

A WAY TOWARDS THE CROATIAN INDUSTRIAL IDENTITY BASED ON OWN RESOURCES AND POTENTIALS

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Preliminary notes

Croatia has many natural resources and a combination of different potentials that are not being sufficiently innovatively used in structuring, encouraging, and implementing of new and sustainable production and economy. These are notably: a very advantageous geo-strategic location and traffic infrastructure; the high-quality spring water, rivers and the sea; various, clean, and high-quality soils; vast wooded areas and high-quality timber; a favourable climate, unpolluted air and winds; a distinctive culture, traditional values and skills; well educated, friendly, creative and adaptable people. This paper draws attention to the possibilities of building an independent economic (industrial) and civilization based identity founded on the synergy of input parameters for sustainable technologies and products. The key areas for the possible manufacturing of products, equipment and systems have been defined: for production of energy from renewable resources; in tourism, use of leisure time, and entertainment; for the new agriculture and industrial bio-technology; in development of ecologically and energy self-sustainable regions, settlements, and homesteads; in processing, refining and designing of wood products, inorganic mineral raw materials and materials of higher added value; information and communication technologies and industrial design in the function of development of the aforementioned sectors of production.

Key words: Croatia, economic and civilisation identity, resources and potentials, sustainable production, synergy

Put ka hrvatskom industrijskom identitetu utemeljenom na vlastitim resursima i potencijalima

Prethodno priopćenje

Hrvatska raspolaze s nizom prirodnih resursa i kombinacijom potencijala koji se nedovoljno inovativno koriste u strukturiranju, poticanju i provedbi novih proizvodnji. To su posebno: vrlo povoljan prostorni položaj i prometna infrastruktura; kvalitetna izvorska voda, vodotokovi i more; čisto i kvalitetno tereno; velike šumske površine i kvalitetno drvo; povoljna klima, čist zrak i vjetar; osebujna kultura, tradicijske vrijednosti i vještine; ljubazni, dobro obrazovani, kreativni i prilagodljivi ljudi. Rad ukazuje na mogućnosti izgradnje vlastitog gospodarskog (industrijskog) i civilizacijskog identiteta utemeljenog na sinergiji ulaznih parametara za nove proizvodnje i proizvode. Definirana su ključna područja mogućih proizvodnji dijelova, opreme i sustava: za proizvodnju energije iz obnovljivih izvora; za turizam, korištenje slobodnog vremena i zabavu; za novu poljoprivredu i industrijsku biotehnologiju; za izgradnju ekološki i energetski samoodrživih regija, naselja i gospodarstava; za preradu, oplemenjivanje i oblikovanje drvnih proizvoda, anorganskih mineralnih sirovina i materijala više dodane vrijednosti; informacijsko-komunikacijske tehnologije i industrijski dizajn u funkciji razvoja gore navedenih područja proizvodnje.

Ključne riječi: gospodarski i civilizacijski identitet, Hrvatska, održiva proizvodnja, resursi i potencijali, sinergija

1

Introduction

Uvod

It might be useful to start by stating arguments for the positive image of, or even prejudice about, Croatia as a country with some key and untapped advantages in comparison with other countries. Can we consider as founded the claims that this country has a preserved and relatively clean environment – air, land, water, soil, flora and fauna – an advantageous geo-strategic location and creative, ingenious, and adaptable people who are ready to take risks and want to have the best life possible?

Numerous comparative studies [1, 2] show that our air is cleaner than the European average because of the smaller share of industry or energy systems producing CO₂, SO₂, NO_x, dust particles, etc. According to some estimates, Croatia is ranked as high as the 5th country on the list of European countries with the largest supplies of fresh water. Many small and medium watercourses are clean and rich in edible fish, crabs, etc. The Adriatic Sea is the cleanest sea in the Mediterranean and is among the cleanest seas in the world with a rich and diverse flora and fauna.

A big part of the cultivable land has been untended for over 20 years and it is therefore relatively unpolluted by artificial fertilizers. On the other hand, due to a relatively low share of industrial agricultural production, even the cultivated land is still not polluted to such an extent like for example in the Netherlands or Denmark. Around 44 % of the country's land surface is covered by well preserved and

kept forests. Biodiversity in Croatia is among the highest in Europe, which is among other things the result of an undisturbed and healthy ecosystem.

Therefore, it is clear that Croatia has a **unique combination of natural resources and potentials**. However, they are either being imprudently used or do not serve as the basis for our own innovatively conceived economic development.

Insisting on production based on natural resources may seem as an outdated approach in today's world. However, we propose here a concept of synergetic joining of essential potentials for organizing modern production and activities which should result in a higher added value.

2

Croatia's basic resources and potentials

Hrvatski temeljni resursi i potencijali

A holistic approach and synergetic activity of basic elements in every production and life (Fig. 1) can be the basis for development of a different structure of economy and the country's own new sustainable productions.

At the present moment, when people are finally increasingly becoming aware of the need for a development based on using individual forces and potentials, it is to be desired that all intellectual forces get actively engaged in drafting and promoting the concept of the future **socially and environmentally sustainable economic system**, which is one of the more recent concepts of the future communities – Fig. 2 [3].

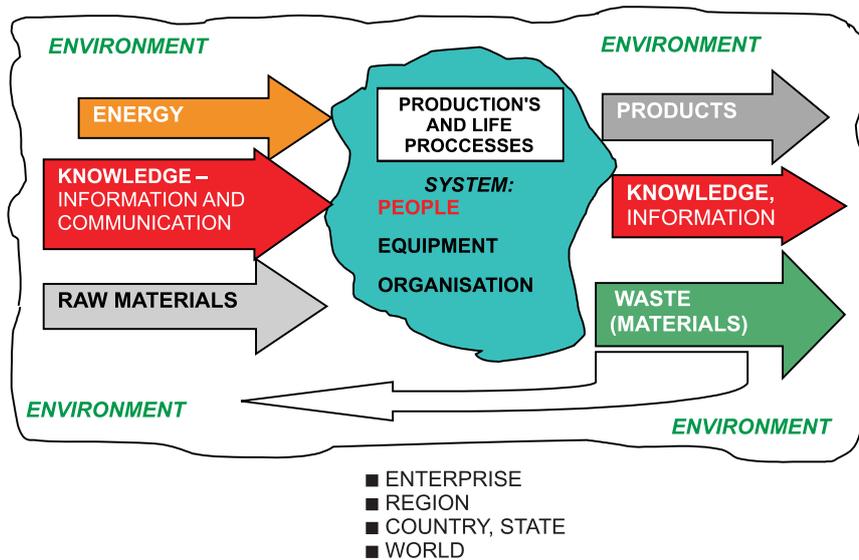


Figure 1 Key resources and input and output parameters in every sustainable production and life
Slika 1. Ključni resursi i ulazni i izlazni parametri svake održive proizvodnje i života

Sustainable development / growth

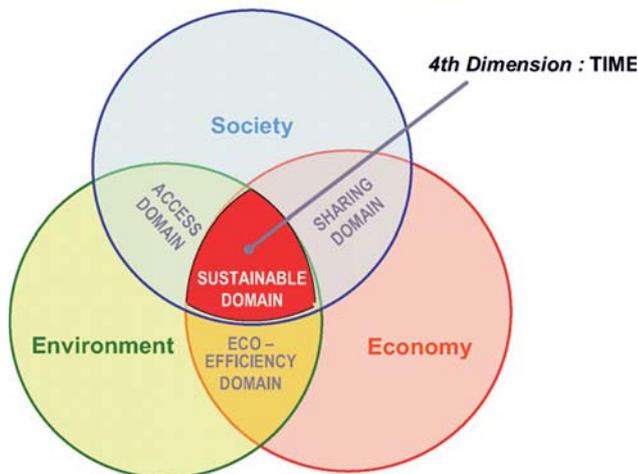


Figure 2 Fundamentals of sustainable development [3]
Slika 2. Temelji održivog razvitka [3]

- Economic sustainability – competitiveness, profit;
- Ecological sustainability – preserved clean and healthy environment;
- Social sustainability – new employments, the contentment and prosperity of people.

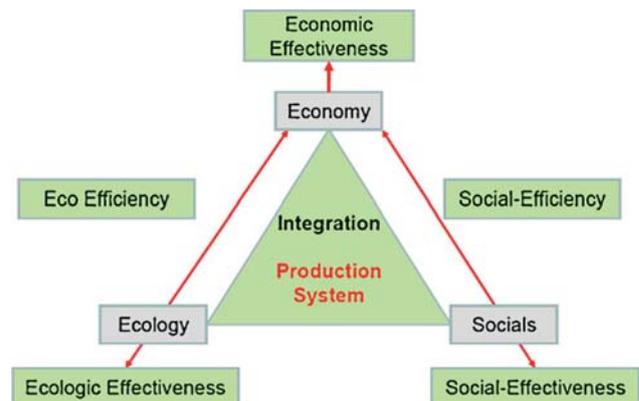


Figure 3 Challenges of sustainable enterprise [4]
Slika 3. Izazovi održivog poduzetništva [4]

Such an approach would be directed towards a wise use of our own knowledge, natural resources, while at the same time it should motivate the entire community to implement it. The aim is to conceive an interconnected system of industrial production within which a surplus of newly created values would be produced through synergetic activities, which would be accompanied by the preservation of environment, securing new jobs, and ensuring a natural, high-quality, and content life for all citizens. On the other hand, we would also be creating and strengthening our own **economic (industrial) and civilization based identity** within the new big Europe, which would be accompanied by deliberate and targeted establishing of ties with partners from other countries.

Experiences of many smaller countries (e.g. Austria, Finland, Switzerland, Norway, Denmark) show the production and sustainable economic development of businesses (Figure 3), but also the development of local communities can be based on the following elements:

- Individual natural resources: raw materials, geographic position, water, air, sun...
- The level of education, cultural values, traditions and skills;

It is therefore logical that we synergistically incorporate all our natural resources and potentials in the building of the new **identity** of Croatian economy and life.

The starting point in creating the future competitive structure of the economy could greatly rely on Croatian **key resources and potentials**:

- a very advantageous geo-strategic position; road infrastructure, sea and river routes;
- high-quality water: freshwater springs, waterways and sea;
- clean, varied and high-quality soil: for field crops, stone, inorganic raw materials;
- vast forest areas and high-quality timber;
- favourable mediterranean and continental climate – a high number of sunny days; clean air and wind;
- a distinctive culture, traditional values and crafts;
- well educated, amiable, creative and adaptable people.

Combining and integrating these potentials can lead us to the new concept of the **socially and environmentally sustainable economic development**, the aim of which is to

balance the functioning of the **biosphere, technosphere, and sociosphere**.

The key question is how to realize economically sustainable activities on the basis of these resources and potentials, while avoiding the pitfalls of unwise depletion of natural resources. Caring about the **protection** of natural resources must become a long-term priority and it certainly includes a protection from foreign and our own exclusively "conquering" interests guided only by the pursuit of profit.

The long-term interest could and should be directed towards conceiving a living space on the basis of a knowledge based society and "wise community" [5], in order to gradually develop the **new identity of Croatian economics and life** [6].

The basic **principles and criteria** for evaluating the existing, as well as for adaptive managing and developing the future manufacturing structure could be:

1. Manufacturing based on own resources and potentials: geographical space, water, air, sun, soil, people;
2. Recognition and awareness of own products and processes ("let's produce Croatian");
3. Security – energetic, financial and legal for investors and company owners, protection of people and property, social safety...
4. Networking, cooperation and synergy of individual fields and resources in research, development and manufacturing – the value chains and value networks;
5. Education, science and applied research in the function of developing own economy and industry;
6. Openness and links to the foreign surrounding – cooperation in science, research, development and manufacturing, import of experts and workforce when needed;
7. Sustainability:
 - biologic and ecologic,
 - economic (market) – available capital, investments, profits, competitiveness,
 - technologic – up-to-date high value added production,
 - social – demographic, employment of as many people as possible (of lower education level, as well);
8. Industrial and social priorities as well as a holistic focus on them – should derive from applying the previously mentioned principles and criteria.

The optimal solution for a real project is a function of specific combination of principles and criteria as well as ranking their relative importance.

One of the key questions is how to evaluate the relative importance of each principle and criterion in particular cases of the realization of developed projects or investments. This question essentially determines the final solutions. As each social group has different functioning goals and their respective values, the problem of defining the function of goals in real-world is very complex.

3

Possible areas for products and production

Moguća područja proizvoda i proizvodnji

As a result of this approach, the article further briefly describes some, in the author's opinion, focus priority areas in the new structure of the economic system based on the production with the use of individual resources and potentials.

The aim of the entire concept is to logically point through a systematic approach to the possibilities of

integrating **agricultural, food, tourism, energy, and manufacturing** sectors and the **intellectual capital**.

3.1

Designing, manufacturing, installing and maintaining of the equipment and systems for using renewable energy sources

Projektiranje, proizvodnja, instaliranje i održavanje opreme i sustava za korištenje energije iz obnovljivih izvora

All scientific studies and technological estimates agree that the world is entering a period of very intense research and application of additional energy from renewable sources, because fossil energy sources will be almost exhausted in some 50 years from now. Our community can also benefit from many opportunities for new jobs, development, and application of scientific breakthroughs and most recent technological solutions that this fast-growing sector offers.

It has become clear that we must create a legal framework that would more strongly encourage manufacturing and installation of the systems for production of electric and thermal energy from: **wind power systems, mini and small hydroelectric power plants, solar systems, hydrogen technologies, biogas and biomass, geothermal energy, etc.**

According to the data of the Global Wind Energy Council, the installed power of **wind power systems** in the world increased by 36 % in 2008. The European Union invested in 2008 some 11 billion € in the production of wind power systems, while some 160 000 people directly or indirectly work in this sector. Some 36,5 billion € were invested in new windmills in 2008 [7].

Investors in Croatia show a very strong interest for future wind power systems of the total envisaged capacity of some 5000 MW. According to figures, the number of wind aggregates is growing, but unfortunately our industry is not sufficiently involved in production of their parts. The only locally produced wind power plant was manufactured by the company KONČAR.

A similar case is that of **mini hydroelectric power plants** for which studies and implementation projects have been made. In the continental part of the country there are many small rivers and streams which are ideal for such facilities which do not require many construction interventions and investments.

Croatia's greatest energy potential is certainly **solar energy**. Croatia has over 70 % sunny days annually, something we almost do not use at all.

Solar cells for photovoltaic transformation of the solar energy are in the focus of the basic and applied researches. The prices of photovoltaic panels are still relatively high, which limits their wider use.

It is not likely that local industry could independently manufacture such solar cells, but it can certainly shape them in panels and "individually tailored" systems for application and develop integrated systems of management and maintenance. In Croatia, photovoltaic systems could have a very important role in areas that are not on the electric grid – remote islands, villages, etc.

For **Croatian naval architecture** new opportunities arise regarding designing and building of platforms (ships with cranes) for the installation of a growing number of off-shore wind power plants in the northern Europe.

3.2

Designing and manufacturing products for tourism, leisure, and fun

Projektiranje i proizvodnja proizvoda za turizam, korištenje u slobodnom vremenu i zabavu

According to all indicators, tourism is the only sector where it is possible to integrate not only food and drink consumption from our own sources and production, but where it is also possible to incorporate and use the equipment which was designed and produced by local companies.

Some of the possible areas of production and products could be: production of hotel and apartment equipment – e.g. cooling systems, solar heating systems and systems of producing electric energy, and waste management. Structures which could be designed and manufactured in Croatia: building of self-sustainable and low-energy tourist buildings; electric drive vehicles; small traditionally crafted boats and small submarines for undersea sightseeing, etc.; sports appliances and equipment for health, recreational and hunting tourism; machines for games, etc.

These could be expanded by new and modern organized production based on traditional manufacturing crafts. Since ancient times these areas have been inhabited by creative people skilful in knitting, embroidering, wickerwork, building wooden ships, stone-dressing, etc. Ethno-tourism, ecotourism, and “amusement industry” offer interesting and innovative possibilities for integration of these small-scale manufactures.

3.3

Designing and manufacturing of equipment for the use of drinking water, for new agriculture and industrial biotechnology

Projektiranje i proizvodnja opreme za korištenje pitke vode, novu poljoprivredu i industrijsku biotehnologiju

The new agriculture and industrial biotechnology carry with them many challenges for the future development of Croatia. Potentials of the soil, water, air, and sun can be easily used in those areas and integrated in growing plants, animals, for organically-grown food and drinks with the latest scientific discoveries and technological solutions.

The primary goal should be aimed at individual production of parts and systems for the processes of preparation and processing of drinks, food, plants, and animals.

Some of the priorities could be linked to the equipment for cultivation and processing of: olives, indigenous healing herbs, flowers, hazelnuts, honey, mushrooms, apples, indigenous varieties of grapes and specific wine sorts, edible birds, snails, sea and river fish, sheep and goats, drinkable spring water, etc.

Numerous individual efforts and results are already visible, but we still lack carefully planned encouragement and organization of all interested sides. One of the ways for better organization would be the creation of clusters that would include smaller agricultural producers, food and drink producers, equipment producers and dealers.

3.4

Development of ecologically, energy, and culturally self-sustainable regions, settlements, and farms

Izgradnja ekološki, energetske i kulturno samoodrživih regija, naselja i gospodarstava

Eco-settlements, ethno-settlements, and modernization of traditional crafts offer great opportunities for revitalization, notably revitalization of run-down or forgotten rural areas [2 – in D. Muvrin, p. 153-157 and Lj. Ajduković, p. 229-243]. In connection with that it should be stressed that almost 50 % of Croatia's population live in villages and outside of cities.

In developed industrial countries and in Croatia, there is a growing number of young and educated people who want to have a high-quality life outside of cities in the natural environment and in smaller communities. New scientific discoveries and technical solutions offer them opportunities for a completely new organization of work (entrepreneurship) and a high-quality life. Eco-architecture is becoming an important worldwide movement which is striving to *integrate the production of healthy food, use of the renewable energy sources, waste management, and traditional crafts* for a higher quality life.

Permaculture is increasingly becoming an important concept and a system of organizing life which takes into consideration all natural potential energy sources and exploits them in the best way possible, by using a minimum amount of energy with the aim of creating a self-sustainable whole. All waste is recycled without any negative environmental impact.

Unlike other countries, Croatia has so far witnessed only isolated attempts of enthusiasts.

3.5

Processing, refinement, and designing of wood and wood products of higher added value

Prerada, oplemenjivanje i oblikovanje drva i drvnih proizvoda više dodane vrijednosti

Forests are among Croatia's main sources of renewable raw materials for industrial production. Unfortunately, at present most of the wooden mass is being exported after primary processing instead of being processed into products of higher added value on the market.

Besides encouraging manufacturing of wood products, modernization of the processing and refinement equipment and a more intense participation of scientific and developmental research and industrial design are also necessary. For example, this notably refers to manufacturing of half-products from: refined and high densified wood, wood composites, use of wood waste in manufacturing of new products or to production of bioethanol fuel.

A positive fact is that this sector of economy recently conducted studies for encouragement of development along these lines and is influencing the awareness and motivation for change.

3.6

Processing and designing of inorganic mineral raw materials and materials of higher added value

Prerada i oblikovanje anorganskih mineralnih sirovina i materijala više dodane vrijednosti

Croatia has varied mineral raw materials of very high quality, but they are not sufficiently used in the manufacturing of materials and half-products of high value.

This is the case of higher degrees in processing and designing of stone, sand, gravel and other similar raw materials.

Croatia could produce oxide engineering and sanitary ceramics of better use characteristics, glass, glass-ceramics, numerous diverse new and improved building materials and half-products (e.g. polymer concrete or fibre reinforced concrete, polymer-ceramic composites and mortars, waterproof materials, etc.).

3.7

Manufacturing of equipment and systems for waste management and the use of recycled materials in the production of new products - Inverse Manufacturing

Proizvodnja opreme i sustava za zbrinjavanje otpada i korištenje recikliranih materijala za izradu novih proizvoda – tzv. obrnuta proizvodnja

According to a study of *Roland Berger Strategy Consultants*, the world market of environmentally friendly technologies and equipment is worth today over 1000 billion €, and according to their projection it will be worth 2200 billion € in 2020 [8].

We have to adequately manage most of our industrial and communal waste, especially after Croatia enters the EU. It is of utmost importance in the development of tourism and, in general, for maintaining and strengthening of its reputation as an ecologically respectable and organized country. Unless we start to design and produce by ourselves the equipment for collection, separating and disassembly, identification, incineration, recycling and reuse of waste and worn-out products, purification of water, etc., in a few years from now we will become completely dependent on imports of that equipment and processes. Since it is normally a single piece production, and the equipment is not too complex for designing, it can be relatively easy performed in smaller companies with higher share of human labour.

Since Croatia is currently almost completely dependent on import of technical materials, recycled raw and other materials could be creatively used for starting new productions. Energy from waste incineration or biogas from landfills can serve as additional sources of electric or thermal energy.

3.8

The use of information and communication technologies (ICT) in development of the aforementioned production sectors

Informacijsko-komunikacijske tehnologije (ICT) u funkciji razvoja gore navedenih područja proizvodnje

New generations of experts with excellent computer knowledge should not only be oriented towards development of software for the needs of communication

devices of foreign companies. The application of ICT in manufacturing and service sectors offers many more far-reaching, varied and creative possibilities.

The ICT's multidisciplinary and transdisciplinary potential is adequately described in the strategic document *Croatia in the 21st century – information and communication technology*. It analyzes in detail possible new products and services based on information and communication technology.

Since no major investments in equipment are needed here, the crucial elements for founding and development of a company are ideas, knowledge, and contacts with users.

3.9

Industrial design

Industrijski dizajn

Creativity of our people is not adequately used in the development of appealing products on the market. It notably refers to consumer goods – house appliances, clothes and footwear, toys, furniture, but a series of other products as well.

Existing companies are not sufficiently aware of the fact that wholly designed products (functionally, aesthetically, and ecologically) have more leverage on the market. The younger generation of our graphic designers is very well-known in the world and has won many awards, while our industrial designers work almost exclusively for foreign companies. One of the key reasons for that is the fact that local producers are not oriented towards innovative development of products, and instead still prefer copying somebody else's solutions.

4

Integration of research and development in the mentioned concept

Integracija znanstvenih i tehnoloških istraživanja u navedeni koncept

Science and technology research should necessarily be integrated with the mentioned areas in order to be in the function of own economic development. Therefore, the entire strategy of scientific and developmental projects, cooperation in European research programmes and other projects, education of young researchers and experts abroad should be linked and oriented to the previously elaborated priorities.

To successfully develop small and middle size companies (the ones that do not have enough own expertise), based on selected priorities, Croatia has to envision and organize a support subsystem for: knowledge transfer, research, testing, installation of state-of-the-art equipment and processes, production services, design, marketing, long-life education etc. Such tasks are specifically to be undertaken by universities, incubation and technology centres, and service centres for manufacturing.

Within the scientific and academic community it is necessary to establish a new system of generating and evaluating projects, based on three basic principles:

- Focused scientific and technological projects selected according to the national priorities – a competition for projects where the priorities can be changed every few years;
- Integration of fundamental and applied research;

- Interdisciplinary and transdisciplinary project cooperation – connecting social, humanistic, natural and technical sciences.

5

Conclusion

Zaključak

New approaches to sustainable production [9] recognize and integrate social, ecological, and economic criteria in industrial development.

In the past 10 years many efforts were undertaken by our intellectual elite with the aim of defining such individual development conception of Croatia and modern economic and manufacturing structure [1, 2], [6-8]. Many of those proposals are based on the systemic approach, convincing arguments and start from defined resources and potentials. Despite that, there are still no visible qualitative breakthroughs toward new conceptions of individual economic development and identity, notably due to recognizable obstacles or limits.

Some of the main obstacles and limits in the implementation of these and similar concepts are:

- Undefined targets and priorities of social and economic development at the state and regional level;
- Insufficient awareness, education, and understanding of political decision-makers for new concepts and unwillingness for a more active and open cooperation with scientists and experts;
- Insufficient understanding and undeveloped (or ruined) ethical motivation of many citizens to act for the general good;
- Insufficient number of experts trained for systematic defining and managing complex projects of this kind;
- Lack of legal and motivating measures in line with the preset priorities of economic development and/or their non-implementation;
- Lack of capital for initial investments in new, aforementioned areas;
- Strategies of developed industrial countries, whose interests in exporting their goods and technologies collide with the interests of smaller countries in individual development.

6

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