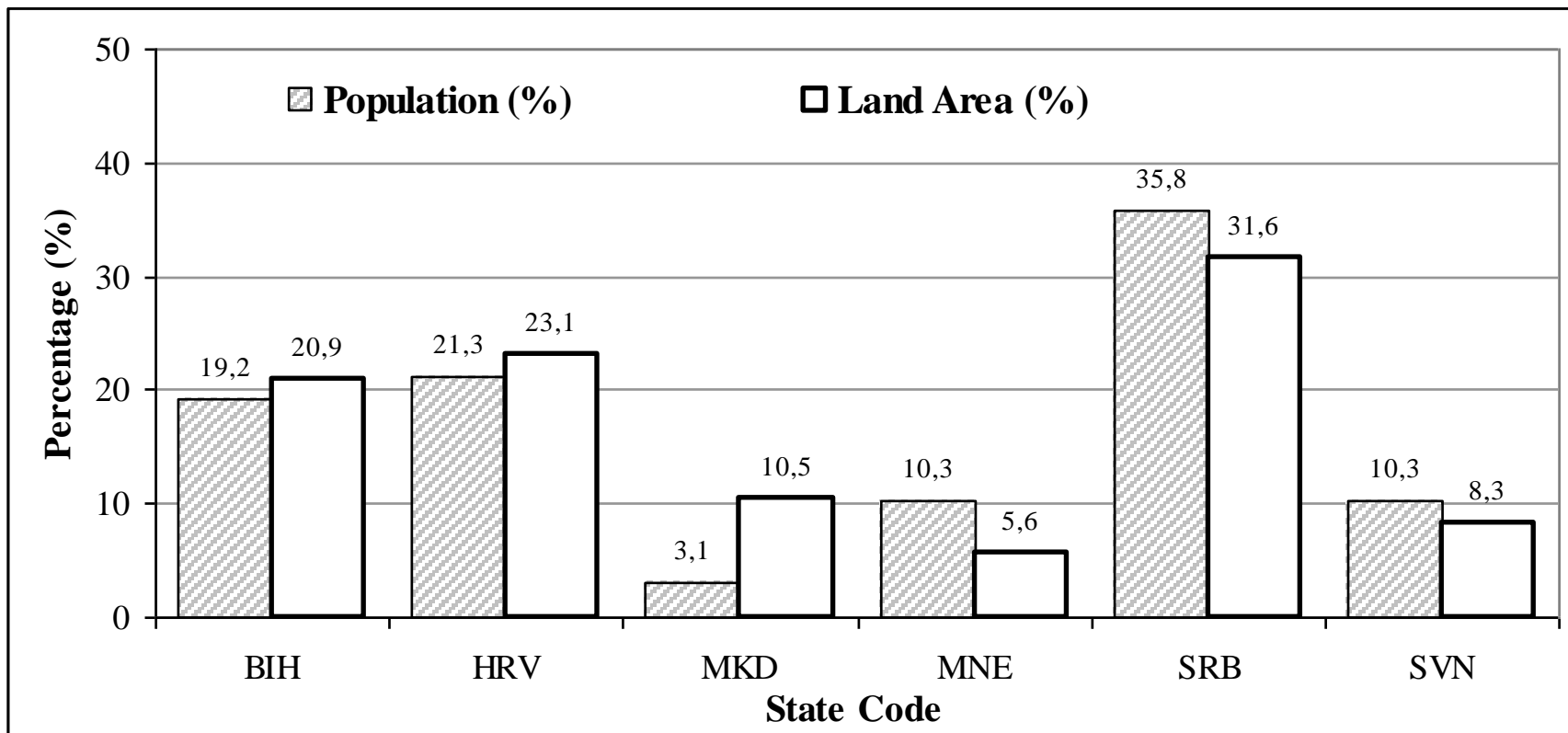


Figure 1. Shares of population and land area in SEE* countries

Average **population density** (population divided by total land area) in SEE* region is **86 people per km²** with standard deviation of 41 people per km².

The greatest population density is in Montenegro with 150 people per km², followed by Slovenia (102 people/ km²), Serbia (92 people/ km²), Croatia (75 people/ km²), BIH (75 people/ km²) and smallest population density in Macedonia with 24 people per km².

Area covered by forests in SEE* region is 99 thousand km² (almost 40% of total land area) range in size from 6,3 thousand km² (Montenegro) to 27,1 thousand km² (Bosnia and Herzegovina).

The greatest share of forested area in total land area is in Slovenia (60%), followed by BIH (53%), Montenegro (45%), Croatia (44%), Macedonia (40%) and smallest share in Serbia with only 24% of forested area.

Shares of forested area in total land area for countries in SEE* region are shown in Figure 2.

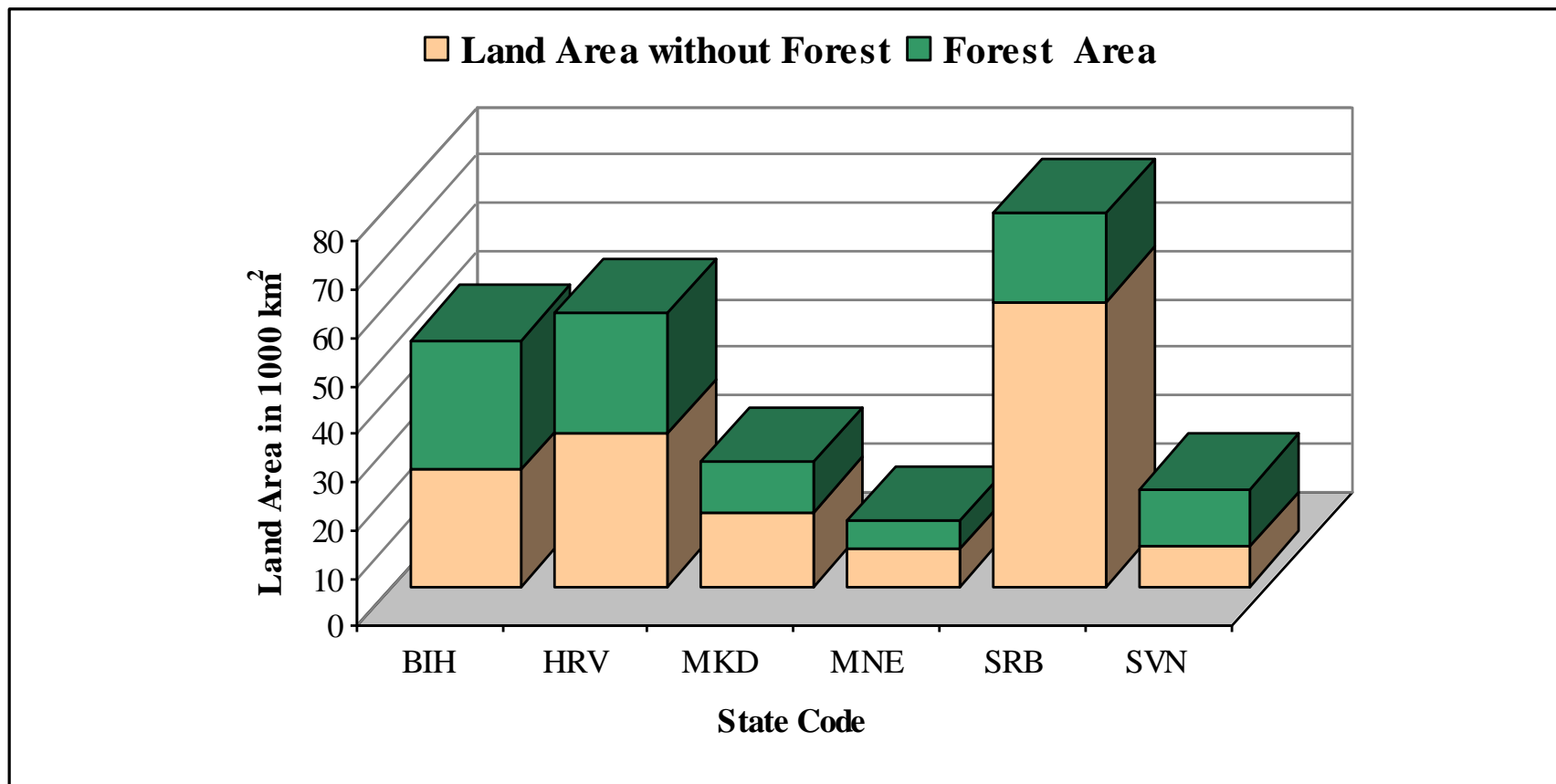


Figure 2. Shares of forested area in total land area for SEE* region

Industrial round wood (IRW) production in SEE* countries

According to results of descriptive statistics for IRW production on the basis of established values in the period 1993-2013, SEE* countries can be categorized into three groups:

- Croatia with an average IRW production of 2,9 million m³ and Bosnia and Herzegovina with 2,7 million m³;
- Slovenia with 1,9 million m³ and Serbia with an average IRW production of 1,4 million m³;
- Montenegro with 0,2 million m³ and Macedonia with an average IRW production of 0,14 million m³.

Results of these analysis are given in Table 1.

Table 1. Descriptive Statistics for IRW Production in m³

State Code	Valid N	Mean m ³	Std.Dev. m ³	Coef.Var. %	Minimum m ³	Median m ³	Maximum m ³	Conf. -95% m ³	Conf.+95% m ³
BIH	17	2.749.436	353.077	12,8	2.099.530	2.683.000	3.332.000	2.567.901	2.930.972
HRV	21	2.882.571	795.847	27,6	1.710.000	2.886.000	4.157.000	2.520.306	3.244.837
MKD	21	142.833	24.846	17,4	101.000	151.000	193.000	131.523	154.143
MNE	8	219.126	44.981	20,5	192.000	208.001	329.000	181.521	256.730
SRB	8	1.382.875	109.289	7,9	1.250.000	1.360.000	1.615.000	1.291.507	1.474.243
SVN	21	1.856.532	307.957	16,6	958.000	1.841.404	2.288.160	1.716.351	1.996.712

Group categories aggrading to an average IRW production seen in Table 1 can be affirm by analysis of IRW production in 2013 (Figure 4) in which shares of IRW production for individual SEE* countries were categorized in the same groups:

HRV and BIH together with 64%, followed by SVN and SRB with 33% and only 3% of total IRW production in 2013 were produced in MNE and MKD.

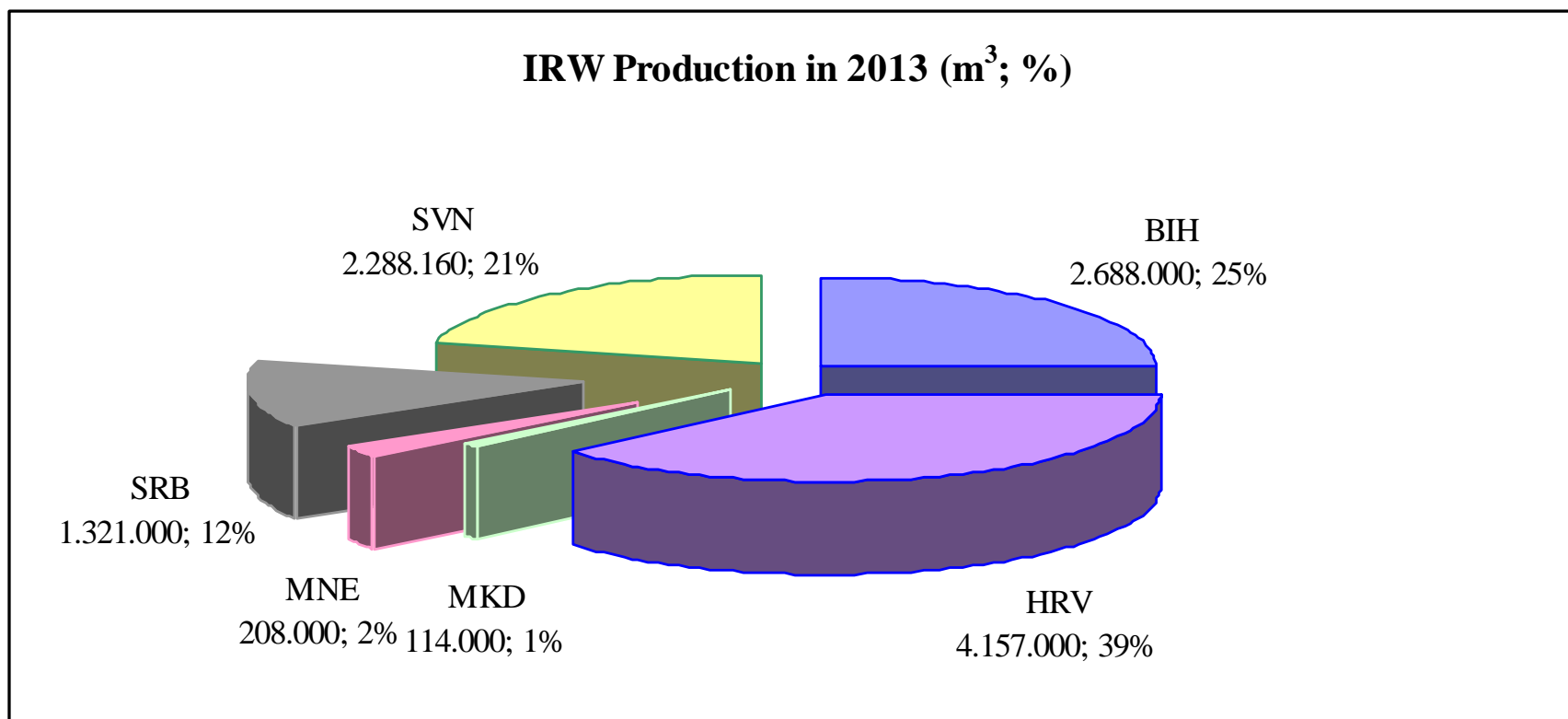


Figure 3. Shares of IRW Production in 2013 for SEE* region

Industrial round wood production per capita (IRW/PC)

According to results of descriptive statistics for IRW/PC production on the basis of established values in the period 1993-2013, SEE* countries can be categorized into two groups:

- Slovenia with an average IRW/PC production of 901 m³/year per 1000 people, Bosnia and Herzegovina with 718 m³/year per 1000 people and Croatia with 679 m³/year per 1000 people;
- Macedonia with with 230 m³/year per 1000 people, Serbia with 194 m³/year per 1000 people and Montenegro with an average IRW/PC production of 106 m³/year per 1000 people.

Results of these analysis are given in Table 2.

Table 2. Descriptive Statistics for IRW/PC Production in m³/year per 1000 people

State	Valid	Mean	Std.Dev.	Coef.Var.	Minimum	Median	Maximum	Conf. -95%	Conf.+95%
Code	N	m ³ /year per 1000 people	m ³ /year per 1000 people	%	m ³ /year per 1000 people	m ³ /year per 1000 people	m ³ /year per 1000 people	m ³ /year per 1000 people	m ³ /year per 1000 people
BIH	17	717,7	92,2	12,8	548,0	700,4	869,8	670,3	765,1
HRV	21	678,8	187,4	27,6	402,7	679,6	978,9	593,5	764,1
MKD	21	229,8	40,0	17,4	162,5	243,0	310,5	211,6	248,0
MNE	8	106,1	21,8	20,5	92,9	100,7	159,3	87,9	124,3
SRB	8	193,5	15,3	7,9	174,9	190,3	226,0	180,7	206,3
SVN	21	900,8	149,4	16,6	464,8	893,4	1.110,2	832,7	968,8

Group categories aggregating to an average IRW/PC production seen in Table 2 can be affirmed by analysis of IRW/PC production in 2013 (Figure 4) in which shares of IRW/PC production for individual SEE* countries were categorized in the same groups:

SVN, HRV and BIH together with 85%, followed by SRB, MKD and MNE with only 15% of total IRW/PC production in 2013.

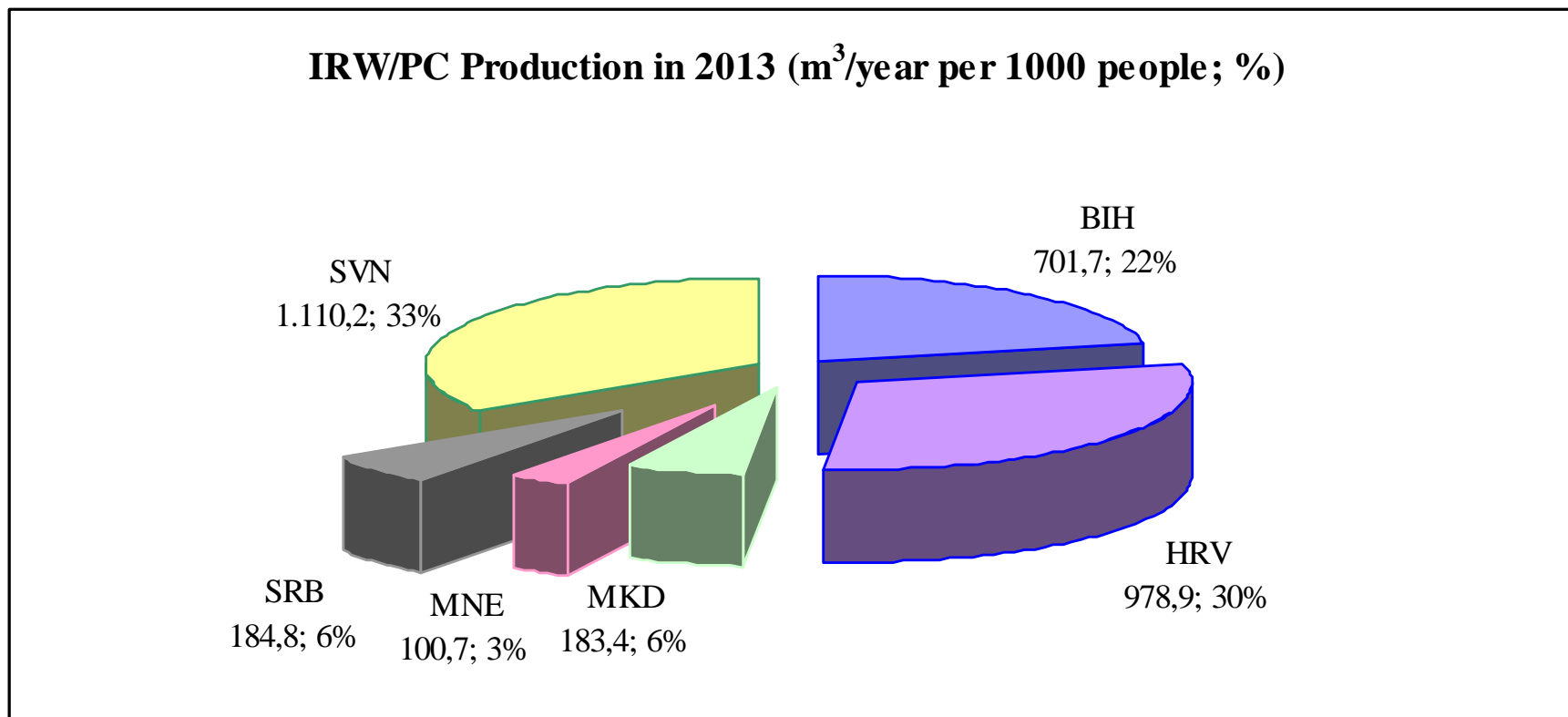


Figure 4. Shares of IRW/PC Production in 2013 for SEE* region

Projections for Industrial round wood production in SEE* countries

Based on the average rate of change (2,027%) in the observed period for:

- IRW Production in SEE* (in mil. m³),
- IRW/PC Production in SEE* (in m³/year per 1000 people),

models A for prediction of future values of IRW production were developed.

Correlation analysis to determine the degree of correlation between the *values of IRW Production* as dependent variables and *time (t)* as independent variable was used.

The direction and strength of the correlation relationship ($r=0,8673$) was positive and high so we developed linear trend models (*models B*) for prediction of future values of IRW Production.

Table 3. Models A and B for calculating the future IRW production values for SEE* countries

Production	Model A	Model B
IRW	$\hat{P}_A(t) = 7,215 \cdot 1,02^{(t-1)}$	$\hat{P}_B(t) = 0,1319 \cdot t + 7,916$
IRW/PC	$\hat{P}_A^{PC}(t) = 361,3 \cdot 1,02^{(t-1)}$	$\hat{P}_B^{PC}(t) = 6,605 \cdot t + 396,35$

According to models B expected linear increase in:

- the annual IRW Production values for SEE* countries is **0,132 million m³**
- the annual IRW/PC Production for SEE* countries is **6,6 m³/year per 1000 people**

In all models, t is mark for the time, where t=0 compared to year 1993, t=1 for year 1994; ... , t=15 to year 2008, etc.

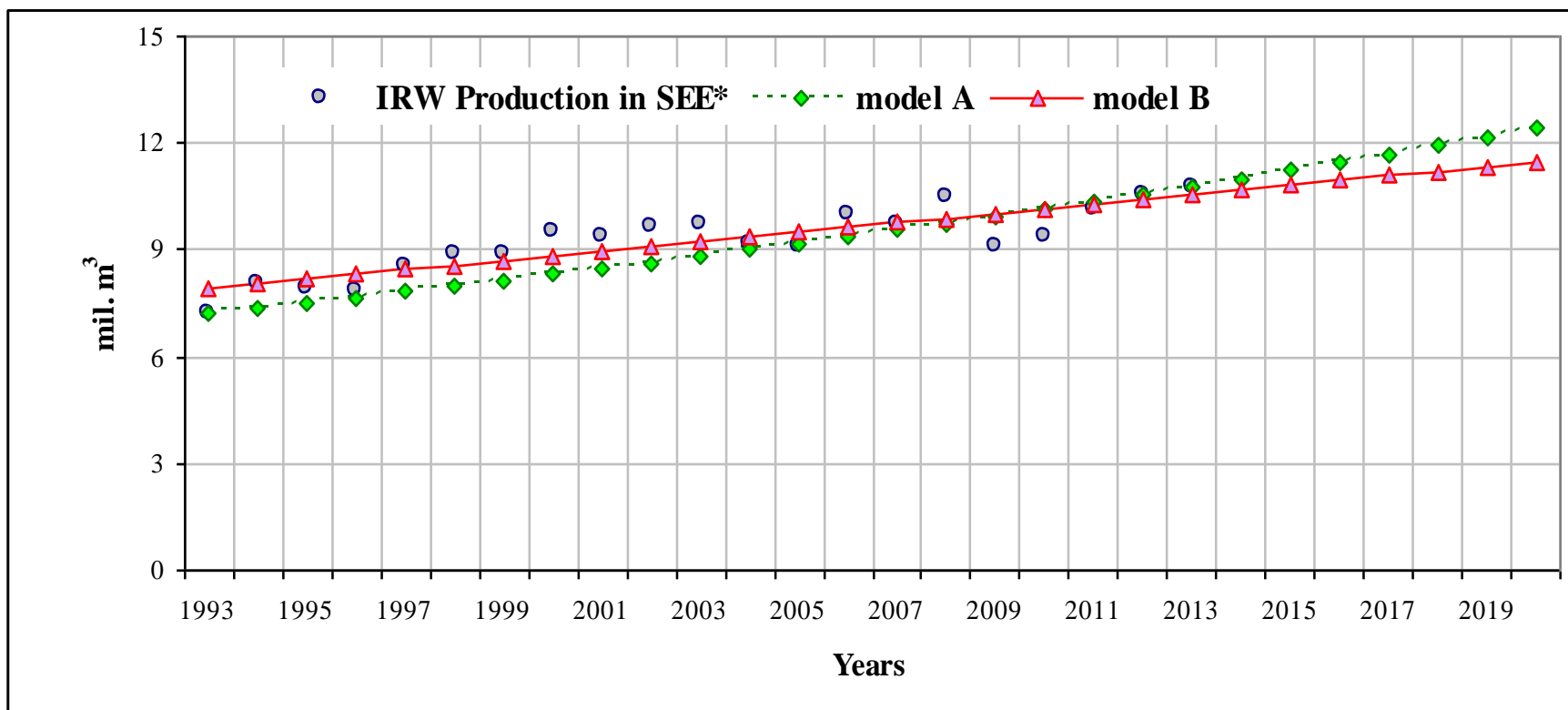


Figure 5. Existing and projected IRW Production values for SEE* countries

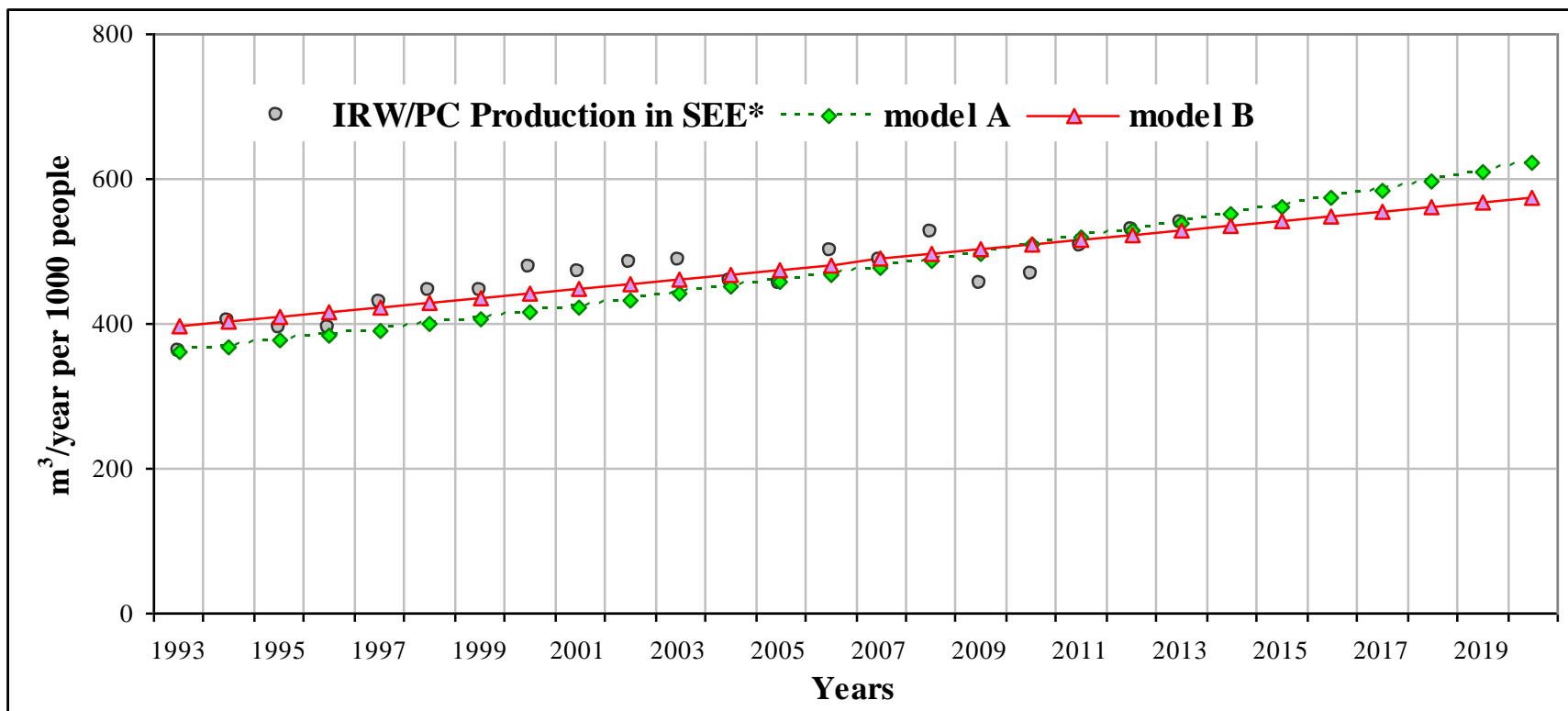


Figure 6. Existing and projected IRW/PC Production values for SEE* countries

CONCLUSION

Assuming that the macroeconomic policies of each SEE* country will not be altered, and assuming that the models for predicting future values of IRW production satisfy all statistical and theoretical terms, constructed models A and models B could become a great help for a future actions in this region.

CONCLUSION

Regional cooperation in SEE* region is essential, regardless of the different stage of integration of the various countries.

The security, stability and prosperity of the region are of significant interest to the all participants.



THANK YOU ALL FOR YOUR ATTENTION

