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CONTENTS

PLENARY SESSION

THE INFLUENCE OF THE ADSORBENT HYDRATION ON COBALT ADSORPTION FROM WATER SOLUTIONS (Jovan Jovanovic, Ivana Milosevic, Sanja Kurcubic, Milan Milivojevic).....	3
EXTRACTS OBTAINED BY NATURAL DEEP EUTECTIC SOLVENTS (NDESs) EXTRACTION AS POTENTIAL FUNCTIONAL FOOD ADDITIVES (Rada Pjanovic, Predrag Petrovic, Ana Milivojevic, Danijela Seremet, Drazenka Komes).....	11
INTERACTIONS OF CLIMATE CHANGE WITH FOOD SECURITY AND GOALS OF SUSTAINABLE DEVELOPMENT IN AGROECOSYSTEM (Hosam Bayoumi Hamuda).....	17

I - INDUSTRIAL ENGINEERING

Session 1. Mechanical Engineering

DEVELOPMENT OF INNOVATIVE AND ENTREPRENEURIAL COMPETENCIES OF FUTURE ENGINEERS THROUGH THE ITlab PROJECT AT THE TECHNICAL FACULTY "MIHAJLO PUPIN" ZRENJANIN (Dragica Radosav, Eleonora Desnica, Slavica Prvulovic, Ljiljana Radovanovic, Jasmina Pekez, Vladimir Sinik, Ivan Palinkas).....	30
INDUSTRIAL ENGINEERING METHODS AND TECHNIQUES IN INDUSTRY 4.0 (Mirjana Misita, Vesna Spasojevic Brkic, Dragan D. Milanovic, Martina Perisic).....	36
PROCEDURE DEVELOPMENT OF FLIP STATION FOR POSITING DISC AND ROTOR TYPE PARTS (Miroslav Milutinovic, Spasoje Trifkovic, Aleksija Duric).....	42
MODERN SWARM-BASED ALGORITHMS FOR THE TENSION/COMPRESSION SPRING DESIGN OPTIMIZATION PROBLEM (Mica Durdev, Eleonora Desnica, Jasmina Pekez, Milosevic Mijodrag, Dejan Lukic, Borivoj Novakovic, Luka Dordevic).....	49
ANALYSIS OF CROSS-SECTION INFLUENCE ON EIGENFREQUENCIES OF THE CRANES WITH LOADING-UNLOADING TROLLEYS (Spasoje Trifkovic, Nebojsa Radic, Miroslav Milutinovic).....	54
NUMERICAL INVESTIGATION OF THERMAL AND MECHANICAL BEHAVIOR OF WAFER MOLD (Omer Sinan Sahin, Muharrem Hilmi Aksoy, Abdullah Sadik Tazegul).....	62
AUTOMATION AND INDUSTRY 4.0 (Stanko P. Stankov).....	70
DYNAMIC MODELLING AND CONTROL OF A REACTION WHEEL INVERTED PENDULUM USING MSC ADAMS AND MATLAB (Abdullah Qakan, Umit Onen).....	78
FORGE WELDING OF BIMETALIC AXE (Zoran Karastojkovic, Nikola Bajic).....	83
VOCATIONAL KNOWLEDGE TRANSFER OF CRAFT MASTER SKILLS IN POST INDUSTRIAL ERA (Vlad Walter Veckie, Edward Anthony Veckie).....	89

USING THE LASER SCANNING FOR CONSERVATION OF CULTURAL HERITAGE BUILDINGS (Clara-Beatrice Vilceanu, Luisa Dungan, Sorin Herban, Francisc Popescu).....	98
--	----

Session 2. Energetics and Process Technique

MANUFACTURE OF THERMAL SOUND INSULATION PANELS FROM RASPBERRY AND BLACKBERRY CUTTINGS (Srecko Curcic, Sandra Milunovic Koprivica, Milan Veskovic).....	106
---	-----

GENERALIZED DIFFERENTIAL QUADRATURE METHOD FOR STUDYING THE IN-PLANE VIBRATIONS OF CURVED PIPES CONVEYING FLUID (Svetlana Lilkova-Markova, Dimitar Lolov).....	114
---	-----

TECHNICAL AND TECHNOLOGICAL PARAMETER ANALYSIS OF HAMMER MILL CRUSHER (Slavica Prvulovic, Jasna Tolmac, Milica Josimovic, Vladimir Jakovljevic, Aleksandra Bozovic)	122
--	-----

SMART AND NETWORKED VILLAGES - INFORMATION SYSTEM FOR RURAL DEVELOPMENT (Kresimir Lackovic, Milan Ivanovic).....	128
---	-----

APPLICATION OF ORGANO-MINERAL AND MICROBIAL FERTILIZERS IN THE PROCESS OF RAISING RASPBERRIES (Srecko Curcic, Stevan Babic, Sandra Milunovic Koprivica, Momcilo Vujicic, Aleksandar Leposavic).....	137
--	-----

OPTIMIZATION OF A SIMULATION FOR THERMOELECTRIC GENERATORS AND THEIR APPLICATION IN WATER BOILER SYSTEMS WITH COMBUSTION CHAMBER (Cristian Chirita, Momir Tabakovic).....	143
--	-----

ALTERNATE FEEDSTOCKS IN THE REFINERY (James G. Speight, Ljiljana Radovanovic).....	152
---	-----

MATHEMATICAL MODELS APPLIED FOR EXPERIMENTS ON BIOGAS PRODUCTION AT SMALL SCALE (Adrian Eugen Cioabla, Gabriela-Alina Dumilrel, Ana Maria Pana, Valentin Ordodi, Dorin Lelea, Madalina Ivanovici, Francisc Popescu, Luisa Izabel Dungan).....	160
--	-----

Session 3. Designing and maintenance

TEMPERATURE MAPPING IN PHARMACEUTICAL WAREHOUSE - FRAMEWORK FOR PHARMACY 4.0 (Ilija Tabasevic, Dragan D. Milanovic, Vesna Spasojevic Brkic^ Mirjana Misita).....	171
CLUSTER AS A MODEL OF ENTREPRENEURIAL INFRASTRUCTURE (Vlado Medakovic, Bogdan Marie).....	176

MATHEMATICAL MODEL OF OPTIMIZATION OF VIBRO-DIAGNOSTICS PROCEDURES (Milica Josimovic, Ljubisa Josimovic, Slavica Prvulovic, Vladimir Sinik).....	182
---	-----

THE STUDY OF FACTORS AFFECTING THE QUALIFICATION OF PHARMACEUTICAL FACILITIES (Ilija Tabasevic, Dragan D. Milanovic).....	191
--	-----

ON PID CONTROLLER DESIGN FOR A HIGH-ORDER SYSTEMS (Sasa Lj. Prodanovic, Ljubisa M. Dubonjic).....	199
--	-----

CBM CONCEPT-PREDICTIVE MAINTENANCE-VIBRATION ANALYSIS AND BALANCING PROCESS OF INDUSTRIAL FANS (Borivoj Novakovic, Ljiljana Radovanovic, Rade Ivetic, Vladimir Sinik, Mica Durdev, Luka Dordevic).....	208
BRIEF REVIEW OF THE APPLICATION OF THE SPM METHOD IN ORDER TO IMPROVE PREVENTIVE MAINTENANCE OF BEARINGS (Luka Djordjevic, Borivoj Novakovic, Jasmina Pekez, Ljiljana Radovanovic, Mica Djurdjev).....	214
Session 4. Oil and Gas Engineering	
OIL PREPARATION AND HEATING FOR PIPELINE TRANSPORT (Jasna Tolmac, Slavica Prvulovic, Marija Nedic, Dragisa Tolmac, Vladimir Sinik).....	221
TESTING AND CONQUERING INTERVAL TECHNOLOGY ON THE WELL (Milan Markovic, Zvonimir Boskovic).....	226
INCREASING THE QUALITY OF SEPARATION IN THE PHASE OF PREPARATION OF OIL FOR TRANSPORT (Milan Markovic, Jasmina Perisic).....	232
II - ENVIRONMENTAL ENGINEERING	
Session 5. Health and Environmental protection	
CO ₂ EMISSION ASSESSMENT OF CONSTRUCTION AND WASTE MATERIALS IN THE CONTEXT OF CIRCULAR ECONOMY: CASE STUDY OF PROJECT "CORRIDOR X" (Nikola Karanovic).....	244
ENVIRONMENTAL IMPACT ASSESSMENT FROM SMALL INCINERATION FACILITY OF ANIMAL CARCASS AND MATERIAL (Sandra Kozomora Subotin, Dejan Ubavin, Bojan Batinic, Zoran Cq)ic).....	250
FIRE RISKS IN A SMALL INCINERATION FACILITY OF ANIMAL CARCASS AND MATERIAL (Sandra Kozomora Subotin, Dejan Ubavin, Jelena Radonic, Zoran Cq)ic).....	257
EPOXICONAZOLE AND TEBUCONAZOLE ADSORPTION IN TWENTY DIFFERENT AGRICULTURAL SOILS IN RELATION TO THEIR PROPERTIES (Nikola Boskovic, Kerstin Brandstatter-Scherr, Pelr Sedlacek, Zuzana Bilkova, Lucie Bielska, Jakub Hofman).....	265
EMISSION OF GREENHOUSE GASES FROM "BUBANJ" LANDFILL IN NIS (Jasmina Radosavljevic, Amelija Dordevic, Ana Vukadinovic, Lidija Milosevic).....	273
EFFECTS OF SUNSPACE GEOMETRY ON THE ENERGY PROPERTIES OF DETACHED APARTMENT BUILDINGS (Ana Vukadinovic, Jasmina Radosavljevic).....	280
CAUSE-AND-EFFECT RELATIONSHIP BETWEEN CARBON MONOXIDE CONCENTRATIONS IN AMBIENT AIR AND RESPIRATORY DISEASES IN PRESCHOOL CHILDREN (Amelija Dordevic, Ana Miltojevic, Aca Bozilov, Goran Janackovic).....	287
MODEL FOR QUANTIFICATION OF ENVIRONMENTAL IMPACT OF TEXTILE PRODUCTS WITHIN WEBSHOPS (Nemanja Stipic, Jiirgen Seibold).....	294
SYNTHESIS AND IMMOBILIZATION OF ZnO NANOPARTICLES DOPED BY WO ₃ ON GLASS BED FOR DIAZINON REMOVAL FROM WATER (Afshin Maleki, Farzaneh Moradi, Reza Rezaee, Behzad Shahmoradi).....	302

INFLUENCE OF MIXING INTENSITY ON ADSORPTION BEHAVIOUR OF ORGANIC POLLUTANTS ON MICROPLASTICS IN WATER (Maja Loncarski, Aleksandra Tubic, Sanja Vasiljevic, Jasmina Agbaba).....	307
ARE WE AWARE OF MICROPLASTIC CONTENTS IN TOOTHPASTES? (AnjaBubik).....	313
WASTE LUBRICATING OILS, ENVIRONMENTAL IMPACT, RECYCLING AND STATE IN THE REPUBLIC OF SERBIA (Snezana Filip, Snezana Komatina).....	319
EXPERIMENTAL INVESTIGATION OF THE THERMAL DEGRADATION OF FOREST LITTER - PINE NEEDLES (Nikola Mistic, Milan Protic).....	324
ANALYSIS OF SOUND LEVELS OF FOOD COURTS AND COFFEE HOUSES AT UNIVERSITY CAMPUS IN NOVI SAD (Selena Samardzic, Robert Lakatos, Aleksandra Mihailovic, Anja Rankovic, Slavko Rakic, Savka Adamovic, Dragan Adamovic).....	330
ASSESSMENT OF METHANE ENERGY RECOVERY POTENTIAL FROM THE MUNICIPAL SOLID WASTE LANDFILL OF ZRENJANIN (Una Marceta, Bogdana Vujic, Visnja Mihajlovic, Jelena Micic).....	335
IMPACT OF COVID-19 PANDEMIC CRISIS ON ENVIRONMENTAL PROTECTION EXPENDITURES OF LOCAL SELF GOVERNMENTS IN SERBIA (Nedeljko Curie).....	338
NO ₂ AQI ANALYSIS AS A MEASURE OF AIR POLLUTION REDUCTION IN THREE CITIES IN SERBIA, CAUSED BY THE QUARANTINE DUE TO THE COVID 19 PANDEMIC (Veselin Bezanovic, Mladenka Novakovic, Dusan Milovanovic, Dragan Adamovic).....	346
IMPACTS OF ORGANIC WASTE MATERIALS ON SOIL CHARACTERIZATION (Hosam Bayoumi Hamuda, Katalin Hrustinszki, Agnes Roczey, Mungunzaya Ganbat).....	351
INFLUENCE OF CLIMATE CHANGE AND URBAN DEVELOPMENT ON GNSS MEASUREMENTS (Alina Bala, Luisa Dungan, Clara-Bealrice Vilceanu, Sorin Herban).....	360
ANALYSIS OF PHOTOVOLTAIC SOLAR PANEL EFFICIENCY (Marija Stankov, Natasa Dabic, Ivan Palinkas, Dusanka Milanov).....	366
PHARMACEUTICAL WASTE DISPOSAL PRACTICE AMONG THE CITIZENS IN THE MUNICIPALITY OF ZRENJANIN (Eleonora Terecik, Una Marceta, Jelena Micic, Visnja Mihajlovic).....	374

Session 6. Environmental Management

AN APPLICATION OF DELPHI METHOD IN SELECTION OF HOSPITAL MANAGER (Ali Reza Afshari, Milan Nikolic).....	383
ENVIRONMENT PRESERVATION AND ACHIEVING COMPETITIVENESS WITHIN THE FRAMEWORKS OF SUSTAINABLE DEVELOPMENT (Mihalj Bakator, Dejan Dordevic, Ljiljana Dordevic, Srdan Bogetic, Dragan Cockalo).....	390
THE CRUCIAL ROLE OF INNOVATION IN ACHIEVING COMPETITIVENESS OF DOMESTIC ENTERPRISES (Dragan Cockalo, Mihalj Bakator, Dejan Dordevic, Carisa Besic, Sanja Stanisavljev).....	396

EMPLOYEES' PERCEPTION OF ENERGY CONSUMPTION AND ENVIRONMENTAL PROTECTION
(Ivana Dolga, Ladin Gostimirovic, Aleksandra Mihailovic, Nebojsa M. Ralevic).....402

LANDSCAPE CHANGE SURVEY IN THE GODOLLO HILLS BASED ON HISTORICAL MAPS
(Krisztina Demeny).....409

Session 7. Occupational Safety

FIRE IN INDUSTRIAL FACILITIES FROM THE ASPECTS OF FACILITY SAFETY AND EMPLOYEES HEALTH
(Goran Boskovic, Dejan Ubavin, Milana Ilic Micunovic, Zoran Cepic).....417

CONTRIBUTION TO THE SAFETY ANALYSIS DURING OPERATION WITH TRUCK-MOUNTED CRANE
(Goran Boskovic, Dejan Ubavin, Dragan Adamovic, Zoran Cepic).....422

AN APPROACH FORWARD TO DIGITALIZATION OF WORKPLACE RISK ASSESSMENT AND MONITORING
(Mirjana Misita, Vesna Spasojevic-Brkic, Martina Perisic, Marija Milanovic, Ankica Borota-Tisma).....427

GEOMETRIC CHARACTERISTICS OF PM PARTICLES TESTED WITH JMICROVISION SOFTWARE
(Milana Ilic Micunovic, Zoran Cepic, Boris Agarski, Zorica Mirosavljevic, Zeljko Santosi).....434

THE EFFECTS OF ECONOMIC TRENDS AND SAFETY REGULATIONS ON OCCUPATIONAL INJURIES
(Goran Janackovic, Ivan Radojkovic, Amelija Dordevic, Jasmina Radosavljevic, Dejan Vasovic)441
PRELIMINARY DESIGN CALCULATIONS OF A SMALL WIND GENERATOR FOR THE SURROUNDINGS OF TOWN OF ZRENJANIN
(Dimitar Petrov).....447

EUROPEAN ONGOING INITIATIVES FOR TRANSFORMING COVID 19 CRISIS INTO AN OPPORTUNITY FOR A SUSTAINABLE FUTURE
(Kaja Primorac, Lucija Kolar, Anja Bubik, Daniela Tulone).....457

SMART AND NETWORKED VILLAGES - INFORMATION SYSTEM FOR RURAL DEVELOPMENT

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Abstract: The aim of this paper is to contribute to the setting of an information model for the development of smart villages in the Republic of Croatia with special reference to villages in five counties of Eastern Croatia. It considers (a) EU rural development policies (2014-2020), as well as broadband networks in EU countries, especially in the new EU Member States, and (b) the concept and policies applied in these sectors in the Republic of Croatia, especially within the Slavonia program. The results of the project "Slavonian Network - Development of Broadband Access in Eastern Croatia" are presented. The "Slavonian Network" project was launched in 2012, and the Panon Institute for Strategic Studies proposed (in published papers from 2013 to 2017) broadband development models with intensive involvement of local communities in terms of social and economic development of Slavonia. Based on the results of these analyzes, the concept of the information system "Slavonian smart and networked village" was proposed.

Key words: Territorial Development, Rural Innovation, Rural Services, Sustainability, Rural-Urban Linkages

1 INTRODUCTION

The Common Agricultural Policy (CAP) since the founding of the EEC and the Treaties of Rome (in 1957) has been one of the most important areas of activity of the institutions of the European Union, and rural development has subsequently been designated as the second pillar of the CAP. The objectives of this policy are: to promote the competitiveness of agriculture, to ensure the sustainable management of natural resources and climate change, and to achieve balanced territorial development in rural areas, including job creation and conservation. A new approach to rural development - dubbed 'smart villages' - appears in the Communication from the European Commission (EC) on the future of food and agriculture in November 2017 [1] with all elements of economic policy - from technology, communications, demographics, information systems and public relations to ecology and climate change. For complex consider of this topic more space/pages are needed to than is available here - therefore, the following considerations will only outline important factors - with reference to published papers explaining the details.

2. SMART VILLAGES AND EU RURAL DEVELOPMENT POLICY

2.1. CAP implementation for the period 2014 - 2020

The basic regulations of the new CAP were published in December 2013. Subsequently, the EC drafted the delegated and implementing acts that were necessary to introduce the envisaged measures. During 2014, Member States had to make key decisions in view of the diversity of the way the new direct payments system is implemented and the space available for manoeuvre. All but one Member State (Germany) made use of the option of coupled payments at very different rates: eight decided to apply a redistribution of payments, while 15 Member States applied the small farmer's regime. When it came to green payment, five Member States gave farmers the opportunity to fulfil some of their obligations by applying the same practice. In addition, the choice of areas of ecological importance varies greatly within the EU. In addition, 15 countries have transferred amounts between the two pillars: for the whole period, the net amount of transfer between the two pillars, i.e. from the first pillar to the second, was approximately four billion €. For the second pillar, between December 2014 and December 2015, the EC approved all 118 rural development programs developed by 28 Member States. Twenty Member States have decided to implement only one national program and eight have opted for more than one program - in order to better take into account geographical or administrative structures. [2] Rural EU policy, now as a Smart Village macro project, covers almost all elements of economic policy - from technology, communications, demographics, information systems and public relations to ecology and climate change – so far more space/pages are required to consider this topic than is available here. Therefore, the following considerations will only outline important factors - with reference to published papers explaining the details.

In April 2017, the EC unveiled initiative for developing smart villages in the EU with the aim of achieving synergies with traditional agriculture, the Internet, local wireless networks and innovation, and through smart specialization to enable the development of new business models. The initiative also seeks to counteract negative demographic trends in rural areas. Public policies such as circular economy, energy union and digital economy need to achieve a EU energy transition to a low carbon society at reasonable cost to economy and greater citizen involvement in decision-making process in order to maximize social profit. Public sector policy-making requires coordination and collaboration of multiple sectors such as energy, transport, agriculture, economy and spatial planning. Development strategies, as a key document with policy objectives, must contain action plans for each sector in order to optimally achieve the policy objectives adopted. Action plans should take into account regional and local specificities, strengthen the planning, financing and implementation of activities, and encourage involvement in EU initiatives such as the Smart Villages.[3]

The Smart Villages concept has brought renewed attention to the development needs and natural potential of rural areas and to a much greater focus on empowering communities at the local level for rural areas to survive and thrive in the coming decades. But at the same time, it signalled the need to strengthen the processes in which local communities take an active role in shaping their own futures. The EU Smart Village Initiative seeks to achieve the synergy of traditional agriculture, the Internet, local wireless networks and innovation, and through smart specialization, enable the development of new business models. The initiative also seeks to counteract negative demographic trends in rural areas. The initiative came to life with the adoption of the EU Action Plan for EC Smart Villages, defined as rural communities based on existing strengths, available resources and the development of new opportunities, i.e. communities where traditional and new networks and services are enhanced by digital and telecommunications technologies, innovation and better use of knowledge. The pilot project "Smart Villages" is being implemented in nine countries of the EU, including Slovenia, which carries out activities in the three municipalities. *"Smart villages are about different policies working together to find better, smarter ways to promote holistic rural development. It is about using existing and new technologies and social innovation to add value to the lives of our citizens. It's about giving the village the tools to meet their own challenges, and at the same time contributing to the greater challenges facing society as a whole."* [3] Therefore, concept of smart villages is one of solutions to prevent its dying out. Croatia is only just beginning in the concept of Smart villages, and the Croatian village is, more than ever, affected by emigration and depopulation today. [4] - [14]

The definition of smart villages

Smart Villages are communities in rural areas that use innovative solutions to improve their resilience, building on local strengths and opportunities. They rely on a participatory approach to develop and implement their strategy to improve their economic, social and/or environmental conditions, in particular by mobilising solutions offered by digital technologies. Smart Villages benefit from cooperation and alliances with other communities and actors in rural and urban areas. The initiation and the implementation of Smart Village strategies may build on existing initiatives and can be funded by a variety of public and private sources. [15]

European Network for Rural Development

The European Rural Development Network has been engaged in a 'smart village' for the third year, focusing on the production of materials that help interested rural stakeholders. Management structures should make materials the most of in rural areas. The aim of developing these materials is to support the concept of 'Smart Village' in the current programming period and in future Common Agronomic Policies. The "smart village" advice on this network recommended that Member States take the following steps when designing support for smart villages in the future CAP: [3]

1. Recognize the needs of rural communities that smart villages can address;
2. Map the existing policy support framework to identify opportunities and disadvantages;
3. Develop a targeted package of interventions that will provide rural communities with an initial idea for change to its sustainable scope.

It is useful to point out here that the scope of planned support for a 'smart village' in Finland is very broad and inclusive - to reflect the very diverse needs of villages in different parts of the country;

there is no intention to develop a general national strategy. The aim is to be able to respond quickly and flexibly to the needs expressed by local communities in the following fields:[16]

- Economic investments and actions for business development of new value chains and local economic clusters (agricultural and non-agricultural) based on local assets and (potential) areas of comparative advantage (bio economy, smart tourism destinations, etc.), smart transport and logistics solutions, smart local services and service chains and smart food chains, digitization and collaboration between businesses.
- Connectivity (broadband) and different models for businesses (for example, social entrepreneurship).
- Social innovation to ensure sustainable and good quality social and cultural services. Also, investing in skills for the future, supporting urban-rural connectivity and sustainable well-being: preventing segregation and inequality among people, improved integration of immigrants, a sense of community, living conditions, culture, security, improving rural knowledge as well as access to "hidden" rural knowledge community.
- Environment - innovation to improve resources creates efficiency, create local energy communities, reduce carbon footprint, and improve biodiversity, both protecting and valorising environmental assets. Encouraging municipal authorities, business representatives, local people, research institutes and experts to work together to design and adapt new cost-effective emission reduction solutions, especially in the context of transport and mobility, housing and food. Low carbon villages: a circular economy, sustainable food production and local food.

3. RURAL DEVELOPMENT AND SMART VILLAGES IN THE REPUBLIC OF CROATIA

The concept of 'Smart village' is a new opportunity for Croatia to change its current direction and way of implementing agricultural policy, i.e. - rural development, by incorporating modern technological trends of internet technologies, energy efficiency, ecological agriculture (green economy), rural tourism, etc. into rural areas. This is fully in line with the priority areas set in the National Development Strategy 2030. [17][18] In this way (by applying the concept of 'smart village') it can more effectively influence the trend of emigration from rural areas and encourage the arrival of young people into the countryside, that is, stimulate a balanced regional development using their potentials better and launching their (joint) development projects themselves. It is important here - as Euro-advocate Davor Škrlec points out - *"that the concept is recognized by the executive in defining the next operational program in national legislation, but the involvement of regional and local authorities is also required. This should remove local obstacles and encourage the development of projects. The concept of smart villages must be among the major initiatives in the next programming period for the modernization and demographic renewal of our rural areas."*[19] One of the basic infrastructure platforms for realizing the concept of 'smart villages' is broadband access - fiber networks for high-speed Internet. Therefore, in order to consider the possibility of implementing this concept of rural development in Slavonia and Baranja, it is important to point out the state of play in this sector - that is, to point out experiences in implementing the project "Slavonian Network".

3.1. "Slavonian Network" - a broadband project

Following adoption of the Broadband Development Strategy in the Republic of Croatia from 2012 to 2015, the Faculty of Electrical Engineering in Osijek (ETF), in February 2012, in cooperation with Croatian Network Agency (HAKOM), organized conference entitled "Development of telecommunications infrastructure – strengthening competitiveness and effective local self-government investment" which was also attended by the leaders of many municipalities, cities and five counties of the Slavonia-Baranja (SB) region. At the end of that year, the ETF launched project "Development of a Broadband Approach in the Five Counties of Slavonia and Baranja" [20] - [25]; (Fig. 1 and 2)

Interdisciplinary project team of 'Slavonian Network' - composed of doctors, masters and graduated engineers of telecommunications, informatics and accounting, geodesy, economics, sociology and law from ETF and Panon Institute for Strategic Studies, Osijek and companies Geoprem doo Osijek and "Sokol" d.o.o. Vinkovci - created concept of the 'Slavonian Network' project and began to research and develop individual modules of this project. The project "Slavonian Network" (total amount of € 21.5 million) received three positive reviews from the Ministry, and by publishing papers at scientific conferences and journals, team members tested hypotheses and/or promoted the project. In this way, an effort was also made to carry out part of the mobilization and training preparations for involvement of other experts and LSGs from the region

in its implementation. Results of one of the first studies (2012) on structure of costs in construction of municipal infrastructure (water supply, sewage, public lighting, hot water pipeline) and public infrastructure (electrical underground network, gas pipeline) were published in the Proceedings of the conference GAS 2013. [23]; the share of earth-works (construction) costs in the construction of fiber optic infrastructure is around 70%, and conclusion of the study - that an integrated approach can achieve a significant reduction in investment costs for construction of broadband infrastructure - is a proposal aimed at accelerating the realization of the "Slavonian network" and reducing costs; It is necessary to install plastic pipes at every construction (and before the start of construction within the framework of the "Slavonian Network") at each construction of the local public infrastructure.

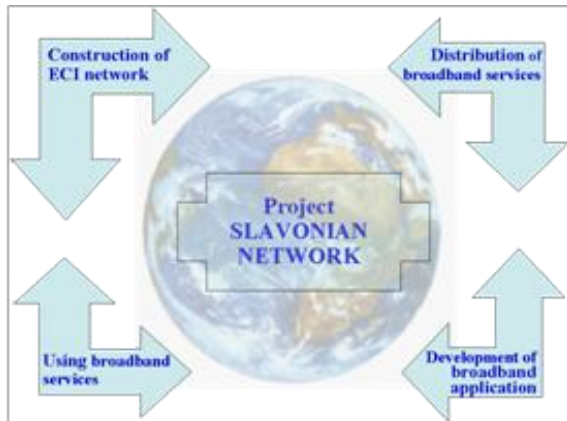


Fig. 1. "Slavonian Network" project [23]

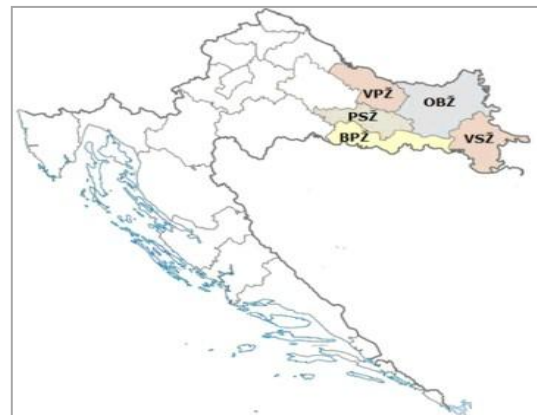


Fig. 2. Area of "Slavonian Network" [22]

However, this proposal - as well as several other organizational models (establishment of consortia, model of 'easement of rights' for electronic communications structure, model of concentration of available financial resources at the county level, and others) - unfortunately did not come to finalization - because in 2014 the project was transferred to level of the University, and all authors of the "Slavonian Network" project were excluded from further work on the project, and new team in the next five years did not realize the earlier proposals and are not initiate others models for implementation. He thus infamously finished the project, which was ranked 11th among the five hundred applications submitted to the Ministry's competition, and was the only broadband project and the only one covering more than one county (Fig. 2). Finally - it should be emphasized that the existing broadband network in the five counties of the Slavonian region is not adequate for the needs of contemporary development, neither in capacity nor in speed; for the most part, this is based on copper conductors or over the air network - making it difficult to access high-speed Internet, especially when multiple users are involved at the same time. This means that for the development of 'smart villages' it is necessary to speed up the construction of a broadband network and make up for the lost seven years.

3.2. Social cohesion and knowledge society a prerequisite for smart village's development

Experience from realization of this project has been discussed in several papers by Slavonian Network project team, from which it is important to state important issue of social cohesion - which is, otherwise, crucial for implementation of infrastructure project [26] - as the show Fig. 3 and Fig. 4;

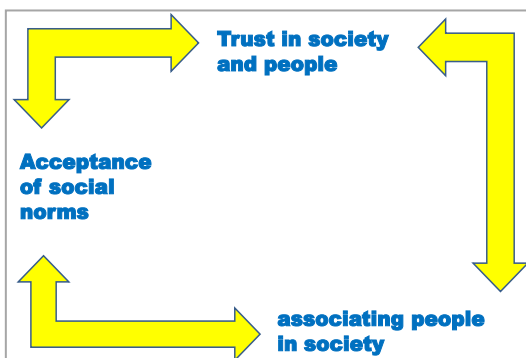


Fig. 3. Elements of social cohesion [26]

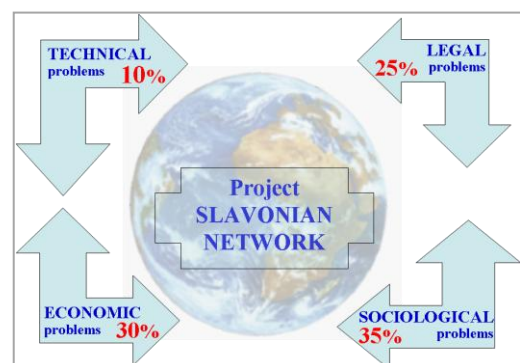


Fig. 4. Problems of "Slavonian Network"[23]

In addition to the above - for the implementation of the concept of 'smart villages', the issue of understanding and application of the concept of 'Knowledge society' in Croatia is also important - on which concept EU projects are based. The know-ledge society (Fig. 5.) is not yet a governing concept in Croatia and especially not in the element of 'lifelong learning', but also because of the fact that the practice is prevalent in which politicians of the 'general direction' make decisions often without effective public consultation, and without consulting independent experts.

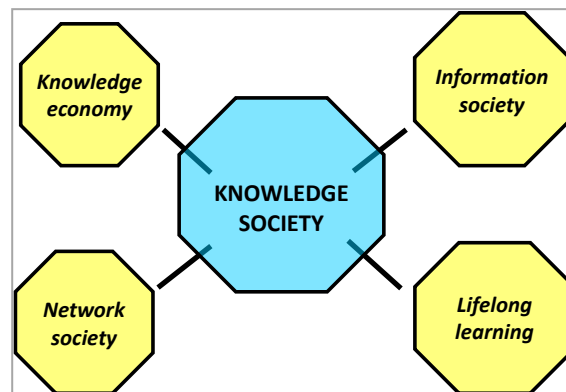


Fig. 5. Elements of the Knowledge society concept [27]

4. INFORMATION SYSTEM FOR DEVELOPMENT OF SMART VILLAGES

Information system includes people, data, processes and information technology, which are together in the function of collecting and processing the data on the basis of which information is stored. Information can thus also be viewed as the output of an information system, since it is created to support the work of the organization. [28] [29] Each information system consists of:

- Hardware - the physical part of the information system (computers, modems, network equipment ...);
- Software - an invisible part of the information system in the form of software solutions, algorithms that drive hardware;
- Life ware - all those who use the information system;
- Data ware - the way and methods of organizing databases and data warehouses;
- Net ware - communication and networking solutions that bring all the elements together;
- Org ware - organizational procedures and methods for connecting all the above elements into one.

Today are in use:

- Classic or transactional information systems,
- Decision support systems,
- Expert systems,
- Communication and collaboration systems.

Decision support systems and communication and collaboration systems are important for our consideration.

An insight into the existing supply of structured knowledge and the broadcasting of important information in areas relevant to 'smart villages' shows that there are hundreds of information systems that produce the necessary information for use in the development of local 'smart village' projects. For example, at the national level, authorities issue daily important information on rural development (from the Ministry of Agriculture, Ministry of Regional Development, Ministry of Finance and other ministries and several national agencies), as well as regional (and local) institutions and EU institutions and/or networks. In this innumerable amount of information, local stakeholders of 'smart village' will not be able to read or read all that information daily, let alone act on it. Therefore, when designing implementation of 'smart village' concept and structural modelled of implementation units should be undertaken, as well as the identification of information needs and the construction of an appropriate information system.

a) Smart Village implementation unit

Each village has its own specificities - natural resources, tradition and human capital, and 'smart village' development programs will be developed on these bases. This means that each village will have its own development program. However, many villages in the regional structure, by territorial and geographical features, will have a number of common elements on which to build their development programs. Therefore, it is advisable to propose the creation of so-called smart village concept implementation units - Fig. 6. - within which there would be one expert team for all villages in one implementation unit, in which, besides local experts (agronomists, etc.), there would be associate experts from surrounding cities (from related companies, associations, chambers, etc.) to ensure that all relevant areas of development are represented by a professional team structure.

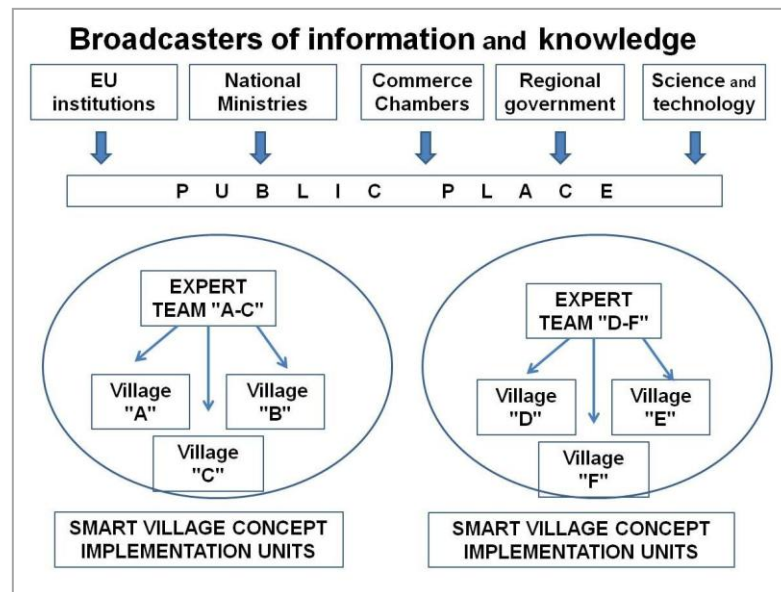


Fig. 6. Model of receiving, selecting and sharing information/knowledge through units for implementation of the smart village concept

b) Identifying information needs

The said expert team should determine the information needs (area, frequency, manner of distribution and distribution) of its design and establishment of programs and methods of work - which should be documented in a separate act.

c) Building an appropriate information system

IT literacy of the average expert (of any profile) in Croatia is today at a reasonably satisfactory level so that building or setting up an information system that would suit the needs of the expert team in each implementation unit of the 'smart village' would not be a particular problem - especially if a staff member from a local software company involved in the process. After setting up the information flows set out in a separate act, the choice of hardware would be started - which should also not be a problem since the current supply of computer equipment in us is satisfactory. Software is also required to complete the 'smart village' implementation information system. It should be noted here that there are a number of ready-made applications (programs) on the Internet and networking applications that can be used for free (or at a small fee) - so it is not necessary to create special computer programs for this purpose. The education (training) of all stakeholders in the 'smart village' to use the selected program is also important element for the well-functioning information system of each unit implementation and each individual 'smart village'.

d) Public relations policy

At the end of these considerations, it is important to emphasize the need for transparency of the whole process and the importance of involving all stakeholders (experts, local government bodies and every household) in the implementation of this development project. That is why it is necessary to have a

well-established and developed public relations model from the first step of setting up and implementing the 'smart village' concept. [30] This is important not only because of the mobilization of all stakeholders in the smart village on a joint development project - in order to optimally set up and implement the project, but it is also important in order to prevent potential corruption – it is also important to prevent potential corruption - which is not unknown in our region; even more - it domesticated.

5. CONCLUDING REMARKS

The EU's Common Agricultural Policy, and rural development as its second pillar, have been given a new dimension of action through the concept of 'smart villages'; In April 2017, the European Commission launched an initiative to develop "smart villages" in the EU with the aim of achieving synergies with traditional agriculture, the Internet, local wireless networks and innovation, and through smart specialization, enable the development of new business models.

- The Smart Villages pilot project is being implemented in nine EU countries - including Slovenia, but the Republic of Croatia is not included.
- The Croatian village is more than ever affected by emigration. Therefore, the concept of smart villages is one solution to prevent its dying out. The concept of 'smart village' is a new opportunity for Croatia to change its current direction and way of implementing agricultural policy, i.e. - rural development, by incorporating modern technological trends of internet technologies, energy efficiency, ecological agriculture (green economy), rural tourism, etc. into rural areas. . This is fully in line with the priority areas set out in the 2030 National Development Strategy.
- One of the cornerstones of successful implementation of the 'smart village' concept is the availability of broadband access. Although the Faculty of Electrical Engineering in Osijek initiated the project "Broadband Development in the Five Counties of Slavonia and Baranja" at the end of 2012, to date, this network in the five counties of the Slavonian region is not adequate either in capacity or in speed. This means that for the development of 'smart villages', it is necessary to speed up the construction of broadband and make up for the lost seven years.
- In addition to the above - for the implementation of the concept of 'smart village', the issue of understanding and applying the concept of 'Knowledge Society' in Croatia is also important - on which concept EU projects are based. Knowledge society is not yet a governing concept in our country, especially not in the element of 'lifelong learning', but also due to the fact that the practice is prevalent in which politicians of the 'general direction' make decisions, often without consulting independent experts.

After a framework analysis of the situation in the Slavonian region, a model of the so-called implementation unit of the "smart village" concept was proposed and basic frameworks for building (setting up) the "smart village" information system were proposed. In order for the whole process of setting up and implementing the concept of a smart village to be efficiently and quality implemented, it is important that the first step is to cultivate an objective public relation.

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