

# Metrology and Capacity Building in Higher Education: Project Knowledge Triangle for a Low Carbon Economy (KALCEA)

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**Abstract** – The threat of climate change and the global challenges in the energy sectors, led the countries all over the world to consider investing in low-carbon energy projects. Hence, renewable energy technologies, storage technologies, smart electric energy grids, energy efficiency aspects and other similar issues, are some of the main aspects which can lead into the direction of large-scale decarbonization. The Knowledge Triangle (KT) methodology points out the significance of jointly organized research, education and innovation processes, and importance of the linkages between these processes. The role of metrology infrastructure in project “Knowledge triangle for a low carbon economy” (acronym KALCEA), because appropriate metrology infrastructure is one of the crucial elements in KALCEA related innovation and technology aspects.

## I. INTRODUCTION

The threat of climate change[1] and the global challenges in the energy sectors, led the countries all over the world to consider investing in low-carbon energy [2] projects. Renewable energy technologies, storage technologies, smart electric energy grids, energy efficiency aspects and other similar issues, are some of the main aspects which can lead into the direction of large-scale decarbonization. The Knowledge Triangle (KT) approach emphasizes the significance of jointly organized research, education and innovation processes, and importance of the linkages between these processes.

Academic actors in the KT approach are at the center of the innovation network, in which extended capacities, high level of integration and leadership are preconditions for building up innovation performance. By founding the Knowledge and Innovation Centres (KIC) the existing institutional capacities of the high education institutions will be built up with goal to make prerequisites for implementation of the knowledge triangle activities. KICs

will provide area where concepts, skills, and knowledge from various partners in the field of energy can be transferred effectively to the innovation.

The role of metrology in capacity building in higher education is emphasized in project “Knowledge triangle for a low carbon economy” (acronym KALCEA[3]), because appropriate metrology infrastructure is one of the crucial elements in KALCEA related innovation and technology areas.

Successful communication, business, and even the existence of economic, scientific and a number of other organizations depends to a considerable extent on the appropriate support of specialized organizations in the fields of standardization, metrology, quality, conformity assessment, i.e. certification and intellectual, i.e. industrial property.

The mentioned areas are interconnected, whereby the area of conformity assessment, ie certification, rests on the area of product realization (of appropriate quality), and is conditioned by the area of accreditation, ie authorization from competent organizations.

Given the complexity and specificity of the fields of standardization, metrology, accreditation, conformity assessment (certification) and intellectual property, as well as their pronounced legislative arrangement, activities in these areas require appropriate institutional support.

The aforementioned support in our country has so far mainly rested on certain state bodies and organizations with relatively little involvement of regional organizations (eg in some regional chambers of commerce). A somewhat greater participation of economic and other organizations was observed in the domain of consulting for the areas of quality management systems, environmental protection management systems and other management systems in the organization, as well as in the domain of conformity assessment (certification), which relies on accredited and authorized

laboratories.

However, it should be pointed out that even such involvement of economic and other organizations was not sufficiently directed and coordinated, which, in certain cases, caused unnecessary duplication of (poorly used) capacities, but also insufficient representation in certain areas.

The strict requirements of regulations and standards, but also of users, i.e. the market, require that, in order to ensure the required quality of systems, processes and products (services), an appropriate dispersed network of (regional) institutions competent to provide appropriate support for effective and efficient work must be provided in the areas of standardization, metrology, quality and conformity assessment (certification), as well as in the area of intellectual and industrial property.

## II. INFRASTRUCTURE OVERVIEW

The technical-technological infrastructure, viewed in this case from the point of view of the region, would represent institutional support for ensuring the quality of systems, processes and products (services), as well as the protection of intellectual, and above all, industrial creativity.

The aforementioned institutional support, from the point of view of consulting, providing and disseminating information, providing services and training staff, would refer to the following areas:

- standardization;
- metrology;
- conformity assessment (certification), including associated accredited and authorized laboratories;
- intellectual and especially industrial properties.

Support from the mentioned areas is, in essence, fundamental support in the areas of system, process and product (service) quality.

The Faculty of Technical Sciences, as part of the Feasibility Study of the establishment of the Regional Center for Standardization and Certification, defined the basic guidelines for the establishment of a wider body that should unite all aspects of the technical-technological infrastructure of the region.

Considering the real situation and the existence of part of the necessary infrastructure at the Faculty of Technical Sciences in Novi Sad, in the aforementioned Feasibility Study of the establishment of the Regional Center for Standardization and Certification, it is proposed that the part dealing with certification be located at the Faculty of Technical Sciences, where there are already laboratories that on a large scale they can satisfy the initial requirements for product certification in the region.

By unifying existing laboratories and developing new ones according to the needs of the region's economy, a

strong technical-technological basis will be created for overcoming the technical barriers that exist in trade with developed countries.

## III. CENTER OF METROLOGY – MISSION, VISION AND AIMS

The regional center of technical-technological infrastructure is intended for the provision of certain information, advisory and other services in the fields of standardization, metrology, accreditation, conformity assessment (certification) and intellectual, and especially industrial property, which meet the needs in these areas, economic, scientific and other organizations in the region and, if necessary, in Serbia as well.

At the moment, there is no such organization in the area of Vojvodina, and in all of Serbia, for some of the mentioned areas, there are only a few organizations, which is insufficient to meet the real needs that ensure modern business on the domestic and foreign markets.

The vision of the Center implies that the Center will be built as a modern, flexible organization, which functions with optimal use of available resources and maximum satisfaction of the region's needs in the areas of standardization, metrology, conformity assessment (certification) and intellectual, especially industrial property.

The development of the Center will be directed in accordance with the realistically determined needs in the mentioned areas, but also with the provided material and other basis, acquired through its own functioning.

The main goal of the Center is to provide a neutral and competent organization for the provision of information and consulting services in the fields of standardization, metrology and intellectual property, as well as in the field of conformity assessment (certification), which is accredited in that field by the Accreditation Body of Serbia, i.e. authorized by the authorities state authorities, for the certification of certain products, that is, systems and services.

In accordance with the stated basic goal, in the management of the processes in the Center, which should ensure the satisfaction of the defined Mission, Vision, or Policy of the Center, are the following goals:

- Provision of satisfactory resources, primarily in terms of staff, equipment, business, or work space; work methods and procedures, as well as appropriate financial resources;
- Combining system knowledge, modern technology and user needs in the conception and implementation of services, with the aim of providing users with relevant and high-quality services, aligned with applicable regulations, that is, standards;
- Expanding the circle of users and creating solid cooperation with them;

- Selection of organizations and individuals - collaborators of the Center, in accordance with their ability to meet the demands of the Center and the demands of its users;
- Achieving a business relationship with partners, in terms of strict compliance with assumed obligations and fair consideration of own and partner's interests;
- Directed development in areas for which there is expressed interest, basic resources and realistically expected, acceptable results;
- Systematically arranged and systematically managed documentation of the work process and work subject;
- Improvement of the work process and appropriate methods and procedures, i.e. development of the Center in accordance with real needs and provided resources;
- Provision of conditions for permanent education, motivated and responsible work of staff.

The center, as a regional body, will carry out high-quality, effective and efficient work in the aforementioned areas, with an acceptable price and short deadlines, which is extremely important for proving the competence of the economy, achieving defined and repeatable product quality and achieving, not only competitive prices and other effects, but in general the placement of products on the domestic, and especially European and world markets.

The operation of the Center implies the provision of appropriate financial results, as compensation for the services rendered. However, the Center will not aim to achieve high profits, but only funds to cover its own functioning and targeted development.

By combining and using existing human, technical and other resources, with a slight addition of those resources, the Center will ensure rational use of those resources and visible effects for economic, scientific and other organizations, as well as for individuals and the social community as a whole.

#### IV. CONCLUSION

On the territory of the region, there is a great need for the implementation of standards in business, as well as the certification of products and services of a large number of companies. The existing infrastructure in this area is very scarce and insufficiently connected, there is still a small number of accredited laboratories (for a large number of products and services that are key in the region, primarily in food processing, there is not a single laboratory that can calibrate products and measuring instruments, that is, it certifies products and services).

By comparing the situation here and in the immediate surroundings, we come to the conclusion that an urgent institutionalized solution is needed in this area, in order not to lose a step further. By forming the Center for Metrology, which unites the information base of companies, people, products and services from one (users of the Center's services), and laboratory and other infrastructure, companies and specialists for certain areas, who are trained to provide certain services in the field of work, in one place Center (training for the application of standards, certification of systems, products and services, etc.), on the other hand, will ensure significant progress in the adoption of international norms in business and will ensure the competence of products from the region on the European market.

#### REFERENCES

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