

**Descriptions of the Solutions by the Ten STE(A)M Challenge Finalists**

**EcoBytes Team – First Kragujevac Grammar School**

The aim of this solution is to improve the air quality in the city and decrease pollution. The solution by this team involves a bioreactor – an ecosystem of unicellular algae located in a glass receptacle that produces oxygen and replaces carbon-dioxide, a product of pollution. The bioreactor includes a solar panel which powers the pump and lamp necessary for its work. Furthermore, the solar panel generates the power used by the information screen which displays information about tourist destinations and points of interest in the city of Kragujevac.

The solution is innovative as it uses live organisms to neutralise carbon-dioxide and decrease carbon footprint, while also making oxygen.

**GSM Decibel Team – “Svetozar Marković” Grammar School, Niš**

The aim of this solution is to raise awareness of sound pollution in schools, which represents a serious problem with potentially harmful effects on health, productivity and learning. The proposed solution consists of sensors that signal every time that noise volume exceeds the allowed limit, warning everyone present to adjust their speech volume or the volume of some other source of noise. The acoustic sensors will be installed in the appropriate places in classrooms and corridors, where noise control is necessary. Once a sensor detects that the noise level has exceeded the allowed limit, it emits light signal as a warning, in order to inform the people present. Thus far, few experts have seriously engaged in measuring noise levels or studied the impact of noise on the health of pupils and citizens in urban environments. Decreasing or controlling the level of sound pollution may positively influence work output, health condition of citizens and concentration of pupils.

**HydroHeroes Team – Pirot Technical High School**

The team addresses the problems with the river Nišava, detecting the water level and warning when the level gets high (when the dam of the hydropower plant is closed, the level of the Nišava substantially rises and the river unfortunately takes a couple of lives each year).

The solution involves installing the system of warning about the water level of the Nišava, thus letting all citizens know that the river is currently dangerous so they should remain at a safe distance. By means of a sensor and a GSM module, the server receives information concerning the current water level of the Nišava, and the information is subsequently distributed via notification systems (light signalisation along the river), as well as panels installed on bridges. The solution would imply installing a panel on every bridge, where the information concerning the water level in the Nišava would be displayed. This innovative system uses IoT technology (Internet of Things) unlike earlier call- or message-based alarm systems.

**One Click One Flower (Jedan klik jedan cvet) Team – First Technical High School in Kragujevac**

The problem that this team addresses is changing citizens’ attitudes concerning the importance and preservation of green surfaces in Serbian cities. What is necessary are efficient watering systems that would use water resources with as little waste as possible, since the existing watering systems are obsolete, inefficient and imprecise. The team’s solution involves managing of the watering system remotely, via a web app, enabling users to control their watering systems easily and comfortably from whichever location. Such a solution simultaneously improves the quality of watering and saves water. Furthermore, the proposed solution contributes to sustainability and environmental protection, promotes recycling and sustainability of green walls, and decreases negative impacts on the environment. The system is innovative since it enables precise management of time and quantity of the water used for watering, thus saving resources and decreasing harmful environmental impact.

**Not Compote but Compost (Nije kompot nego kompost) Team – First Technical High School in Kragujevac**

The compost made of bio-waste decreases refuse, fertilises soil, prevents pollution and lowers the costs of waste management, while simultaneously raising ecological awareness. The problem addressed by this team of the First Kragujavac Technical High School is the huge amount of biodegradable waste in the school yard, including grass, dried leaves, paper and leftovers of students’ snacks, which could all be transformed into a useful product – compost. The solution involves a web app for management of the compost made of bio-waste, microcontroller and a roto composter. The app can be used by persons or organisations that produce compost and wish to use digital sensors and IT technologies to measure and monitor the parameters of compost – temperature, humidity and PH value, so as to provide adequate conditions for composting. Also, the app can be used by those who use compost in soil building, or planting, so as to know what the quality of compost is, and be able to use it in the best possible way. Users can monitor the condition of compost and receive notifications about any anomaly or reading faults via the internet and their cell phones, which largely replaces the need for personal monitoring and control.

**Team Pančevo Smart City – High School of Mechanical Engineering "Pančevo", High School of Electrical Engineering "Nikola Tesla", Pančevo and Medical High School "Stevica Jovanović”, Pančevo**

The team works on integrating the digital solutions that represent the concept of “Smart Cities”, and on this occasion, they created a system that sends information on air pollution. They measure the concentration of airborne particles and inform the citizens so as to prevent their exposure to hazardous concentrations of air pollutants. This innovative solution involves monitoring of air quality via sensors – analysis and forecasting of the trends in atmospheric developments. In addition to measuring the concentration of certain particles, temperature, as well as wind velocity and direction are also measured, monitoring these values in the micro-area (wider city centre). The other component are the alarms that warn about hazardous concentrations of harmful particles, sent to the users via a mobile app for Android as notifications.

**Safer Choice Team – Aleksinac Grammar School**

This team addresses the problem of traffic accidents that are caused by fatigue, lack of awareness and inappropriate behaviour by drivers. The product of this team is a mobile app. Driver needs to position the phone in the car and adjust it so that it can monitor his/her eyes, and the app will emit sound warnings, in case he/she is drowsy, or is not keeping his/her eyes on the road. The app has additional safety options, such as sending calls for help.

**TechnoKragujs – First Kragujevac Grammar School**

This team from the First Kragujevac High School addresses air pollution by developing a device equipped with a high-precision sensor for measuring the concentration of PM2.5 particles in the air, as well as measuring temperature. The device is intended for all who wish to measure air pollution at a location of their choice. In addition to information on highly polluted micro-locations, it also raises awareness of air pollution and offers the possibility of measuring pollution in any location.

**Soil Diagnosticians Team (Zemljišni Dijagnostičari) – Vrnjačka Banja Grammar School**

The team has been taking soil samples and with the help of experts and professional services, made an analysis of suitability of the soil for growing raspberry, as well as assessed the rate of the soil pollution. Raspberry is the culture most frequently grown in Vrnjačka Banja and its vicinity. Thus, having analysed the soil suitable or growing raspberry, the team created “EKO MALINA” app (Eco-Raspberry). The application would help citizens to get needed information on growing raspberry, improve soil quality if necessary and receive suggestions, based on the data entered after the soil analysis, how to improve its quality. By studying and presenting the results of this solution, measures to prevent soil pollution will be promoted, including responsible waste disposal, while the awareness would also be raised among the citizens concerning the importance of soil preservation.

**Star Counters (Zvezdobrojci) Team – Grammar School “St. Sava” in Požega**

The problem that this team addresses is frequent overflowing of the river Skrapež from its bed, with the grammar school building being located by the river and thus usually affected by this flooding. This team’s idea is to prevent this from happening by making the model which would serve to demonstrate the proposed solution. The team uses the system of streaming the excess water into adjacent canals, together with application FIZZIQ which takes physical measures by means of sensors. The FIZZIQ app enables recording, storing and exporting data, creating and analysing graphs, creating tables, making notes and adding photographs. No one in the town has thus far seriously dealt with the problem of the river spilling and this is an attempt by the school team to change this.