

Prof. Yana Topalova, Doctor of Science in Biology

A Center will finance the development of technologies before the business asks for them.

"Sofiyska Voda" is of the very few exceptions which spend resources for laboratory level science pilot projects

- Prof. Topalova, have the business and the science met each other in the project "Pure technologies for sustainable environment – Water, waste, energy for circular economy"?

- A dream came true. But the work in order to meet the business, science and education especially in this field began rather a long time ago. In this project we managed to implement all good practices, which we have created so far. First – we have a long history of cooperation with Sofiyska Voda and MoS.

- Who are you – the Sofia University, the Faculty of Biology?

- I am referring to the Faculty of Biology as one whole but mainly the major "Environmental Biotechnology" at the Department of "Common and applied hydrobiology". "Sofiyska Voda" has been financing this project's preparation for many years. It hires our students for paid internships in its laboratories, as some of them stay to work there, and others return to us and become Ph.D. students and assistant professors. They have gone through this school of connecting business with science. We have started to increase the interconnectivity with the biggest companies, engaged with water and waste treatment, in particular "Sofiyska Voda", by creating the "Live water" project under SV's initiative and financing.

- What is the purpose of this project?

- The purpose was to study the water cycle of Sofia. The project lasted for 2 years but we are thinking about continuing it.

- What did the students do?

- They tested the water quality, the biodiversity of organisms in the water cycle.

- What turned out after the tests?

- It was established that Iskar River and Iskar Dam are clean, the water quality is suitable for supplying the capital, of course after going through the PWTP "Bistritsa", where the waters are treated.

- Have you proved that we drink clean water?

- *We drink clean water, it is with very good quality.* I am going to describe to you the water cycle – first it is the Iskar River and the Dam, afterwards it is the PWTP where the waters are distributed along the Sofia network. We pollute them, and afterwards they go to the sewerage where they are taken to another treatment plant - "Kubratovo" and from there they go to the mid-part of the Iskar River.

-Your students have tested in all points, correct?

- They have tested the river water, the quality of the dam, the potable water, the process velocity in the two treatment plants.

- How are the waters being treated?

- They are being treated mainly with organisms. In PWTP "Bistritsa" this is a biofilm on the sand particles of the filters. This biofilm is mainly from microorganisms. And in the waste water treatment plant the treatment is with active sludge, which is in the bio pools and what it is is packed in flocs microorganisms. That is why we say live water. The biofilm and the active sludge are not only from microorganisms, there are small animals in them that feed off the

microorganisms which on their part eat the pollutants. In order for this water to become clean, it passes through a very complicated biological system which runs the water treatment process. During the study of the biodiversity in the waters colleagues even discovered new species for the science.

- What did the students learn?

- How to take samples, how to process them, how to make hydrobiological tests. They participated directly in the research work. What is more important is that it was demonstrated to them how important the connection between business and education is and how the colleagues from Sofiyska Voda participate in the recruiting and building of their own personnel, who they afterwards employ. Some colleagues, who have gone through these laboratories, decide to start their research work in extramural studies or so called free Ph.D. major. Some time ago "Sofiyska Voda" invested personally in me, as together with the Dean of the Hydrotechnical Faculty of UACEG, provided us with a post graduate fellowship in Veolia. In the Paris campus we met with the whole innovation policy of the company. There we saw the structure of the center for which we later prepared the clean technologies project. My colleague and I said to ourselves – yes, we could do this in Bulgaria. For me it was something like charging with energy and faith that what happens in France could happen here as well.

- We go back to the clean technologies and environment project. Did you take the project from Veolia?

- To a large extent but it is consistent with the Bulgarian reality and the operational programs.

- Clean&Circle is the project's acronym. It will become something like an innovation centre, correct?

- It is an innovation infrastructure, this is how it was conceived. The financing of 23 million BGN is under the "Science and education for intelligent growth" program. We have a new 4-storey building construction. It will be filled completely with new equipment. The building will cost 3 million BGN and the equipment will be 15 million BGN. But *while we create the new infrastructure, parallel to this, we develop technologies in the existing at the moment laboratories*, we already have create laboratory technologies which we will elaborate into pilot ones through scale enlargement.

- Will the Sofia University be the basics, the heart of this center?

- The Sofia University in partnership with three more universities – UACEG, the University of Forestry, the Bourgas University and 3 Institutes of the BAS– the Institute of Microbiology, the Institute of Organic Chemistry with a Center of Phyto-Chemistry and the Institute of Physical Chemistry, one non-governmental organization "Cleantech", MoS, "Sofiyska Voda", energy agency-Plovdiv, "Interplast BG". The latter company, it is also municipal, is our partner, because we will produce up-to-date construction materials out of ashes, slags, and waste glass. UACEG and the Institute of Physical Chemistry will participate in this.

- But the Faculty of Biology is the basics, correct?

- It is the coordinator. I have envolved long-time partners with whom we look into the same direction. Start-ups will be created around this circle.

- You said the goal was to develop technologies. How will you choose them, though?

- They are all described in the project itself. When we began to build the center, we gathered partners, as we knew who was going to do what. Some with solid waste, some-biodegradable waste, other- with water supply and sewerage. This is how the "waters", "waste", „energy" modules were created. We requested from everyone to describe the innovations they had had so far and the ones planned for the next 10 years.

- In order to provide financing for them?

- Exactly. I will tell you about one of the UACEG projects, it is in the WSS sector and its purpose is to increase the energy efficiency, to utilize the heat carriers, to create a harmonic WSS system.

- What does it mean to utilize the heat carriers in WSS?

- As a lot of waters go out warm, especially during bathing, the goal is to utilize this heat. Now the warm water goes in the sewer, the idea is to have systems, which will capture the heat and use it for heating the buildings themselves. There are already such technological solutions. It is being contemplated that the last stage in the water treatment in Kubratovo to be with microalgae. They take in the nitrates and the phosphates, they synthesize biomass. And it could be used not only to get biogas but also ethanol, rear metals-aluminum, argent, that could be extracted, are accumulated in it. The water treatment with algae leads not only to methane production but also of other raw materials.

- You have ideas, you developed them into projects, you made the concept idea of the center, you applied...

- And we were approved based upon these proposed technologies.

- How many projects are in this center?

- We have set down at least 25 new technologies.

- What will be the effect of these 23 million BGN?

- We have an investment plan, we plan to go to self-support after the 6th year . We will create a new generation of technology entrepreneurs, all of them young people. They, apart from surrounding the center with startups, will learn how to do technical entrepreneurship in the clean technologies in the country. What is happening with Sofiyska Voda, with the Sofia Waste Treatment Plant is a model that started to be used by the other universities. The purely economic effect will be big, we will create an infrastructure which will constantly produce both technologies and entrepreneurs.

As a first stage of the project we will create a technological map of Bulgaria for all critical problems in the field of water pollution and in the field of waste. What is of utmost urgency could be deducted from the map. Both the map, and the study results will be uploaded on the tech cloud. And the people from Ruse, for example, will be able to see what the critical points in their region are.

- While you are constructing the building, you are buying the equipment, in the parallel to it, you are also developing the technologies?

- That's right, we have ready technologies. Based on the Ass. Prof. Irina Schneider's research work we have created a technology for water treatment of the milk processing industry. Right now we are at the laboratory technology stage, we should have a pilot one in order to apply it to the enterprises.

- Is there any interest towards it?

- Let me tell you how the interest goes. When we have a lab technology with innovation, and even the technology is still pilot, the business is not interested because at this stage, the technologies only waste money. The moment when it proves itself in industrial conditions and it gives fruits, the business starts chasing you and says: I want this thing because it brings profit. Until now the tie between business, science and education was torn because of these reasons. Such centers in question are what makes the connection. This means that the first two stages are financed in them, so that the business could be reached. Few are the companies like Sofiyska Voda which finance fresh from the first stages. In the face of Mr. Arnaud Valleteau/CEO of Sofiyska Voda/ and his team we met like-minded people who know that you have to go through laboratory and pilot technologies in order to get to the production stage.

- Which is the craziest technology?

- When from a molecular and nanodiamond level we get to a big compound. Now we improve the biogas and increase the methane in it, the technology works on a molecular level. If a technologist sees that, he or she will say – they are counting molecules. But out of this molecule counting a control system will be made, we will put it in a phone application and the people

who run the real technology will say – let me see what percentage of bacteria glow, so to know how much methane will be produced.

- You make the bacteria glow?

- We will make the methane producing bacteria glow in order to show what is the methane percentage. So in Bulgaria high technologies can be created, we have the human and the professional capital to do that. With this financing we will open new horizons for young researchers and entrepreneurs. The thing we do is analogical to Dutch, German, French centers.

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