# A New Linkage Approach to the River Economic Complex Development

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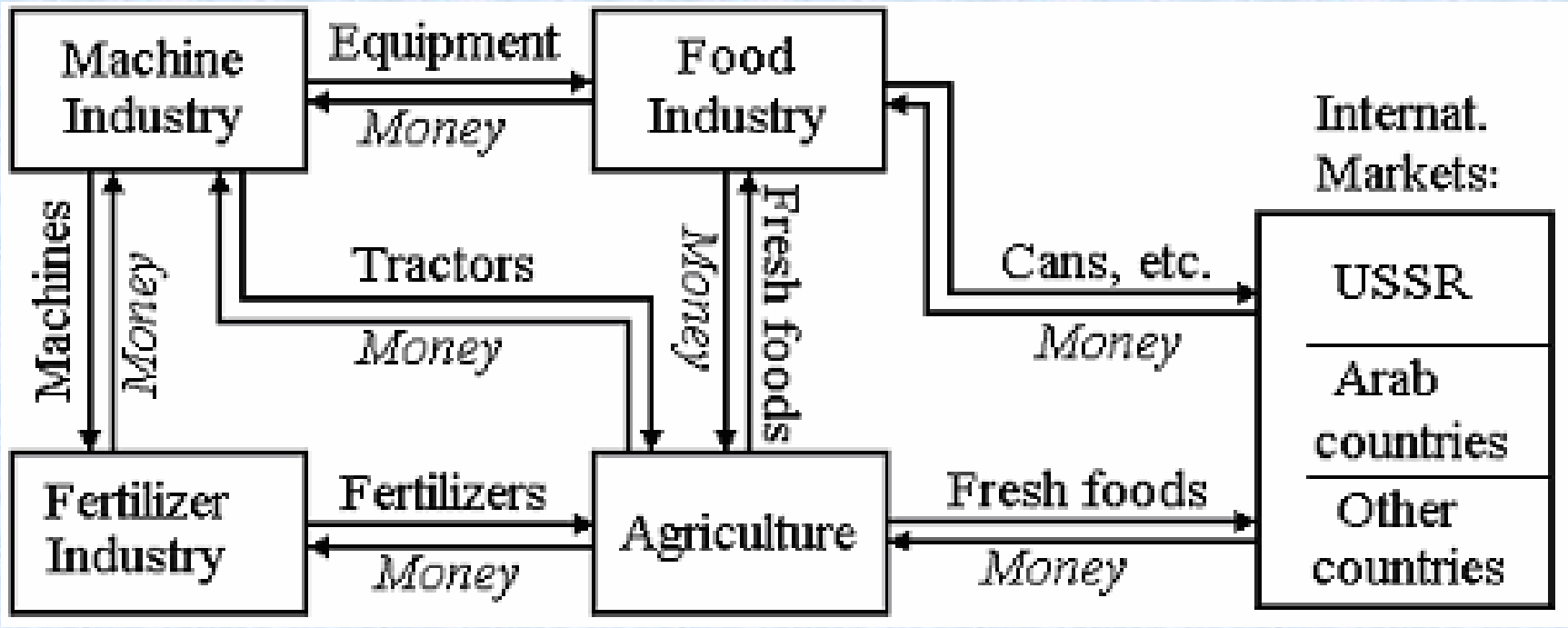
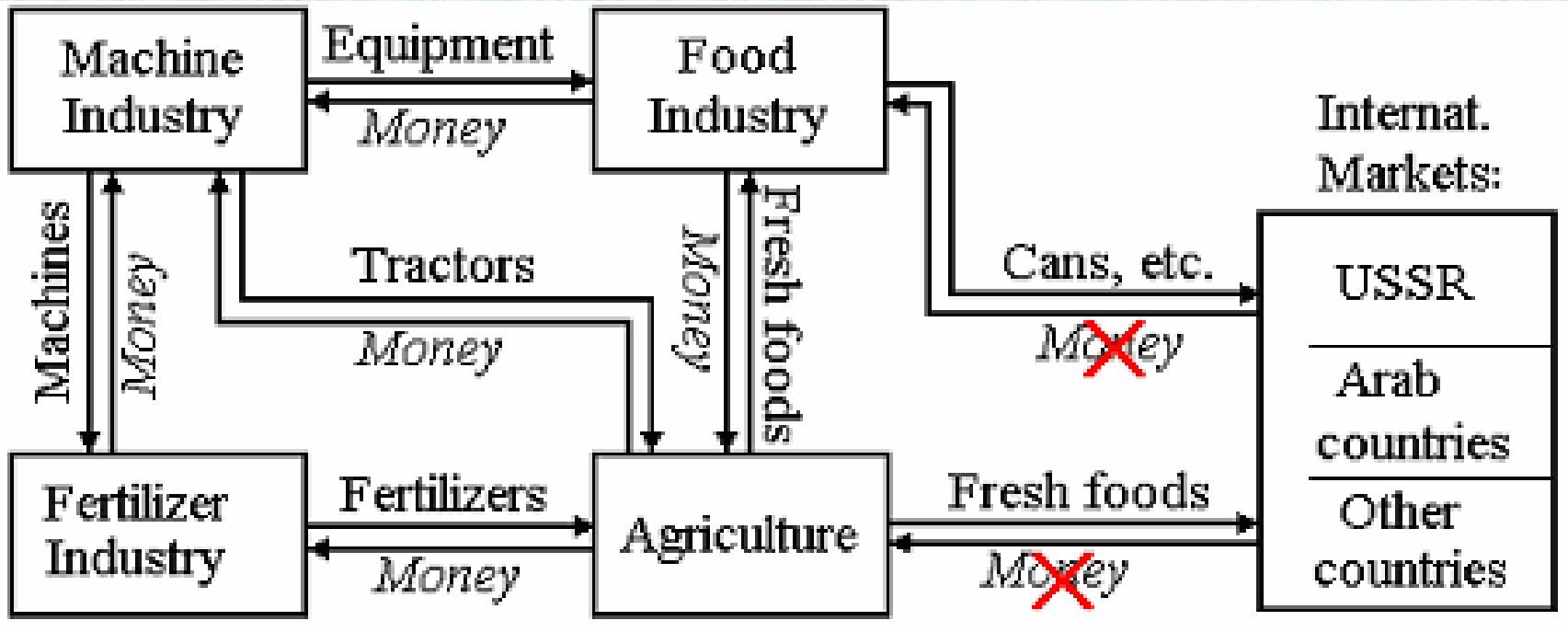
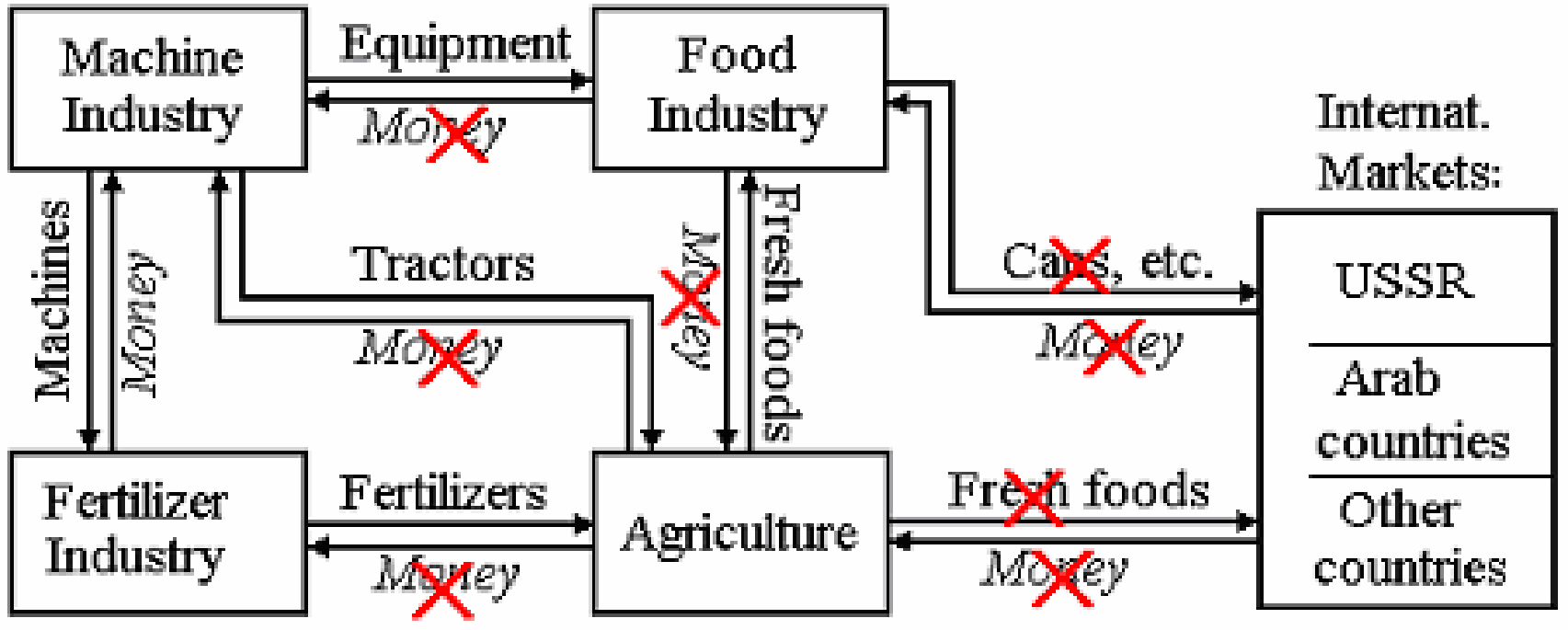
# Some financial and good flows in Bulgaria during the Socialist era



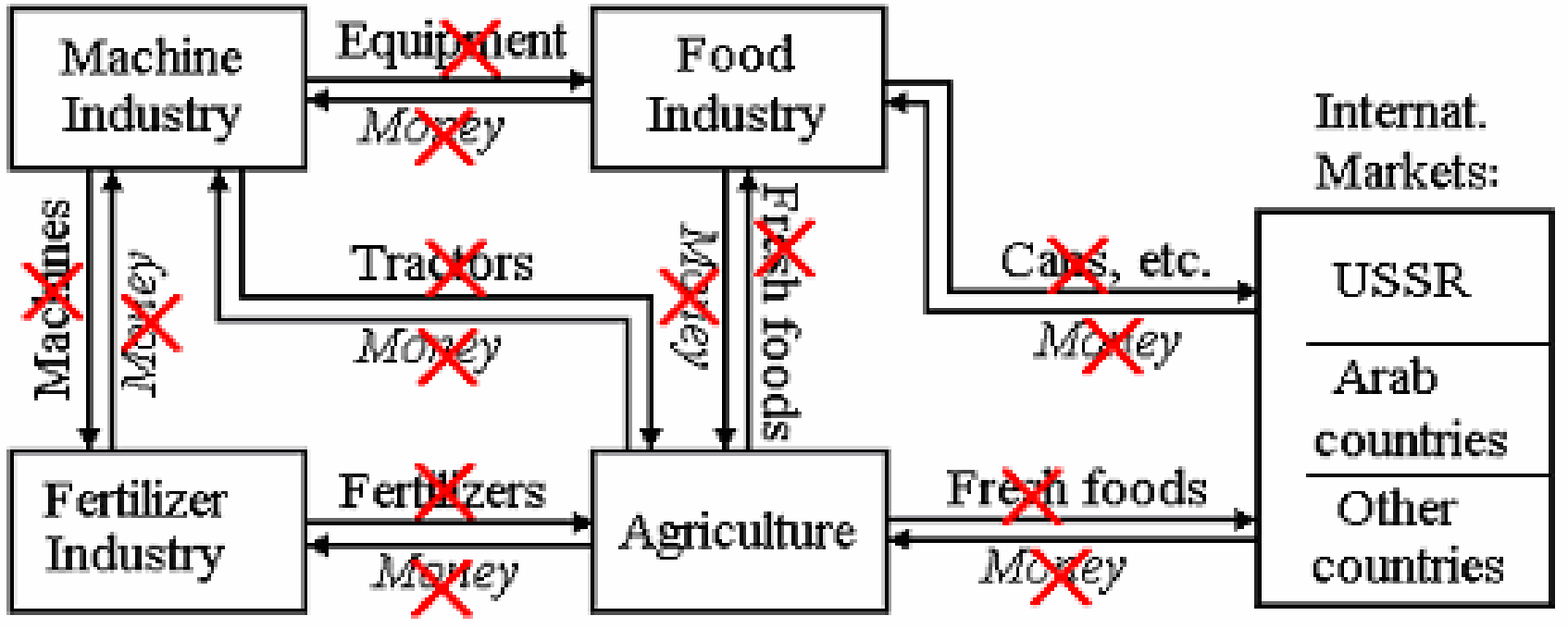
# Lost flows because of political reasons



# Multiplied negative effects to sectors of the national economy.



# Broken or drastically reduced intersectoral linkages



# The collapse

- All 11 *Fruit Can Factories* in the Rousse region closed.
- The *Machine Industry* and *Fertilizer Industry* reduced drastically the number of their employees and their total output. The plant of “Georgi Dimitrov”, from over 1500 goes to less than 200 workers.
- High unemployment, mafia, corruption; increasing emigration to the EU, USA and other countries. In 1990 the population of Bulgaria is about 9 million, in the beginning of 21st century it fell to 7,5 million, facing serious aging problems.

# Prerequisites for a new tool

The Transition period creates a new environment, which hampers the implementation of the Leontieff Model. The **starting points** are:

1/ The Leontieff Model study the economic complexes by sectors, assuming that the linkages among the sectors exist.

2/ The Transition period in the post-socialist Eastern Europe challenges the existence of the intersectoral linkages. Hence the new tool should be focused on studying the ***origin of linkages*** and thus to determine the sustainability of the economic complex in the time and space.

# Sustainability and Investments

- **“Sustainability of The Economic Complex”** is the ability of the linkages to remain in the space and in the time => support the linkages among the sectors, rather than direct investment in the sector =>
- “***Investments in Linkages”*** is: *investments (of money, time, information, human resources, etc.) in initiatives to eliminate, restrict, encourage or establish linkages (financial, information, human resources, materials, services) between sectors, taking into consideration an integrated economical, social and ecological dimensions*

# The *River Economic Complex*

- *It is a system of activities (elements) and linkages, which could exist only if there is a river and a river-coast within a region.* This definition is based on the geographical monopole approach and it describes the river economic complex as a spatial (territorial) unit.
- 18 river economic activities (REA) and 5 types of flow between the river-based economic activities: ***I*** *– information,* ***H*** *– human resources,* ***F*** *– financial,* ***M*** *– materials and* ***S*** *– services.*

# River-based economic activities (**REA**):

*№1. River Water Pumping* (water pumping stations at the river bank)

*№2. River Water Purification* (purification station at the river bank for waste waters)

*№3. Digging of Inert Materials from the River Bed* (special ships for such activity)

*№4. Wood Production from the River-Costal Areas and Islands* (units which regulate or cut woods at the river bank)

*№5. Electricity Production*

*№6. River Activities Control* (Directorates, Inspections, Agencies, etc. - all of them are elements of the public administration)

*№7. River Ship Supply* (firms which offer ship supply)

*№8. River Shipping (Agencies and ships)*

*№9. River Ship Maintenance* (Firms and their working premises at the river bank)

*№10. River Shipbuilding* (Firms and their working premises at the river bank)

*№11. River Education and Trainings*

*№12. River Guard* (Boundary police and their ships)

*№13. River Port Activities* (terminals for passengers, cargo, Ro-Ro, containers, etc.)

*№14. Construction of River Hydro Technical Buildings* (firms for design and construction)

*№15. River Sports* (clubs in all kind of river sports and their facilities)

*№16. River Tourism* (tourists ships and boats, river festivals, restaurants with “river view”)

*№17. River Fish Producing and Fishing* (fish breeding pool, ships, firms for fish can production)

*№18. River Bank Fortification* (firms and units for river bank cleaning and fortification)

# The origin of linkages

The concept of this research is that the origin of the linkage as a fundament for their sustainability. The origin could be initiated by the *authorities* (by legislation acts) or the *market* (by freedom to exchange):

- ***Rank 0*** – stands for ***no linkage, which means*** that the linkage doesn't exist. This linkage cannot exist during the present stage of economic complex development. It is possible the linkage to exist in the future or in the previous periods.
- ***Rank 1*** – *the origin of the linkage is a result of a* ***legislative act***. If there are changes in the legislation then this linkage could disappear.
- ***Rank 2*** – *the origin of the linkage is a consequence of the technical-economic progress and personal* ***freedom to exchange***. It is a result of the demand and the supply on the market.

# **Rank 1** – Legislative linkages

- If there are changes in the legislation then this linkage could appear or disappear.
- Example: the small boats could sail on the Danube river without any special documents proving the navigation abilities of the sailors. In 2003 the Bulgarian laws have been changed in a way that it put an obligation - at least one person in the river boat must have a proper document for river navigation. Thus the legislation creates the linkages between the activities of *River Tourism (REA 16)* and *River Education and Training (REA 11)*. If the law is changed then this linkage will disappear. (Table 4)

# **Rank 2** – Marketing linkages

- It is a result of the demand and the supply on the market.
- Example: shipping companies (REA 8) need ships to transport their passengers and cargos. They establish business contacts with shipbuilders (REA 10) to purchase ships. No mutter of the legislation the shipping companies will need a vessel for transport issues. If they don't buy a vessel, then the shipping companies are not able to provide their clients with the transportation service. Therefore this linkage is a result of the free market.

# New tools

- *River Linkages Sustainability Index-* $\boldsymbol{I_{RLSF}}$
- *River Linkages Sustainability Coefficient -* $\boldsymbol{C_{RLSF}}$.
- *Comprehensive River Economic Linkages Sustainability* ***Table***

# River Linkages Sustainability Index

$$I_{RLS^F} = (0 * \sum S_{0F}) + (1 * \sum S_{1F}) + (2 * \sum S_{2F}),$$

$$I_{RLS^F} = \sum S_{1F} + 2 * \sum S_{2F},$$

where:

- $F$ – *Flows*: information, human, financial, materials and services;
- $\sum S0F$ – quantity of the non-existing linkages, level 0;
- $\sum S1F$ – quantity of the linkages in all flows, level 1;
- $\sum S2F$ – quantity of the linkages in all flows, level 2.

**The Index may vary**

# River Linkages Sustainability Coefficient

$$C_{RLS^F} = \frac{I_{RLS^F}}{\sum S_{1F} + \sum S_{2F}} = \frac{I_{RLS^F}}{N^F},$$

where:

- $I_{RLSF}$ – River Linkages Sustainability Index;
- $N_F$ – total number (quantity) of the existing linkages.

$$1 \le C_{RLSF} \le 2$$

# Comprehensive River Economic Linkages Sustainability Table

| (*Output* – ***j***) / (*Input* – ***i***) | Basic level of linkage sustainability between the River Economic Activities (**REA**), exchanging Flows ($s_{ij}$) | | | | Index of River linkages sustainability of the outgoing flows, $I_{OFRLS}{}^{F}$ | Number (Quantity) of the outgoing flows, $N_{OF}{}^{F}$ | Coefficient of sustainability of the outgoing flows, $C_{OFRLS}{}^{F}$ |
|---|---|---|---|---|---|---|---|
| | $REA_1$ | $REA_2$ | $REA_3$ | . . $REA_j$ | | | |
| $REA_1$ | $s_{11}$ | $s_{12}$ | $s_{13}$ | . . $s_{1j}$ | $I_{OFRLS}{}^{F}{}_1$ | $N_{OF}{}^{F}{}_1$ | $C_{OFRLS}{}^{F}{}_1$ |
| $REA_2$ | $s_{21}$ | $s_{22}$ | $s_{23}$ | . . $s_{2j}$ | $I_{OFRLS}{}^{F}{}_2$ | $N_{OF}{}^{F}{}_2$ | $C_{OFRLS}{}^{F}{}_2$ |
| $REA_3$ | $s_{31}$ | $s_{32}$ | $s_{33}$ | . . $s_{3j}$ | $I_{OFRLS}{}^{F}{}_3$ | $N_{OF}{}^{F}{}_3$ | $C_{OFRLS}{}^{F}{}_3$ |
| . . $REA_i$ | . . $s_{i1}$ | . . $s_{i2}$ | . . $s_{i3}$ | . . $s_{ij}$ | . . $I_{OFRLS}{}^{F}{}_i$ | . . $N_{OF}{}^{F}{}_i$ | . . $C_{OFRLS}{}^{F}{}_i$ |
| Index of River linkages sustainability of the incoming flows $I_{IFRLS}{}^{F}$ | $I_{IFRLS}{}^{F}{}_1$ | $I_{IFRLS}{}^{F}{}_2$ | $I_{IFRLS}{}^{F}{}_3$ | . . $I_{OFRLS}{}^{F}{}_j$ | $I_{RLS}{}^{F}$ | | |
| Number (Quantity) of the incoming flows, $N_{IF}{}^{F}$ | $N_{IF}{}^{F}{}_1$ | $N_{IF}{}^{F}{}_2$ | $N_{IF}{}^{F}{}_3$ | . . . $N_{IF}{}^{F}{}_j$ | | $N^{F}$ | |
| Coefficient of sustainability of the incoming flows $C_{IFRLS}{}^{F}$ | $C_{IFRLS}{}^{F}{}_1$ | $C_{IFRLS}{}^{F}{}_2$ | $C_{IFRLS}{}^{F}{}_3$ | . . $C_{IFRLS}{}^{F}{}_j$ | | | $C_{RLS}{}^{F}$ |

# Empirical study, 2003, 2006

**Object** of this research is all organizations from the Ruse River Economic Complex (North East Bulgaria), which exist because of Danube river:

- FIRMS (20/23):
- PUBLIC ADMINISTRATION UNITS: (10/10)
- NGOs: (4/4)

The total quantity of employees at these organizations is about 4000 during the studying period.

**Subject** of this study is to outline the origin of the linkages among these organizations in all five flows – information exchange, human resources exchange, financial flows, material flows, services.

# Basic results (1)

**Financial flow:**

- 14 legislative linkages, and 61 with marketing origin
- $\mathbf{I_{RLS}Fin}$ = **136** = 14 + 2*61
- $\mathbf{C_{RLS}Fin}$ = **1,81 =** 136 / 75
- See the details in Tabl.2

**Information flow:**

- 48 legislative linkages, and 19 with marketing origin,
- $\mathbf{I_{RLS}Inf}$ = **86** = 48 + 2*19
- $\mathbf{C_{RLS}Inf}$ = **1,28 =** 86 / 67
- See the details in Tabl.3

# Basic results (2)

**Services flow:**

- 17 legislative linkages, and 48 with marketing origin
- $\mathbf{I_{RLS}Ser} = \mathbf{113} = 17 + 2*48$
- $\mathbf{C_{RLS}Ser} \approx \mathbf{1,74} = 113 / 65$
- See the details in Tabl.4

**Materials flow:**

- 0 (zero) legislative linkages, and 19 with marketing origin
- $\mathbf{I_{RLS}Mat} = \mathbf{38} = 0 + 2*19$
- $\mathbf{C_{RLS}Mat} = \mathbf{2,00} = 38 / 19$
- See the details in Tabl.5

# Basic results (3)

**Human Resources flow:**

- 0 (zero) legislative linkages, and 20 with marketing origin
- $\mathbf{I_{RLS}HRe} = \mathbf{40} = 0 + 2*20$
- $\mathbf{C_{RLS}HRe = 2{,}00} = 40 / 20$
- See the details in Tabl.6

**Consolidated information for all five flows:**

- $\mathbf{I_{RLS}5} = \mathbf{413} = 79 + 2*167$
- $\mathbf{C_{RLS}5} \approx \mathbf{1{,}68} = 413 / 246.$
- See the details in tabl.7.

# Table 2

Table 2. Basic level of linkage sustainability between the River Economic Activities (**REA**) [1], exchanging **financial flows (Fin)** in the Economic River Complex, 2003 and 2006 , ($s_a$)

| River Activity Output / River Activity Input | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | Index of River linkages sustainability of the outgoing flows $I_{OREA}^{Fin}$ | Number (Quantity) of the outgoing flows $N_{i}^{Fin}$ | Coefficient of sustainability of the outgoing flows, $C_{OREA}^{Fin}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| REA №1 | | | | | | 1 | | | | | | | | 2 | | | | | $I_{OREA}^{Fin}{}_{1}$ = 3 | 2 | $C_{OREA}^{Fin}{}_{1}$=1,50 |
| REA №2 | | | | | | 1 | | | | | | | | 2 | | | | | $I_{OREA}^{Fin}{}_{2}$ = 3 | 2 | $C_{OREA}^{Fin}{}_{2}$=1,50 |
| REA №3 | | | 2 | | | 1 | 2 | | 2 | 2 | | | 1 | | | | | | $I_{OREA}^{Fin}{}_{3}$ = 10 | 6 | $C_{OREA}^{Fin}{}_{3}$=1,67 |
| REA №4 | | | | | | | | 2 | | | | | | | | | | 2 | $I_{OREA}^{Fin}{}_{4}$ = 4 | 2 | $C_{OREA}^{Fin}{}_{4}$=2,00 |
| REA №5 | | | | | | | | | | | | | | | | | | | $I_{OREA}^{Fin}{}_{5}$ = 0 | 0 | $C_{OREA}^{Fin}{}_{5}$=0,00 |
| REA №6 | | | | | | | | | 2 | | | | 1 | 2 | | | 2 | | $I_{OREA}^{Fin}{}_{6}$ = 7 | 4 | $C_{OREA}^{Fin}{}_{6}$=1,75 |
| REA №7 | | | | | | 1 | | | | | | | 2 | | | | | | $I_{OREA}^{Fin}{}_{7}$ = 3 | 2 | $C_{OREA}^{Fin}{}_{7}$=1,50 |
| REA №8 | | | | | | 1 | 2 | | 2 | 2 | 2 | | 2 | | | | | | $I_{OREA}^{Fin}{}_{8}$ = 11 | 6 | $C_{OREA}^{Fin}{}_{8}$=1,83 |
| REA №9 | | | | | | 1 | | | | | 2 | | 2 | 2 | | | | | $I_{OREA}^{Fin}{}_{9}$ = 7 | 4 | $C_{OREA}^{Fin}{}_{9}$=1,75 |
| REA №10 | | | 2 | | | 1 | | | | | 2 | | | 2 | | | | | $I_{OREA}^{Fin}{}_{10}$ = 7 | 4 | $C_{OREA}^{Fin}{}_{10}$=1,75 |
| REA №11 | | | | | | 1 | | | | | 2 | | | 2 | | | | | $I_{OREA}^{Fin}{}_{11}$ = 5 | 3 | $C_{OREA}^{Fin}{}_{11}$=1,67 |
| REA №12 | | | | | | | | | | | | | | | | | | | $I_{OREA}^{Fin}{}_{12}$ = 0 | 0 | $C_{OREA}^{Fin}{}_{12}$=0,00 |
| REA №13 | | | | | | 1 | | 2 | 2 | 2 | 2 | | | 2 | | | | 2 | $I_{OREA}^{Fin}{}_{13}$ =13 | 7 | $C_{OREA}^{Fin}{}_{13}$=1,86 |
| REA №14 | | | 2 | | | 1 | | | | | | | | | | | | 2 | $I_{OREA}^{Fin}{}_{14}$ = 5 | 3 | $C_{OREA}^{Fin}{}_{14}$=1,67 |
| REA №15 | | | | | | | | | 2 | 2 | 2 | | 2 | | 2 | 2 | | 2 | $I_{OREA}^{Fin}{}_{15}$ =14 | 7 | $C_{OREA}^{Fin}{}_{15}$=2,00 |
| REA №16 | | | | | | 1 | 2 | 2 | 2 | 2 | 2 | | 2 | 2 | 2 | 2 | | 2 | $I_{OREA}^{Fin}{}_{16}$ =21 | 11 | $C_{OREA}^{Fin}{}_{16}$=1,91 |
| REA №17 | 2 | | | | | 1 | | 2 | | 2 | 2 | | | | | | 2 | 2 | $I_{OREA}^{Fin}{}_{17}$ =13 | 7 | $C_{OREA}^{Fin}{}_{17}$=1,86 |
| REA №18 | | | 2 | 2 | | | | 2 | | | | | | 2 | | | | 2 | $I_{OREA}^{Fin}{}_{18}$ =10 | 5 | $C_{OREA}^{Fin}{}_{18}$=2,00 |
| Index of River linkages sustainability of the incoming flows $I_{OREA}^{Fin}$ | $I_{OREA}^{Fin}{}_{1}$ = 2 | $I_{OREA}^{Fin}{}_{2}$ = 0 | $I_{OREA}^{Fin}{}_{3}$ = 8 | $I_{OREA}^{Fin}{}_{4}$ = 2 | $I_{OREA}^{Fin}{}_{5}$ = 0 | $I_{OREA}^{Fin}{}_{6}$ =12 | $I_{OREA}^{Fin}{}_{7}$ = 6 | $I_{OREA}^{Fin}{}_{8}$ =10 | $I_{OREA}^{Fin}{}_{9}$ =12 | $I_{OREA}^{Fin}{}_{10}$ =12 | $I_{OREA}^{Fin}{}_{11}$ =16 | $I_{OREA}^{Fin}{}_{12}$ = 0 | $I_{OREA}^{Fin}{}_{13}$ =12 | $I_{OREA}^{Fin}{}_{14}$ =18 | $I_{OREA}^{Fin}{}_{15}$ = 4 | $I_{OREA}^{Fin}{}_{16}$ = 4 | $I_{OREA}^{Fin}{}_{17}$ = 4 | $I_{OREA}^{Fin}{}_{18}$ =14 | **$I_{REA}^{Fin}$ = 136** | | |
| Number (Quantity) of the incoming flows $N_{i}^{Fin}$ | 1 | 0 | 4 | 1 | 0 | 12 | 3 | 5 | 6 | 6 | 8 | 0 | 7 | 9 | 2 | 2 | 2 | 7 | | **75** | |
| Coefficient of sustainability of the incoming flows $C_{OREA}^{Fin}$ | $C_{OREA}^{Fin}{}_{1}$=2,00 | $C_{OREA}^{Fin}{}_{2}$=0,00 | $C_{OREA}^{Fin}{}_{3}$=2,00 | $C_{OREA}^{Fin}{}_{4}$=2,00 | $C_{OREA}^{Fin}{}_{5}$=0,00 | $C_{OREA}^{Fin}{}_{6}$=1,00 | $C_{OREA}^{Fin}{}_{7}$=2,00 | $C_{OREA}^{Fin}{}_{8}$=2,00 | $C_{OREA}^{Fin}{}_{9}$=2,00 | $C_{OREA}^{Fin}{}_{10}$=2,00 | $C_{OREA}^{Fin}{}_{11}$=2,00 | $C_{OREA}^{Fin}{}_{12}$=0,00 | $C_{OREA}^{Fin}{}_{13}$=1,71 | $C_{OREA}^{Fin}{}_{14}$=2,00 | $C_{OREA}^{Fin}{}_{15}$=2,00 | $C_{OREA}^{Fin}{}_{16}$=2,00 | $C_{OREA}^{Fin}{}_{17}$=2,00 | $C_{OREA}^{Fin}{}_{18}$=2,00 | | | **$C_{REA}^{Fin}$=1,81** |

# Table 7

| River Activity Output / River Activity Input | Basic level of linkage sustainability between the River Economic Activities (**REA**) ', exchanging all **five flows (5)** in the River Economic Complex, 2003 and 2006, $(\Sigma s_{ij}^{5})$ consolidated results | | | | | | | | | | | | | | | | | | Index of River linkage sustainability of the outgoing flows $I_{OFRLS}^{5}$ | Number (Quantity) of the outgoing flows, $N_{OF}^{5}$ | Coefficient of sustainability of the outgoing flows, $C_{OFRLS}^{5}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **17** | **18** | | | |
| REA №1 | | | | | | 2 | | | | | | | | 2 | | | 2 | | $I_{OFRLS^{5}1} = 6$ | 4 | $C_{OFRLS^{5}1}=1,50$ |
| REA №2 | | | | | | 2 | | | | | | | | 2 | | | 1 | | $I_{OFRLS^{5}2} = 5$ | 4 | $C_{OFRLS^{5}2}=1,25$ |
| REA №3 | | | 10 | | | 4 | 2 | | 2 | 4 | 2 | | 1 | 2 | | | | 2 | $I_{OFRLS^{5}3} = 29$ | 16 | $C_{OFRLS^{5}3}=1,81$ |
| REA №4 | | | | | | 1 | | 2 | | | | 1 | | | | | | 4 | $I_{OFRLS^{5}4} = 8$ | 5 | $C_{OFRLS^{5}4}=1,60$ |
| REA №5 | | | | | | | | | | | | | | | | | | | $I_{OFRLS^{5}5} = 0$ | 0 | $C_{OFRLS^{5}5}=0,00$ |
| REA №6 | 2 | 1 | 2 | 2 | | 2 | 2 | 2 | 4 | 1 | 2 | 1 | 3 | 4 | 1 | 5 | 4 | 1 | $I_{OFRLS^{5}6} = 39$ | 34 | $C_{OFRLS^{5}6}=1,15$ |
| REA №7 | | | 2 | | | 2 | | 2 | | | | | 2 | | | 2 | | | $I_{OFRLS^{5}7} = 10$ | 6 | $C_{OFRLS^{5}7}=1,67$ |
| REA №8 | | | | 2 | | 4 | 6 | 4 | 4 | 2 | 6 | 1 | 3 | 2 | | 2 | 2 | 2 | $I_{OFRLS^{5}8} = 40$ | 22 | $C_{OFRLS^{5}8}=1,82$ |
| REA №9 | | | 2 | | | 3 | | 2 | 2 | | 4 | | 4 | 2 | 2 | 2 | | | $I_{OFRLS^{5}9} = 23$ | 12 | $C_{OFRLS^{5}9}=1,92$ |
| REA №10 | | | 4 | | | 2 | | 2 | 2 | | 4 | | 2 | 2 | 2 | 2 | 2 | | $I_{OFRLS^{5}10} = 24$ | 13 | $C_{OFRLS^{5}10}=1,85$ |
| REA №11 | | | 2 | | | 4 | 2 | 4 | 4 | 4 | 3 | 2 | 4 | 2 | 3 | 3 | 2 | | $I_{OFRLS^{5}11} = 39$ | 22 | $C_{OFRLS^{5}11}=1,77$ |
| REA №12 | | | | 1 | | 3 | | | | 1 | | | 1 | | 1 | 3 | 1 | | $I_{OFRLS^{5}12} = 11$ | 9 | $C_{OFRLS^{5}12}=1,22$ |
| REA №13 | | | 2 | 2 | | 2 | 2 | 5 | 4 | 4 | 6 | 1 | 2 | 2 | 2 | 2 | | 2 | $I_{OFRLS^{5}13} = 38$ | 21 | $C_{OFRLS^{5}13}=1,81$ |
| REA №14 | 2 | 2 | 2 | | | 4 | | | 4 | 2 | | | 2 | | | 2 | 1 | 4 | $I_{OFRLS^{5}14} = 25$ | 14 | $C_{OFRLS^{5}14}=1,79$ |
| REA №15 | | | | 1 | | 2 | | | 2 | 2 | 2 | 1 | 2 | | 6 | 8 | | 4 | $I_{OFRLS^{5}15} = 30$ | 16 | $C_{OFRLS^{5}15}=1,88$ |
| REA №16 | | | | 2 | | 4 | 2 | 2 | 2 | 2 | 4 | 1 | 3 | 2 | 10 | 8 | | 4 | $I_{OFRLS^{5}16} = 46$ | 25 | $C_{OFRLS^{5}16}=1,84$ |
| REA №17 | 2 | 1 | | | | 2 | | 2 | | 2 | 2 | 1 | | 1 | | | 4 | 2 | $I_{OFRLS^{5}17} = 19$ | 12 | $C_{OFRLS^{5}17}=1,58$ |
| REA №18 | | | 2 | 4 | | 1 | | 2 | | | | | 2 | 2 | | 2 | 2 | 4 | $I_{OFRLS^{5}18} = 21$ | 11 | $C_{OFRLS^{5}18}=1,91$ |
| Index of River linkage sustainability of the incoming flows, $I_{IFRLS}^{5}$ | $I_{IFRLS^{5}1} = 6$ | $I_{IFRLS^{5}2} = 4$ | $I_{IFRLS^{5}3} = 28$ | $I_{IFRLS^{5}4} = 14$ | $I_{IFRLS^{5}5} = 0$ | $I_{IFRLS^{5}6} = 44$ | $I_{IFRLS^{5}7} = 16$ | $I_{IFRLS^{5}8} = 29$ | $I_{IFRLS^{5}9} = 30$ | $I_{IFRLS^{5}10} = 24$ | $I_{IFRLS^{5}11} = 35$ | $I_{IFRLS^{5}12} = 9$ | $I_{IFRLS^{5}13} = 31$ | $I_{IFRLS^{5}14} = 25$ | $I_{IFRLS^{5}15} = 27$ | $I_{IFRLS^{5}16} = 41$ | $I_{IFRLS^{5}17} = 21$ | $I_{IFRLS^{5}18} = 29$ | $\mathbf{I_{CEL}}_{5}^{5} = \mathbf{413}$ | | |
| Number (Quantity) of the incoming flows, $N_{IF}^{5}$ | 4 | 3 | 15 | 9 | 0 | 36 | 9 | 16 | 16 | 13 | 19 | 8 | 19 | 14 | 15 | 22 | 13 | 15 | | **246** | |
| Coefficient of sustainability of the incoming flows $C_{IFRLS}^{5}$ | $C_{IFRLS^{5}1}=1,50$ | $C_{IFRLS^{5}2}=1,33$ | $C_{IFRLS^{5}3}=1,87$ | $C_{IFRLS^{5}4}=1,56$ | $C_{IFRLS^{5}5}=0,00$ | $C_{IFRLS^{5}6}=1,22$ | $C_{IFRLS^{5}7}=1,78$ | $C_{IFRLS^{5}8}=1,81$ | $C_{IFRLS^{5}9}=1,88$ | $C_{IFRLS^{5}10}=1,85$ | $C_{IFRLS^{5}11}=1,84$ | $C_{IFRLS^{5}12}=1,13$ | $C_{IFRLS^{5}13}=1,63$ | $C_{IFRLS^{5}14}=1,79$ | $C_{IFRLS^{5}15}=1,80$ | $C_{IFRLS^{5}16}=1,86$ | $C_{IFRLS^{5}17}=1,62$ | $C_{IFRLS^{5}18}=1,93$ | | | $\mathbf{C_{EL}}_{S}^{5}=\mathbf{1,68}$ |

# Conclusions about the $C_{RLS}$

- $C_{RLS}5 = 1,68$ *:* in the beginning of 21st century the investigated River Economic Complex has mostly linkages with marketing origin; it is a precondition for an economic development.
- The flows of material and human resources *($C_{RLS}Mat = 2,00$, $C_{RLS}HRe = 2,00$)* are entirely under the influence of the market.
- Partial influence of the legislation on the financial flows and the offered services *($C_{RLS}Fin = 1,81$, $C_{RLS}Ser = 1,74$)*.
- The information flows are mostly dominated by the legislation *($C_{RLS}Inf = 1,28$)* and there is relatively low influence of the market in creating information linkages.

# Conclusions about the $I_{RLS}$

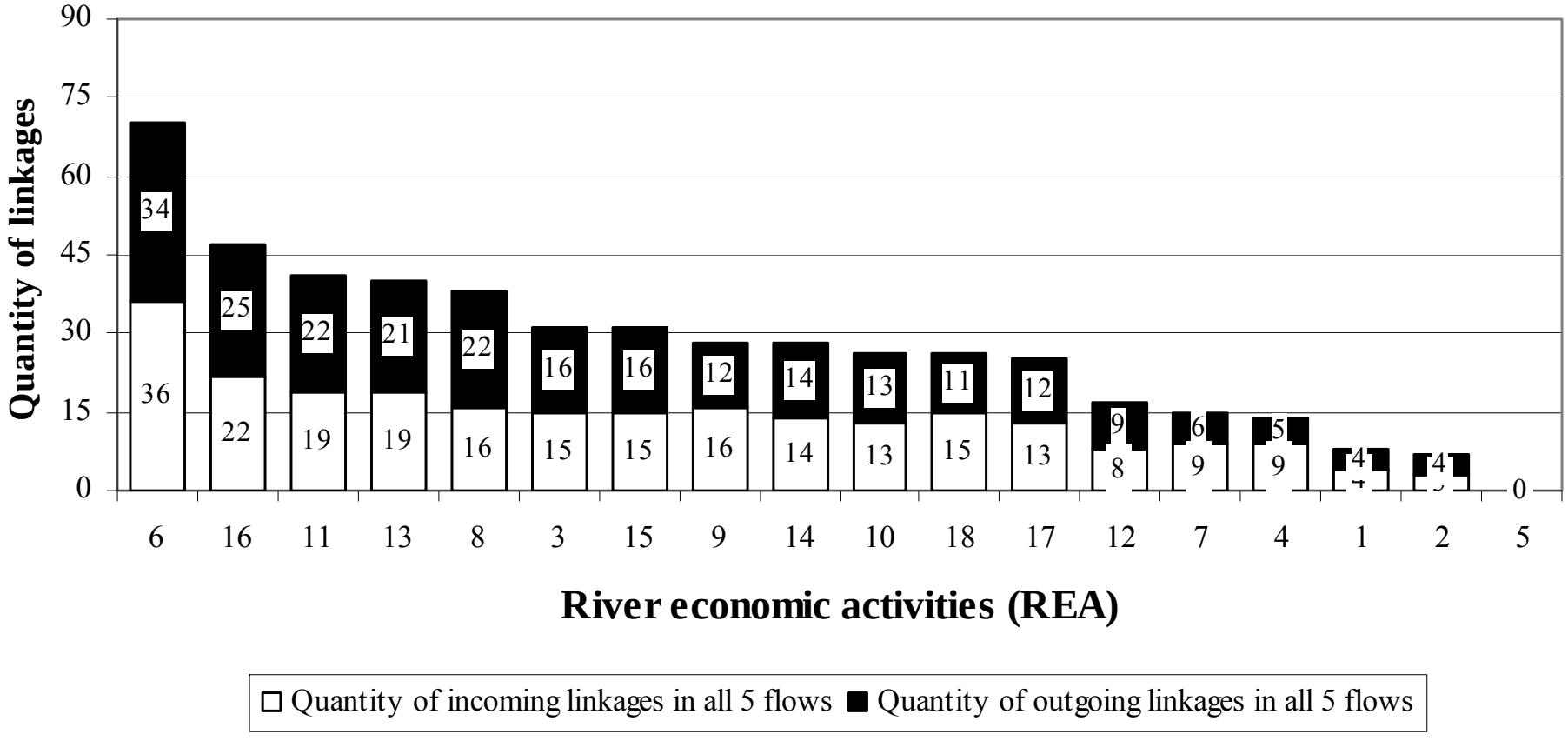
- The relatively high value of the Index about information linkages ($I_{RLS}Inf = 87$) is a result of the great amount of documents, which the organizations, have to exchange by legislation.
- The relatively low values of the Index about the material and human resources flows ($I_{RLS}Mat = 38$, $I_{RLS}HRe = 40$) are result of their environment, which (according to their coefficients) is 100% marketing orientated.
- The relatively high values $I_{RLS}Fin=135$, $I_{RLS}Ser=113$, and the values of their Coefficients show that there is a necessary influence of the legislation in these two flows.

# **100%** vs. **50%**

- The extreme cases (100% marketing society or 100% central planning society) are not the proper economic environment for economic development.
- The sustainable development = a balance between linkages with “marketing” and “legislative” origins.
- The empty cells indicate lack of any linkages – opportunity for entrepreneurship.

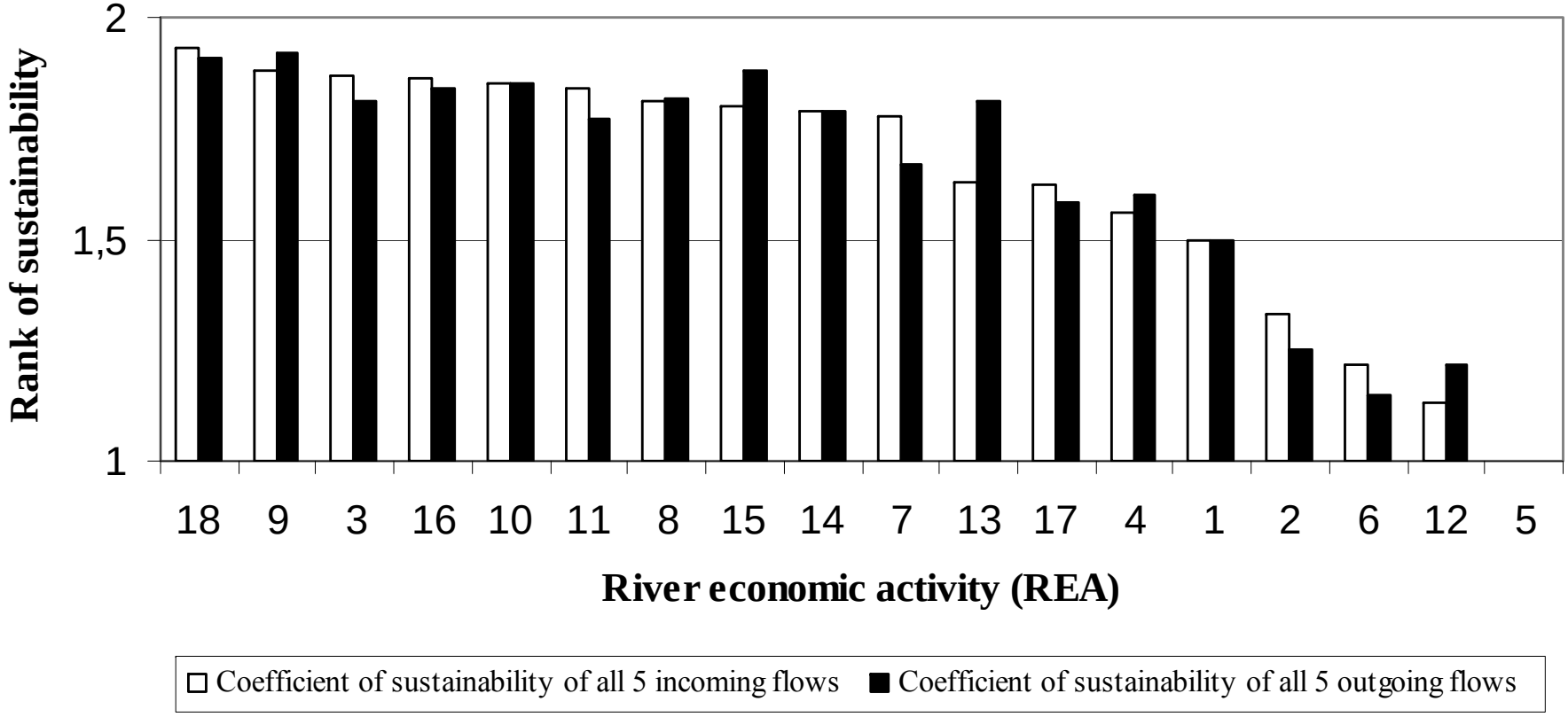
# Quantity of linkages per REA

**Figure 1. Quantity of linkages for all flows per River economic activity in Rousse municipality River Economic Complex**



# Sustainability of the linkages per REA

**Figure 2.Coefficient of sustainability of all 5 flows in Rousse municipality River Economic Complex**



# Global crises

- It could be also possible to use this *Comprehensive River Economic Linkages Sustainability Table* in a period of large complex changes (such as the Global Financial Crises, which begun in 2008) - it may show which linkages the crises will negatively affect first (the marketing ones), and which linkages will be affected last (the legislative ones).
- In a time of development this Table may show the linkages which will need improvement (the legislative ones) and the linkages which will bring the society to economic prosperity (the marketing ones).

# Other applications

- Clusters
- Project networks
- Members in a team/department
- Interregional analyzes – EU, Danube, etc.