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**Nuclear Security Education in “non-Nuclear” Countries –  
Inseparable Component of Global Nuclear Security Scheme**  
*Example of Montenegro*

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# **Abstract**

- **Global regime of nuclear security cannot be complete and functional if all countries are not involved**
- **Apart from the fact that developed nuclear countries are crucial in this sense (and determining the system), due attention should be paid to small, developing, “non-nuclear” ones**
- **Small problems in big countries are often big problems in small countries – so it is with HRD in nuclear related fields**
- **Everything is based on competence, with education being fundamental for building it up**
- **To that aim, the role of universities is of utmost importance, while networking is another corner stone**
- **Experience of Montenegro, perhaps exemplary in the above context, is discussed**

# Introduction

- It goes without saying that global scheme of nuclear security cannot be limited to nuclear countries – there should be no “blank” spots on the world map, which could jeopardize security as a whole
- Small “non-nuclear” countries are particularly sensitive and should be paid due attention in this respect
- Human resource development (HRD), education in particular, being fundamental in every respect when building up the competence, is to start with.

# The need for nuclear education in Montenegro

- Montenegro is such a small, developing and “non-nuclear” country (no nuclear installations or fuel cycle elements), the use of radiation sources being modest and limited to ordinary medical and industrial applications
- Even though – and taking into account current and near-future status of the field – there is (or will be) significant need in nuclear knowledge (NK), which is the case with many (similar) countries. It goes about the following areas, the list being far from exhaustive (note many being related, directly or indirectly, to safety and security):

- **medical uses of radiation sources, e.g. diagnostics, radiotherapy, palliative treatment, sterilization (of equipment, blood products, consumables, etc.)**
- **radiation protection in general, with its various particular aspects, e.g. dosimetry (personal, environmental), radioactivity control in food and consumables, radon monitoring and control, environmental issues and radioecology, low and medium activity radioactive waste management, various analytical and monitoring services, etc.**
- **preparedness and response to radiological and nuclear emergency situations**
- **applications in industry, geology, hydrology, agriculture, biochemistry, ... (e.g. non-destructive testing, various gauges, radioisotope labeling, radio-tracers, etc.)**
- **scientific and educational applications (both nuclear and non-nuclear);**
- **safety and security of radiation sources in general, with its various aspects**
- **legislative and regulatory issues, including complying to international safety/security norms and joining international conventions in the field**
- **nuclear forensics and applications of nuclear techniques in classic forensics**
- **combating illicit trafficking of nuclear and radioactive materials**
- **security systems based on X-rays and/or other nuclear methods**
- **introduction of some future topics, e.g. nuclear power for electricity generation, sea water desalination, nuclear fusion, etc.**
- **information and communication with public and media**

- **There is currently an obvious NK shortage in the country, resulting from unfortunate recent political and economic history of the region, brain drain and attrition, poor interest of young students for the subject, etc.**
- **Perhaps the most in need are nuclear safety and security related items from the above list**
- **One should however note considerable improvements in the past few years, following re-installing the country independence in 2006. This is particularly valid for establishing regulatory and legal infrastructure, but less so for HRD**
- **Developing and promoting an adequate education/ training scheme is imminent and of first priority**



# State University of Montenegro

- University of Montenegro (UoM) is the only state university in the country and the only one providing higher education, scientific research and expertise in natural and technical sciences, including nuclear/radiation-related ones
- It is the statutory duty of UoM to do so, and to do it in a manner commensurate with country needs
- By far the most relevant expertise in the country is either concentrated at UoM or is deriving out of it
- It therefore goes without saying that UoM has fundamental role in meeting nuclear-related (safety and security included) goals in Montenegro





**University of Montenegro**



- **University Centre for Nuclear Competence and Knowledge Management (UCNC) was established in 2009 with support of the IAEA, with intention to help the country cope with the problem**
- **UCNC is already, or should act towards:**

- **becoming national center of competence and expertise in nuclear related issues;**
- **being national radiation protection centre;**
- **assessing, creating, preserving and transferring nuclear knowledge (NK), according to Montenegro needs;**
- **offering consultancies and technical support services to regulatory authorities and relevant stakeholders;**
- **focal point for dissemination and exchange of NK, in particular with the IAEA;**
- **promoting nuclear applications for peaceful purposes, in particular medicine and environmental protection;**
- **being advisory body to the government for nuclear related issues;**
- **developing curricula for nuclear related studies at all levels;**
- **supporting young students and scientists in nuclear related field and facilitate their exchange with reputed institutions abroad;**
- **giving proper and timely information and comments to the public and media on relevant nuclear related subjects**

## Networking – educational aspects

- Networking is becoming increasingly important for building/sustaining the national body of knowledge, competence and expertise
- This is particularly valid for those countries whose domestic resources are limited and/or where no critical mass of the above three constituents exists, which could sustain the system on its own
- IAEA-based international networks for nuclear security education (INSEN) and training&support (NSSC), even relatively recent, proved pivotal/fundamental in this respect

- **At UoM (Department of Physics) we have launched several targeted educational courses at post-graduate level, following INSEN guidelines**
- **The pioneering educational materials developed within the network represent the basic literature for both students' and lecturers' use**
- **We participate in nuclear knowledge management (NKM) activities and use their information system (INIS) when sourcing relevant data**
- **UoM is also national contact point for INES (International Nuclear and Radiological Event Scale) and has trained staff for properly reporting in case of incident/accident**



- **UoM participates in IAEA-supported Nuclear Instrumentation Laboratory Network (NILNET)**
- **We will also be among the first ones to participate in Internet Reactor Laboratory (IRL) – a novel/advanced learning tool in nuclear physics and engineering**
- **UoM offers a number of versatile laboratory services, primarily for educational/training purposes, but also for routine measurements, monitoring of radioactivity and radiation parameters in the living, working or outdoor environment**

**As a result of our INSEN activities, curricula for several nuclear safety and security related courses were developed and courses were introduced (as part of optional courses menu) into post-graduate educational programmes of Applied Nuclear Physics at the University of Montenegro, Department of Physics. These include:**

- Fundamentals of Nuclear Safety and Security**
- Radiation and Nuclear Security – Practical Aspects**
- Nuclear Forensics**
- Nuclear Physics for Regulators**

- In addition, awareness about nuclear safety and security issues (education and training in particular) rose considerably among academic staff
- However, this was not the case (at least not to the same extent) among other stakeholders (regulatory bodies, relevant ministries, police departments, emergency centres, etc.) – we are determined to strive for improving that in future

## A few concluding remarks

- Perhaps the most difficult task will be to attract more attention for the topic from young students: with interest for natural and technical sciences declining in general in the past 20 years, it represents a broader concern than nuclear education alone
- It is reassuring that within last two generations we are noticing some recovery, both in number and in quality of enrolling students



- Finally, one should distinguish clearly between education and training
- Education builds up knowledge, while training develops ability to its practical application
- Both knowledge and training are necessary for competence
- However, training cannot replace education; training is meaningful only when superposed onto an adequate education
- Messing up these terms may lead to a false perception of knowledge and competence (quasi-knowledge and quasi-competence)...
- ... which would inevitably compromise safety and security!

- **IAEA assistance to Montenegro in the above sense – through various modalities of its cooperation with Member States – proved effective and welcome; we hope it will continue the same way**
- **With Montenegro in the accession process to the European Union, it is now our double responsibility to provide required education, knowledge and competence for applying international norms and standards in nuclear safety and security in the country**



**IAEA NKM Mission  
at the University Campus  
September 2009**

*Thank you!*





**Montenegro**

*- a great heart of the Mediterranean -*