

# Development of an Automated Emission Management System

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**Abstract**— The Automated Emissions Management System is a unified platform that collects permissible emissions from stationary point sources provided by the Ministry of Environment for each pollutant, and actual emissions from annual statistical reports submitted by organizations. The system allows organizations to submit emission plans electronically, obtain permits, and submit annual reports. A system of harmful substances emitted into the atmosphere is created in the system, on the basis of which it becomes possible to perform analysis and modeling through the GIS system.

**Keywords**—Emission, air pollutants, statistic data, GIS technologies.

## I. INTRODUCTION

- One of the priority directions of environmental management is the introduction of unified modern systems of environmental monitoring, permits, licenses, systematic management of primary information. In this direction, the Ministry of Environment is carrying out a number of works, in particular, in the field of air emissions management, the legislative-normative-methodological base is being improved, modern approaches are being introduced in the processes of pollution monitoring, assessment and forecasting.
- The Institute for Informatics and Automation Problems of the National Academy of Sciences of the Republic of Armenia together with the Ministry of Environment of the Republic of Armenia carries out relevant works, in particular, e-government system, data warehousing, air pollution assessment, mapping, modeling, emissions automation.
- The computational resources of the Armenian National GRID Initiative [3] helped to overcome the above mentioned problem. This infrastructure consists of relevant computational resources, which enable the development of an automated emission management system, the creation of emissions databases, analysis and assessment.
- The developed system is a unified platform that allows online organizations to submit emission test projects online to the Ministry of Environment of the Republic of Armenia, obtain emission permits from real sources based on them, as well as provide administrative statistics on actual emissions. A system is also created in the

system, on the basis of which reports are prepared to the National Statistical Service for submission to other beneficiaries. The created database will be the basis on which analysis and modeling will be performed by GIS system.

- The system has developed about 1,200 enterprises that have more than 3,500 stationary source emissions [1] [2].

## II. DEVELOPED SYSTEM STRUCTURE

The structure of the system is divided into the following subsystems:

1. Login system,
2. Organization accounting system, Registration of organizations (entities) in the system (entering details, editing, viewing)
3. Emission authorization system, Emission project upload system by organizations (entities), Enter the number of real sources, Enter the allowable quantities, View existing projects in the system, download them (download), View permissions received download download
4. System for entering (editing) administrative statistical reports
5. Reporting system
6. Legislative field
7. Data Processing and Management System (Administrative Panel)  
Data processing,  
Inserting and editing directory spreadsheets,  
Reporting.

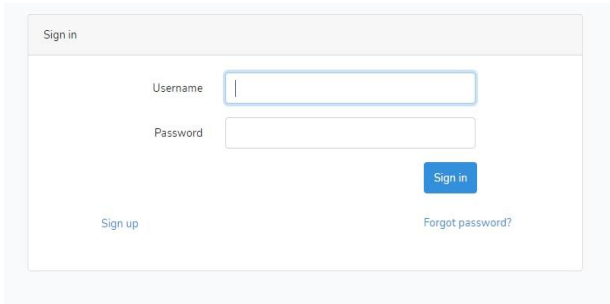
## III. INPUT DATA

1. Log in to the system  
After launching the system, the "System Login" window should open.  
If the user does not have access yet (does not have a login and password), he / she must register and get the login (login and password) via his / her registration email address.  
If the user is already registered, the personal web page of the given user will be opened with its menus:

- Main page
- Permits
- Reports
- Information

Such a web page will open for every user.

Here it is necessary to distinguish the notions of user and organization (subject). The user is the registered person who has the right to perform the functions of the organization (entity) or organizations in the system.



**Fig.1 Log in to the system**

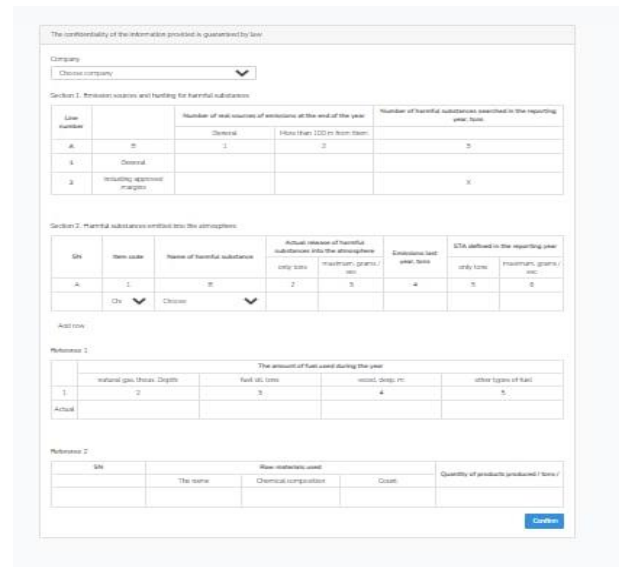
#### IV. REPORTING SYSTEM

Logging in to the system opens the Home Page. If the user has registered organizations, after entering his page he will see all the organizations he has registered.

If the organization is not registered, the user must register a new organization. The system should be able to add new production areas and edit the organization's data in addition to the taxpayer registration number, which will be the organization identification code in the system.

Mandatory data for entering the organization are:

- The name of the organization
- Legal type (LLC, CJSC - it should be an optional field from the reference table)
- Registration number in the state register
- Taxpayer Registration Number (VAT Number)
- Identification code
- Legal address - region, community, postal code, address, telephone numbers, e-mail address
- Activity address - region, community, postal code, address (activity address can be several)
- Name of the director
- Types of actual activities - primary, secondary - (can be several).

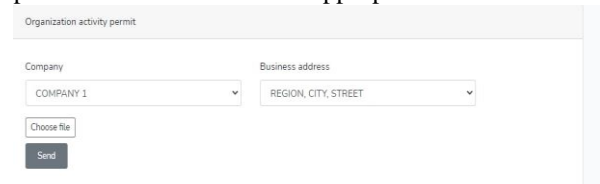


**Fig.2 Reporting system**

#### V. PERMISSION SYSTEM

The emission submission and emission permitting action functions are performed on the PERMITS page.

Accessing the permissions page should include the projects submitted for all user-registered organizations, as well as the permissions received in the appropriate tables.



**Fig.3 Organization activity permit**

Companies				Add company
#	Name	VAT number	View / Edit	
1	COMPANY 1	12345678	View	Edit
2	COMPANY 2	12345672	View	Edit

**Fig.4 Registered user organizations**

Company	Business address	STA project	Date
COMPANY 1	Region, city, street	file202109090949111.doc	2021-09-09 09:48:11
COMPANY 2	Region, city, street	file202109090951591.zip	2021-09-09 09:51:59

Company	Business address	STA project number	Date of issue	Attached authorization
ՀԱՅԿԻՆՎԵՐԱՍՏԻ	ԵՐԵՎԱՆ		2021-09-09 09:49:11	file202109090949111.doc
ՀԱՅԿԻՆՎԵՐԱՍՏԻ	ԵՐԵՎԱՆ		2021-09-09 09:51:59	file202109090951591.zip

**Fig.5 User submitted projects and obtained permits for emissions**

## VI. ENVIRONMENT FOR ACCESS TO THE EMISSION MANAGEMENT SYSTEM

The platform is a web portal <http://arimei.grid.am/>, which was designed with the help of the php programming language Laravel framework.

The interface of the site was created with the help of bootstrap, the jquery library of the javascript programming language was also used.

The site has a user interface and dashboard.

The dashboard has access to 3 types of users – administrator, editor, viewer.

The administrator can do everything – view, edit, create, delete.

The editor can view, edit, create, delete only the report.

The viewer can only view.

The CEO of company must register as a user then create a company.

All the information is stored in a space database under the maintenance of MySQL.

This portal provides easy internet browser access to the inventory of point source emission of pollutants. The data are viewed as text reports, tables.

## VII. CONCLUSION

Thus, the system is designed to increase the effectiveness of emissions management, automate the corporate environmental sector (obtaining permits, reporting), enable the strength database, perform analysis and assessment.

## ACKNOWLEDGMENT

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## REFERENCES

- [1] Ministry of Environment of the Republic of Armenia. <https://env.am/shrjaka-mijavayr/artanetumner>
- [2] Statistical Committee of the Republic of Armenia. <https://armstat.am/en/?nid=82&id=2301>
- [3] Armenian National Grid Initiative Foundation. <http://www.grid.am>