



# Consultation process on forest biomass and sustainable forest management: How knowledge mobilization in the cross-border region of Croatia and Serbia worked?

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## Abbreviations:

JAP – Joint Action Plan  
RRA – Regional Research Agenda

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## Abstract

**Background and purpose:** The aim of the paper is to describe and analyse the consultation process on forest biomass and sustainable forest management in the context of renewable energy. Rather unique for the cross-border region of Croatia and Serbia the process was initiated within the EU project RoK-FOR [1] and based on a 'triple helix' principle- taking into consideration perspectives of science, administration and stakeholders [2 in 3]. Achieved body of information provides insights into forest-related issues in the context of renewable energy in the Western Balkans.

**Materials and methods:** The methods and analytical frame used for the purpose of this article was proposed by [3], focusing on: actors and their roles in the process; instruments and tools used in the process of gathering information and consultation; and assessing the level of interaction among actors during the consultation processes. Stakeholders' panel was the main instrument that generated »body of information«, whereas structured interviews were used for better understanding of actors involved. For understanding administrative and legislative framework the whole set of documents and decisions from both countries was analysed while observational notes helped to critically reflect upon data obtained by stakeholder interviews.

**Results and conclusions:** Use of stakeholders' panel as a platform for creating a rather robust »body of information« proved to be valuable tool in the consultation processes, which resulted in a consensus of participating actors on strategic research topics and common recognition of major challenges related to forest biomass production and use. An overall level of interaction among participants can in both countries be classified as of a »medium intensity«, although the ways of interaction were somewhat different. The results could serve as inputs to national research and/or energy strategies in context of achieving renewable energy goals and fulfilment of obligations according to the Kyoto Protocol.

## INTRODUCTION

Management of natural resources involves complex problems that cannot be solved by one actor no matter how knowledgeable. »Effectively linking knowledge and action to meet the needs of human

development while protecting fundamental biophysical systems has proven to be a chronically difficult task« (4). Indeed, gaps in knowledge-action systems have been recognized as »archetypal problems« where decision-makers do not get information they need and scientists produce information that is not used (4). In addition to that, relationship between scientific advice and the policy process has changed (2, 3) in a way that other knowledge suppliers start to enter „knowledge market” and compete for the recognition of relevance and authority of their knowledge (5). This might well be driven by the knowledge-based economic development that is characterized by emerging need for innovation and growth (6). As a result, different modes of interaction among academia, industry and government started to grow what has often been illustrated with a »triple-helix« relation (6) where each of three helices develop internally and at the same time they interact in terms of exchange (of goods and services) and functions (7).

Described trends have tremendously increased the need for mobilizing knowledge captured by diverse actors and using this knowledge as a valuable input to decision making (2, 3). Many different initiatives related to knowledge mobilization emerged respectively. One of them is a series of Framework Programs launched under the European Union (EU), with the focus on the Research, Technology, and Development Networks. These networks are considered as one of the tools to foster science-policy-industry interaction. This should further support innovation and action on the international or sub-national level, so as provide new opportunities for the specific organization of these interfaces (8, 9, 10).

Within the seventh EU Framework Program a RoK-FOR project on »Sustainable forest management providing renewable energy, sustainable construction and bio-based products« was launched in 2010 with the purpose to mobilize different sources of knowledge among five European regions, produce common research agendas and foster joint actions in the fields of renewable energy, sustainable construction and bio-based products. Mobilization of different sources of knowledge was facilitated through a series of consultation processes held among research, industry and governmental actors in each region.

In a cross-border region of Croatia and Serbia consultation process started in 2010 and was concerned primarily with the issue of using wood residues from sustainably managed forests as a source of renewable energy. We selected this process as a research case for several reasons: (i) the relevance of renewable energy issues is growing rapidly in Serbia and Croatia (11). Both countries are signatories of Kyoto protocol (12, 13), and have integrated EU's 20/20/20 goals for energy efficiency in their strategic documents as a result of the EU accession (14, 15), what makes policy-makers increasingly dependent on information and knowledge about available resources and possible scenarios for renewable energy utilization. (ii) The consultation process corresponds with the newly launched strategic goals in both countries, recognizing importance of „(...) strengthening partner-

ship between all segments of community (...)” as one of the ways to achieve sustainable development (16). Serbian government has committed itself toward „(...) establishment of better connection between science, technology and producers (...)“ by taking care of the „(...) rational use of natural resources“ (17, p.13) and the forest sector emphasized the need for „strengthening relations between the state, research and education institutions, private sector, NGOs and end-users” (18, p. 67), by calling for permanent dialogue (p. 61) and „switching toward user-friendly, applied research” (p. 64, 66). (iii) our participation in the process enabled a good field access, i.e. direct insights into the process and high availability of data.

In the light of above settings the task of this paper is to look deeply into the consultation process initiated by the RoK-FOR project in the cross-border region of Croatia and Serbia, with the aim to describe and understand it. For that purpose we use a set of analytical elements proposed by (3) and rely on the empirical evidence collected during the process. After main features of the consultation processes in both countries are captured and described, the discussion reveals their common characteristics and leads to the main conclusions. Results are expected to provide better understanding of the forest-related bio-energy issues in Western Balkans as based on a consensus among science, administration and stakeholders, what may further contribute bridging the „knowledge-action gap” existing in this emerging field.

## ANALYTICAL FRAMEWORK

In this paper analytical categories found useful in the framework proposed by [3] were used, namely actors, instruments and co-produced knowledge.

*Actors* involved in knowledge mobilisation differ from case to case, from process to process, and these different actors produce different types of knowledge (3).

Scientific knowledge is developed by researchers. Scientific knowledge is produced by using various scientific models and methods and becomes eligible after passing through rigorous quality checks based on the peer-review evaluation. Bureaucratic (or administrative knowledge, as it is going to be referred to from now onwards) is generated by administration bodies and their representatives in order to support governmental arguments. It may be based on professional and/or scientific grounds (19). This type of knowledge production is less rigorously scrutinized in comparison to scientific knowledge. It focuses on political and strategic usefulness in the first place, which does not mean that scientific knowledge cannot serve the same purposes. Stakeholder knowledge emerges from day-to-day experiences and practices and as such is contextual and local. In comparison to scientific and bureaucratic knowledge, stakeholder knowledge gains its legitimacy through the process of social validity.

According to these categories actors can be differentiated into the three groups: science, administration and stakeholders. This differentiation serves well for analytical purposes, e.g. to see who has access to consultation

process and who is excluded, or to analyze the role of the group of actors in the process and degree of interaction between these groups. Thus, we consider these three groups as analytically useful but at the same time recognize their general context.

*Instruments* used to mobilise and generate knowledge during the policy-making processes are many, but more often than not they are too technical and have to be conducted with great rigor, what leaves little space for inputs from stakeholders (3). Therefore, the need for more informal and qualitative methods is being ever more underlined (3). The consultation process that took place in Serbia and Croatia was based on the qualitative approach.

Interaction appears between experts, bureaucrats and stakeholders and leads to the exchange and combining of facts, interpretations and assumptions, whereby in the end *co-produced knowledge* is negotiated and accepted by all involved (3). In the consultation process that took place in Serbia and Croatia our focus was on the exchange of facts, interpretations and assumptions from different knowledge domains. Thus, instead of co-produced knowledge in this paper we are focused on the *achieved body of information*, meaning elements negotiated during the consultation process, in particular challenges and research priorities related to forest biomass and sustainable forest management. Consequently, *the use* of achieved body of information (in the project and beyond) will be considered here instead of looking at the use and impact of the co-produced knowledge on the decision-making.

## MATERIAL AND METHODS

Material that is collected and analysed for the purpose of this research consists of documents, interview data and observational notes.

*Documents* refer primarily to the internal project documentation of the RoK-FOR project. Besides, the policy and legislative documents related to renewable energy (with emphasis on forest biomass) were used. In Serbia most relevant policy documents in this case are Scientific and Technological Development Strategy (20) and the Forestry Development Strategy of the Republic of Serbia (18). The former formulates clear strategic research line related to the development of new technologies for the exploitation of renewable sources of energy and cogeneration and use of biomass, together with the eco-materials (materials using renewable raw materials for their synthesis and/or materials whose environmental impact is of high significance), the scientific monitoring of eco-systems, monitoring and research of climate change. The latter addresses research and development issues referring to biomass and sustainable forest management providing it. It emphasizes efficient use of bio-energy from sustainably managed forests, increase of the forest area (p.53), potentials of the private sector to provide forest goods and services (p.63) and the role of intensive forest plantations as sustainable and ecologically friendly

sources of renewable energy and raw material for industry (p.29). Government shall support consumption of wood as an energy source (by means of economic instruments), help solving issues of forests in which fuel-wood is the major product (p.43), foster innovations as well as interest and business associating (p.61). Croatian Strategic Frame for Development 2006-2013 (21) stresses importance of diversity of energy sources, and sets goals of increasing energy efficiency and promotion of renewable energy. Current strategy addressing energy production is the Energy Strategy of the Republic of Croatia (14) that recognises bio-energy as adding to greater possibility of achieving requirements of reaching EU's energy efficiency goals as well as the Kyoto Protocol targets, but also to decrease energy dependency of the Republic of Croatia. Croatia is perceived in the Strategy as a country with great biomass potential and the Republic of Croatia will „foster development of wood processing industry, work on development of forest management in term of better utilisation of forest biomass, foster afforestation and short rotation forestry on the forest land, foster cogeneration energy plants for production of electricity and heat, as well as use of biomass for heating” (p. 46) by integrating these goals in relevant sectoral policies and using synergy produced by activities of included relevant institutions. For the more comprehensive overview of legislation related to renewable energy and sustainable forest management in Croatia and Serbia see (11).

*Interview data* was gathered through structured individual interviews and through group interviews. Structured individual face-to-face interviews were conducted in the period of May to June 2010 with the representatives of different groups of actors identified according to the triple helix approach, i.e. administration (policy makers), research (academia) and industry (forestry and business professionals). These interviews served to gather first insights into the roles, activities and capacities of actors involved in the renewable energy and forest biomass issues. Group interviews were conducted afterwards, in a form of stakeholder panels. All together four stakeholder panels took place in the period between November 2010 and April 2011. In Serbia first panel was held at the premises of the Provincial Chamber of Commerce in Novi Sad and the second at the premises of the Serbian Chamber of Commerce in Belgrade, with 62 participants in total. In Croatia first stakeholder panel was organized in the premises of Croatian Forests Ltd. Company in Zagreb and second in the City Hall of Town of Vinkovci, hosting altogether 31 participants. In all cases researchers were facilitators of the discussion. Discussion topics addressed challenges and research priorities for sustainable forest management on the one hand and the use of forest biomass for energy purposes on the other. Participants first expressed their views and opinions about each and then ranked identified challenges and research priorities according to the perceived importance. Overall results were sent to all participants by e-mail for final verification.

*Observational notes* were taken by facilitators during the stakeholder panels. These participant observation notes helped us to critically reflect upon data obtained by stakeholder interviews. We observed group interaction during stakeholder panels, agreement or disagreement on views and opinions of others, as well as their body language, to make our final opinion on the relevance of information gained by these panels.

Data collected from documents, interviews and observational notes were critically analyzed and the results of the analysis structured according to the analytical categories suggested above.

## RESULTS

In this section description of the consultation processes in Serbia and Croatia will be brought.

### Consultation process in Serbia

Broad range of stakeholders related to forest biomass participated in stakeholder panels with the good resonance between those involved. All three groups of *actors* attended the panels: science, administration and stakeholders (Figure 1).

*Scientific representatives* were researchers from the Institute of Lowland Forestry and Environment (ILFE) from Novi Sad and researchers from the Faculty of Forestry, University of Belgrade (Figure 1). In the consultation process the science had a twofold role. First, the majority of researchers contributed to the process through their own arguments and problem statements based on their existing scientific knowledge and expertise. Second, the project requested that researchers act as facilitators as well. Researchers were deemed eligible to act as facilitators as the main purpose of the consultation process was to collect information for developing the Regional Research Agenda. Those acting as facilitators took over only this role in order to keep the neutral position in the process, since such position is the most desirable feature of a facilitator (22).

*Administrative actors* were public servants working at the state and provincial authorities. The state forest authority was represented by the director of the Directorate of Forests and by the deputy director, both from the Ministry of Agriculture, Trade, Forestry and Water management. Provincial authority had representatives from the forestry department of the Provincial Secretariat of Agriculture, Forestry and Water Management. Also the representatives of environmental and nature conservation authority attended the panel as well as those from the Serbian investment and export promotion agency (SIEPA) (Figure 1). They all expressed opinions from the perspective of their institutions and prioritized topics of relevance according to it. In comparison to other two groups of actors, administration representatives discussed and ranked topics of relevance according to their perceived political usefulness, either in the field of forestry and environment or in terms of financial feasibility.

*Stakeholders* encompassed a very heterogeneous group (Figure 1). This group was made of public enterprises for managing state-owned forests and public enterprise for managing national parks, which were dominating discussions on sustainable forest management and utilization of unused potentials of wood residues after harvesting. The wood-based industry had representatives from private companies producing wood chips (FER Komerc Ltd.), wood pellets (Bioenergy Point Ltd.) and wood briquettes (SAGA Drvo Ltd.). Also representatives of wood processing and furniture industry accompanied the process (AD Dunav Apatin, Novi drvni kombinat). The wood industry pushed forward topics related to existing and future potentials of forest biomass as well as that of demand-supply chains. The private forest owners were represented through the forest owner association from Podgorac who brought onto the table main problems private forests were facing with. Chamber of Commerce representatives belonged to the forestry and wood industry division from national to local level. Together with the media (Serbian news agency TANJUG) they contributed minor but relevant arguments to the process. Only representatives of the energy sector remained silent. They excluded themselves from the panel discussions, although proved cooperative during individual interviewing.

Interaction between these three groups of actors was analysed after the consultation process. According to the scale and terminology used by [3] it was of a „medium degree”. It means that actors were primarily focused on expressing their own problems, needs, priorities, assumptions and epistemological values, whereas differences were displayed in the one-way communication to the other actors.

*Achieved body of information* is structured into the challenges and research priorities:

– *Challenges* identified with respect to sustainable forest management and its potential to provide forest biomass for bio-energy are following:

- Keeping production capacity of forests and forest soils none decreasing, preferably increasing, when producing forest goods and services for markets: this is what the forest management in Serbia traditionally relies on (23, 24). Yet, in the light of intensified production of marketable goods (e.g. wood for energy), keeping up this principle might become a challenge, too.

- Overcoming barriers in ownership fragmentation: in Serbia private forest ownership is highly fragmented (both in Vojvodina and central Serbia) which was perceived as a barrier for both, forest protection and use. If forests are to be utilised in a cost-efficient way then the ways need to be found on how to overcome this barrier and that is certainly a challenging for state forest authority as well as for private forest owners. Joint forest management could be one solution.

- Overcoming barriers in resources access: access in this case refers to forest road network. That network is of a low density in Serbia, especially when private forests



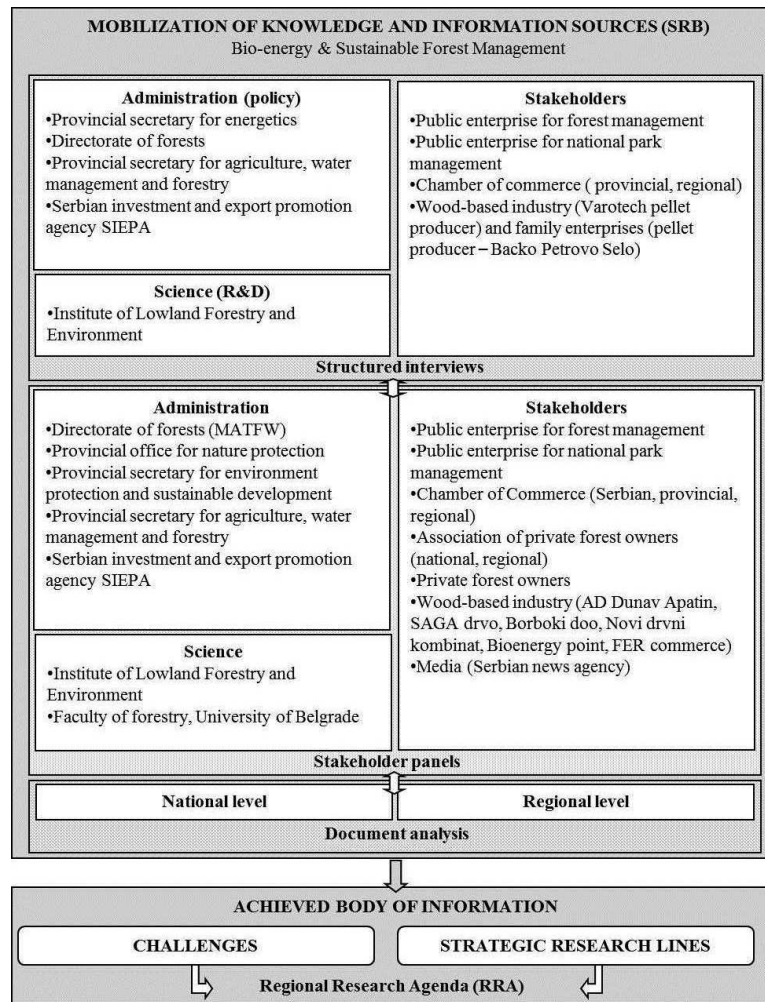


Figure 1. Consultation process in Serbia regarding bio-energy and sustainable forest management.

are concerned. That has been perceived as a barrier for the usage and forest protection.

- Better utilisation of logging residues: up to date most of logging residues remains in the forest. Its efficient use could provide additional source of revenue for both the state and private forest owners.

- Making more use of plantation forestry: plantation forestry could become one of the main sources of wood and wood residues for renewable energy markets (energy plantations).

- Communication: in order to increase acceptance of its goals and activities the challenge for the forest sector is to establish and maintain communication with stakeholders and with the public.

– Challenges related to forest biomass and its use for renewable energy purposes are:

- Revealing the potential for forest biomass production in Serbia, as well as afforestation potential of forest and other land use: resource availability is important precondition for creation of bio-energy market.

- Overcoming barriers in mobilizing forest biomass: wood for renewable energy might be provided from private forests if their owners would be motivated to engage themselves into the process. Thus, the challenge is to motivate them and mobilize existing wood. Private forests would also become managed according to professional norms what would contribute to their health and vitality.

- Overcoming barriers in coordination/communication/cooperation of different stakeholders regarding forest biomass production: number of stakeholders showing interest in forest biomass production and use is increasing. Yet, barriers on their coordination/communication/cooperation should be overcome.

- Utilizing forest biomass efficiently: cost reduction is a priority issue for both producers and users.

- Cutting down bureaucratic procedures: there are serious administrative barriers for those who want to start business in bio-energy. Entrepreneurs need initiatives to invest, which means fast and simple procedures, flexibility, security, etc.

– *Research priorities* on sustainable forest management, as securing sources for renewable energy production, are identified as following:

- Exploring new/optimised forest management practices and operations, that combine (intensified) utilisation for renewable energy purposes with conventional methods, by relying on good forest management practice
- Exploring the ways of mobilizing unused potentials of private forest
- Revealing attitudes, opinions, motivations of private forest owners, stakeholders and/or public regarding sustainable forest management (use and protection of forests)
- Calculating optimal density of forest roads (in state and private forests)/ designing of forest opening plans; exploring policy instruments for overcoming barriers in accessing resources
- Identification of new/modified forest products and/or new markets for forest goods and services; product diversification; etc.
- Land-use changes from agricultural to forestry land-use: obstacle or opportunity?
- Long-term monitoring of forest ecosystems (for engaging into multi-factor analysis and timely detecting of changes that could influence forest health, vitality and production potentials)
- Examining genetic potentials of selected tree species and their vulnerability to expected climate and other changes
- Analyzing socio-economic aspects of sustainable forest management in order to better anticipate future changes

– *Research priorities* concerned with forest biomass and its use for renewable energy purposes are:

- Developing reliable assessment methods for estimating current and future potentials of state and private forests, forest and other lands, as well as forest plantations, to provide raw materials for renewable energy markets (fuel wood, forest biomass, residues, biomass from energy plantations, etc.).
- Exploring barriers in mobilising forest biomass and developing mobilization models
- Exploring methods of managing and utilizing forest biomass in a cost-effective way
- Exploring clustering needs, potentials and methods
- Revealing attitudes, opinions and motivation of forest owners, stakeholders and public with respect to usage of forest biomass for energy purposes
- Analyzing effectiveness of policy instruments, as means for pursuing and implementing renewable energy policies
- Exploring potentials of fast-growing plantations to provide required resources

- Studying roles, interests and conflicts around emerging renewable energy markets

- Reveal and explain relevant economic aspects of renewable energy production in Serbia.

## Consultation process in Croatia

The same opinion-eliciting technique in the form of a stakeholder panel was applied as an *instrument* of knowledge mobilization in Croatia. Also, all three groups of *actors* participated in the consultation process- science, administration and stakeholders.

*Science* was represented through the Croatian Forest Research Institute, whose role was on the one hand to organise and facilitate consultation process in Croatia and on the other hand to represent the scientific viewpoint. Two researchers of the Croatian Forest Research Institute dealt with the group management in terms of one being a facilitator and the other one took the role of the assistant. Facilitator took neutral stance since the rationale for this stakeholder panel was not for researchers to impose themselves as authorities in the field of bio-energy, but to facilitate the discussion and gather as wider as possible view on issues and challenges related to forest biomass as well as to secure that each viewpoint was taken into account and all participants had their say. Relevant actors in this consultation process where also the researchers from the energy sector (Figure 2).

*Administration* included public servants associated with the local government bodies, namely the Town of Vinkovci, dealing in their everyday work with issues of energy policy, nature and environmental conservation as well as those in charge of implementation of Town's projects, like preparation activities on the future energy plant based on forest biomass or zero emission community centre. Representatives of the state administration (e.g. relevant ministries) did not join the panels and had been consulted through structured interviews instead (Figure 2). In the second round of consultation process the representatives of the Croatian Development Agency at the regional (county) level also took part.

*Stakeholder* group comprised of representatives of the forest management company Croatian Forests Ltd. and its daughter company Forest Biomass Ltd. that is acting so far as the only supplier of forest biomass in Croatia. Entrepreneurs in the renewable energy sector, such as pellet producers, were important actors in these panels since they provided first hand experience about the issues and challenges of obtaining and using forest biomass as a renewable energy. Two divisions of the Croatian Chamber of Commerce dealing with renewable energy also attended the panel, namely the Committee for Biomass which belongs to Association for Renewable Energies and Group for Cogeneration that is a part of the Association for Energy. Wood processing industry holds a stake in bio-energy sector as well, in terms of using wood residues that are by-products of wood processing for heating. No less important participants were representatives of the financial sector and media.

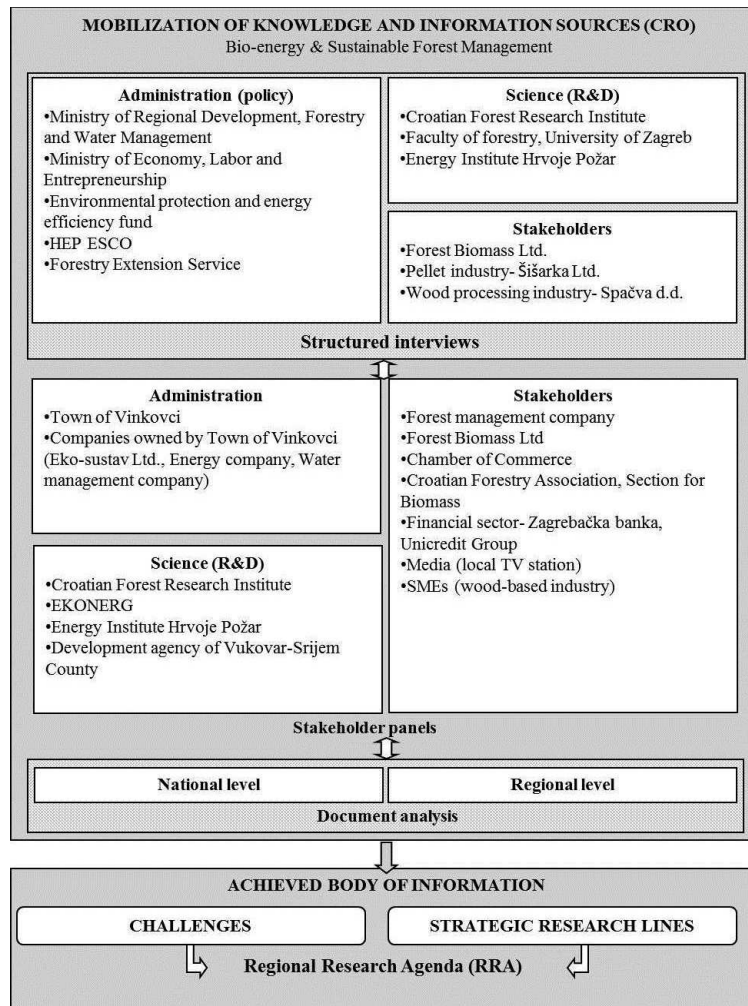


Figure 2. Consultation process in Croatia regarding bio-energy and sustainable forest management.

Interaction between participants was like in Serbian case of a „medium intensity”. During first panel dominant person tried to take over the discussion but was kindly neutralised by the facilitator. Participants were interested in having their say, but due to the fact that they know each other very well the conversation was rather open and included interaction between participants. The second stakeholder panel gathered wider range of stakeholders and most of them new each other. The discussion was open and participants were willing to express their opinion and especially stress all the problems they encounter.

*Achieved body of information* was divided into challenges and research priorities.

– The following *challenges* have been identified regarding sustainable forest management and its provision of forest biomass for bio-energy production:

- Adaptation of the forest policy as related to forest biomass – There are several alternatives for the purpose of increasing forest biomass production: increasing the felling intensity leading to increased wood residue and

energy wood production, decreasing a rotation period for existing forest plantations, establishing energy plantations on the forest land or abandoned agricultural land. So far it is not possible to establish forest plantation on the abandoned agricultural land. However, all these alternatives would require huge change in hitherto tradition on how things in forestry are done.

- Integration of forest and other sectoral policies - Cross-sectoral cooperation and consultation process are necessary to negotiate possible changes in forestry practices in terms of synchronisation with policies of other sectors (e.g. possible restrictions that might be imposed on wood harvesting as a result of implementation of some nature conservation policies such as NATURA 2000).

- Mobilisation of forest biomass from private forests - Fragmentation of ownership, small size of parcels as well as lack of forest management plans for private forests are seen as issues that need to be overcome in future. Potential of private forests to provide forest biomass for the market as well as interest of private forest owners to get them involved in this enterprise is hard to predict.

- Better utilisation of wood residues after harvesting operations – All potential forest biomass left in the forest after harvesting operations cannot be utilised, on the one side due to necessity to maintain soil production and biodiversity, and on the other side due to reduced feasibility of its utilisation. Improvement of existing methods of utilisation might be useful in increasing the feasibility of wood residue.

Climate change and adaptability of forest ecosystems - So far it is hard to predict possible impacts of climate change on forest ecosystems in Croatia, and subsequent adaptability of these ecosystems, but these are seen as the challenges hugely laden with uncertainty.

– The following *challenges* have been identified as important regarding forest biomass and renewable energy sector:

- Bureaucratic *challenges* related to establishment of energy plants on forest biomass - Challenge in this case is a euphemism to the *myriad of paperwork* and permissions that entrepreneurs have to deal with before putting energy plant into work.

- Legislative frame related to efficiency of energy use in combined heating plants running on forest biomass - Current legislative frame dealing with energy production in energy plants omits obligatory minimum level of energy efficiency for utilisation of heat in combined heating plants. So far only efficiency of electricity use is taken into account and subsidized, while utilisation of heat is not regulated resulting in huge amounts of heat wasted.

- Fostering domestic production of high technology products needed for utilisation of forest biomass for energy – High technology products like boilers and pyrolytic combustion systems are mostly imported while domestic production is still rudimentary at best. Renewable energy sector is seen as an opportunity to increase local employment, but if components for energy plants would be imported instead of locally produced, that opportunity would decrease significantly.

- Stability of energy market in terms of energy prices and forest biomass supply – This is perceived as a threat to sustainability of forest biomass based energy production.

– Identified *research priorities* in terms of sustainable forest management as a framework for forest biomass production, were as follows:

- Developing reliable assessment methods for estimating current potential of forests for biomass production regardless of forest ownership, as well as decision support systems for strategic planning of its future production.

- Exploring efficient methods of wood mobilization.

- Research on values, attitudes, motivations and obstacles of private forest owners to utilise their forests for the purpose of energy wood production.

- Studying genetic variability of forest tree species and adaptation of trees and forest ecosystems to possible impacts of climate change.

- Socioeconomic studies on impacts of different alternatives for increasing forest biomass production as well as perception of these practices by the society in general.

– Identified *research priorities* related to energy production based on forest biomass are:

- Research and development of technologies in combined heating plants that would increase the efficiency of electricity and heat utilisation.

- Research on efficiency of policy instruments as related to energy production based on forest biomass.

- Development of innovative business models mainly focused on better use of forest biomass from private forests for heating of public buildings (schools, municipal buildings etc).

*Use of information* – The body of information achieved during the consultation process in both countries has primarily been used within the RoK-FOR project ([www.rokfor.eu](http://www.rokfor.eu)) for the purpose of compiling the document called the Regional Research Agenda – RRA (Figures 1 and 2). The idea behind this document was to identify challenges and research priorities as related to sustainable forest management and forest biomass in the context of using wood for bio-energy purposes. Identified challenges were used as a starting point to develop a Joint Action Plan (JAP) and research priorities contributed to the RRA, which is ready to be incorporated in national research agendas as well.

## DISCUSSION

Results will be discussed in line with the chosen analytical framework (3) focusing on: (i) actors involved in the process, their roles and the level of interaction; (ii) the very process and instruments used during the consultation; (iii) outputs represented by the „body of information” gained through the consultation.

### Actors

In both Serbia and Croatia all three groups of actors participated in the consultation process, namely science, administration and stakeholders. Structured interviews in both countries involved similar actors with more diverse representatives of science in Croatian case. The same goes to stakeholder panels. In Serbian case national and regional administration related to forest and forestry was better represented, while in Croatia administration was represented by local (town) administration. In terms of the stakeholder group similar actors participated in both Croatia and Serbia. The difference was reflected in representatives of the financial sector being present during the second stakeholder panel in Croatia, while in Serbia the public enterprise for the management of the national park was present at the panel which was not the case in Croatia. This is due to the difference in the legislative framework between Serbia and Croatia - in



Serbia forests in national parks are actively managed, while in Croatia only passive management is allowed.

Representatives from research institutes in both countries had a role to facilitate the process and also to provide expert knowledge and scientific information during the discussion. Administrations from national and local levels provided in both countries bureaucratic knowledge and information on how administrative processes work. Stakeholders were more diverse group providing information from the local level and the case specific environment, striving towards implementation.

Interactions between actors in both cases, Croatian and Serbian, can be classified as of a „medium intensity”. This is probably due to the specific nature of this consultation process aiming to produce inputs to the RRA and JAP for the particular project. Both documents (RRA and JAP) opened a vast number of possibilities and the consultation process was very open in a way that even conflicting ideas could be discussed. In that way it seems not possible to assess the real level of interaction between actors.

**Process**

Although the process was organized in two parts (i) structured interviews and (ii) stakeholders’ panel, only the latter can be seen as an interactive and productive in a sense of contribution to the common „body of information”. The process was a mix of presentation, exploration, discussion and only sometimes negotiation on the relevance of the some topics.

In the Serbian case we observed the absence of open and communicative dialogue between actors. Possible reasons for that may be that actors were not meeting on a regular basis and that no „field activities” were taking place but more a pro-active dialogue initiated through the EU project. Accordingly, each party acted as an advocate of the institution and the sector it belongs. In the end however, they agreed upon all suggested outputs, showing the readiness to get involved in their realisation, if that would be the case during the project life-time. In Croatian case consultation process took place in smaller groups and participants new each other well from many other events they had participated together and were

addressing each other by first name. This led to very open communication that was not hindered by the presence of a facilitator and his assistant even though they have no previous history with most of the participants in the consultation process. Actors even discussed issues they face for which they asked to stay in confidence. It was obvious that participants new each other’s standpoints very well. During the first stakeholder panel one participant tried to dominate the discussion but in the end it did not affected further discussion among participants.

**Outputs**

In both countries the goal of the consultation process was to co-produce strategic document- the RRA based on the inputs from actors about challenges and strategic research lines in sustainable forest management and utilisation of forest biomass. Achieved „body of information” showed some commonalities and differences between consultation processes in Serbia and Croatia (Table 1).

Sustainable forest management is generally agreed approach in both countries and the forestry sector is committed to the sustainable yield policy where the annually allowable cut is being harvested. Increased mobilisation of wood could be achieved by increasing the amount of wood to be cut and subsequently the amount of wood residues would grow. Another way would be to improve the methods of wood and wood residue extraction in a more cost-efficient way. Private forests are perceived as having potential for mobilising more wood, which is mostly hindered by disinterested private forest owners. Also an important issue in both countries is assessment of the available wood for renewable energy purposes since stable supply of the forest biomass is precondition for further development of the forest biomass and bio-energy market. Better use of forest plantations is also seen as one of the ways to produce more energy wood. Socioeconomic studies involving private forest owners, their willingness to engage themselves in forest management and in most cases to join private forest owners association to be able to do forest management due to fragmented ownership is therefore needed in both countries. Even without previously described

**Table 1**

Commonalities and differences in achieved body of information in Serbia and Croatia.

COMMONALITIES	DIFFERENCES
Sustainable forest management and its potential to provide resources for bio-energy	
Better use of forest plantations	Climate change and climate change adaptation (Croatia)
Socioeconomic studies involving private forest owners and public	Land use changes (Serbia)
Forest biomass and its use for bio-energy purposes	
Better utilization of wood residues, especially in private forests	Overcoming technological issues in renewable energy production (Croatia)
Reducing bureaucratic barrier in starting renewable energy business	Need for exploring clustering possibilities (Serbia)

challenges, entrepreneur starting renewable energy business in both countries faces complex bureaucratic obstacles in terms of issuing all necessary permits. In comparison to Serbia, actors in Croatia were concerned with facing uncertainty associated with the climate change and developing mechanism for effective climate change adaptation. On the other side in Serbia, possibility of land use change (from agricultural to forest land) is identified as a potential for increasing forest plantation area and therefore energy wood production. In Croatia there is lots of interest in establishing power plantations based on bio-energy including forest biomass. Major concern especially of those from energy sector is economic feasibility of these enterprises due to the lack of production technology needed for power plant establishment in Croatia, which means that technology has to be imported and this has no effect on boost of green jobs. On the other side, technology used so far has low energy efficiency. In Serbia the need for exploring clustering opportunities was identified, since at the time of the consultation process no such organisation existed.

## CONCLUSIONS

This paper provided insight into the consultation processes on forest biomass and sustainable forest management that are rather unique for the cross-border region of Croatia and Serbia. The processes were initiated within the EU's project RoK-FOR (1). The aim of the paper was to describe and analyse these processes. Analytical framework proposed by (3) served well for this purpose and the analysis of the empirical evidence collected during the processes led to the following conclusions:

- The consultation processes differed, as involving different actors from different levels but still belonging to the three main groups: science, administration and stakeholders (Figures 1 and 2). All actors started the process playing their traditional roles but according to (25) one can expect that future interactions may change the role they play.

- Both processes applied the same instruments but resulted in different ways of interaction; from the very open in Croatian case to the absence of open discussion in Serbian case. However, in the end in both cases there was a common agreement on strategic research topics and common recognition of major challenges related to forest biomass production and use.

- An overall level of interaction in both countries can be assessed as of a „medium intensity” (3), meaning that actors were mainly focused on expressing their own problems, needs, priorities, assumptions and epistemological values, whereas existing differences were displayed in one-way communication to the other actors.

- Achieved „body of information” is robust and harmonized only to the certain point, yet it is produced by combining the information from different sources (science, administration and stakeholders), which makes it very usable as a basis for the future consultation processes and possible decision making (3) processes as well.

In the cross-border region of Croatia and Serbia the knowledge mobilisation served well the desired goal-to provide the input for RRA and JAP due to applied 'triple-helix' principle that included perspectives of science, administration and stakeholders. This provided valuable insight into challenges and opportunities of forest biomass and sustainable forest management in the bio-energy context.

The results could provide an input to national research and/or energy strategies in the context of achieving renewable energy goals and fulfilling the Kyoto Protocol obligations.

## REFERENCES

1. RoK-FOR, [www.rokfor.eu](http://www.rokfor.eu)
2. PIELKE R S 2007 The honest broker: Making sense of science in policy and politics. Cambridge University Press, Cambridge, p 196
3. EDELENBOS J, VAN BUUREN A, VAN SCHIE N 2011 Co-producing knowledge: joint knowledge production between experts, bureaucrats and stakeholders in Dutch water management projects. *Environ Sci Policy* 14(6): 675-684
4. CASH D, CLARK W, ALCOCK F, DICKSON N, ECKLEY N, JÄGER J 2002 Salience, credibility, legitimacy and boundaries: linking research, assessment and decision making. Cambridge MA: Harvard University, November 2002 (John F. Kennedy School of Government Faculty Research Working Paper, RWP02-046)
5. EDELENBOS J 2005 Institutional implications of interactive governance: insights from Dutch practice. *Governance* 18(1): 111-134
6. ETZKOWITZ H 2008 The triple helix: university-industry-government innovation in action. London, Routledge, p 164
7. LEYDESDORFF L, DOLFSMA W, van der PANNE G 2006 Measuring the knowledge base of an economy in terms of triple-helix relations among 'technology, organization, and territory'. *Res Policy* 35(2): 181-199
8. GULBRANDSEN M, ETZKOWITZ H 1998 The convergence between Europe and America: The transition from industrial to innovation policy. *J Technol Transfer* 24(2-3): 223-233
9. VAN DEN BELT H, RIP A 1987 The Nelson-Winter-Dosi model and synthetic dye chemistry. In: Van Den Belt H, Rip A, Bijker W E, Hughes T P, Pinch T J (eds.) The Social Construction of technological systems: new directions in the sociology and history of technology. Cambridge, MIT Press, p 135-158
10. LEYDESDORFF L, ETZKOWITZ H 1998 The triple helix as a model for innovation studies. *Science & Public Policy* 25(3): 195-203
11. STEVANOV M, KRAJTER S, ORLOVIĆ S, VULETIĆ D, MARJANOVIĆ H, KLAŠNJA B 2010 Obnovljivi izvori energije i održiva gradnja- konceptualni elementi i zakonski okvir u Srbiji i Hrvatskoj. *Topola 185-186: 69-86* (in Serbian with English summary).
12. PARLIAMENT OF THE REPUBLIC OF CROATIA 2007 Zakon o potvrđivanju Kyotskog protokola uz Okvirnu konvenciju Ujedinjenih naroda o promjeni klime (Law on ratification of Kyoto Protocol of United Nations Convention on Climate Change). *Official International Gazette* 5 (in Croatian and English)
13. PARLIAMENT OF THE REPUBLIC OF SERBIA 2008 The law on ratifying Kyoto Protocol within the Framework Convention of United Nations on Climate Change, Belgrade (in Serbian)
14. PARLIAMENT OF THE REPUBLIC OF CROATIA 2009 Energy Strategy of the Republic of Croatia. *Official Gazette* 130 (in Croatian)
15. GOVERNMENT OF THE REPUBLIC OF SERBIA 2005 Strategy of developing energetic sector in the Republic of Serbia until 2015, Belgrade (in Serbian)
16. PARLIAMENT OF THE REPUBLIC OF CROATIA 2009 Strategy of sustainable development. *Official Gazette* 30 (in Croatian)
17. PARLIAMENT OF THE REPUBLIC SERBIA 2008 Strategy of sustainable development, Belgrade (in Serbian)
18. GOVERNMENT OF THE REPUBLIC OF SERBIA 2006 Forestry development strategy, Belgrade

19. STEVANOV M, BÖCHER M, KROTT M, VULETIC D, ORLOVIC S in press The Research, Integration and Utilization (RIU) model as an analytical framework for the professionalization of departmental research organizations: Case studies of publicly funded forest research institutes in Serbia and Croatia. *Forest Policy Econ*
20. SERBIAN MINISTRY OF SCIENCE AND TECHNOLOGICAL DEVELOPMENT 2009 Scientific and Technological Development Strategy, Belgrade (in Serbian)
21. GOVERNEMENT OF THE REPUBLIC OF CROATIA 2006 Croatian Strategic frame for development 2006-2013. Available at: <http://www.mingorp.hr/UserDocsImages/IPA%20IV%20-%20Razvoj%20ljudskih%20potencijala/Strateki%20okvir%20za%20razvoj.pdf> (Accessed: 4 February 2012)
22. KROTT M, STEVANOV M 2008 Comprehensive comparison of state forest institutions by a causative benchmark-model. *Allg Forst Jagdstg* 4: 57-64
23. MEDAREVIĆ M 2006 Forest management planning. Faculty of Forestry, University of Belgrade, p 401 (in Serbian)
24. PARLIAMENT OF THE REPUBLIC SERBIA 2010 Forest law, Belgrade (in Serbian)
25. BÄCKSTRAND K 2003 Civic science for sustainability: reframing the role of experts, policy-makers and citizens in environmental governance. *Global Environ Polit* 3(4): 24-41