

Informatic system for identifying and evaluation of the environmental aspects and waste products management

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Abstract. *In this paper, the authors present the instruments provided by a software package that is dedicated for the identification and evaluation of the management of environmental aspects and waste. The solution proposed, modeled as a cycle, can be adapted to any company in the manufacturing sector and involves the elaboration of a procedure for environment-related aspects, the implementation of software, training of personnel, identification, evaluation and monitoring of the significant environmental issues, preoccupation for future improvement.*

Keywords: environment, waste, factor, software, evaluation.

JEL Classification: Q51, Q56.

1. Introduction and Literature review

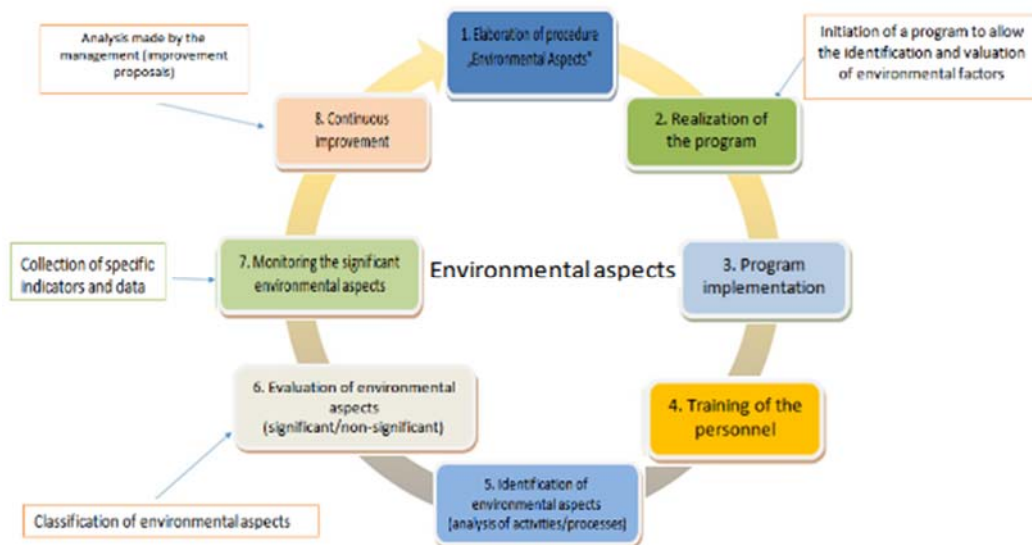
The evaluation of the impact on the environment (EIM) is a process by which there is identified and foreseen the effects that a proposed social and economic activity proposed to be promoted (initiated, designed, realized and put in order) might produce on the environment, on the human health and his benefit.

The most efficient way by which it might be prevent the apparition of new waste products useless quantities is the *decreasing at source*, thus it became the most used method for the waste products managements. The products recycling (Masing, 1988), the separation and their sale decrease the quantity of waste products that have to be stored in cesspool.

The identification and the evaluation of the environmental aspects represent an instrument of the environmental management (Panaitescu and Bucuroiu, 2014a, 2014b, Petrescu and Bucuroiu, 2014, Petrescu et al., 2014). In this sense, this stage has to be quantified in the activity of each company that has or might have, in the future, an impact on the environment.

The solution proposed as follows contributes to the improvement of the environmental system within any productive company.

Figure 1. Flux scheme of the program for the identification and evaluation of the environmental aspects and waste products management



The waste products management may be conceived based on the scheme presented in the Figure 1. Starting with this representation, in collaboration with SC WEB CONTUR SRL company, there was conceived a software program (<http://mediu.conturweb.ro>) in order to identify and evaluate the environmental aspects and the waste products management consisting of two sections:

- The first section allows the identification and the evaluation of the environmental aspects.

- The second one realizes a waste products management, according to HG 856/2002, adjusted in 2014.

The program named “conturweb environment” may be implemented in any company that desires to implement an environmental management system.

Masing (1988) represents a comprehensive manual on quality assurance. Anghelache (2011) approaches the management of environmental risk. Anghelache and Anghel (2016a, 2016b) present the statistical and econometric instruments that can be used for data analyses, Păunică et al. (2009) emphasize the usefulness of business intelligence techniques in the same scope. Panaitescu and Bucuroiu (2014a) analyze the composition of urban waste, they approach the urban areas belonging to the Romanian county of Prahova, another study by the authors outlines the pollutants affecting the surface and ground water in the residence city of the named county. Petrescu and Bucuroiu (2014) evaluate the possibility to reach lower emissions level through the working tanks inside fuel deposits. Petrescu, Panaitescu and Bucuroiu (2014) present the implementation of a software package in the wastewater treatment plants.

2. Identification and evaluation of the environmental aspects

The stage of identification and evaluation of the environmental aspects supposes to follow in an interactive form some steps that have to define the company organizational and productive profile, the maintaining of the environmental aspects (Figure 2) ascertained by the internal/external audits and the evaluation of the impact based on some pre-defined criteria (Table 1), in accordance with the following relation:

$$I = G + C + F + R + PI, \tag{1}$$

the notation signification being mentioned in Table 1.

Table 1. Criteria quotation grad

CRITERION	POINTS (P)		
	1 - 3	4 - 7	8 - 10
Gravity (G)	There is no risk	Risk for the environment	Risk for the human being and the environment
Quantity (C)	Reduced level	Average level	High level
Frequency (F)	Occasional	Average	Daily
Settlements (R)	Conformity, stable demands	Conformity, there might be perspective on the demands' toughness	Non – conformity
Interested parts (I)	There are no complaints or critics	Complaints or / and occasional critics	Complaints and systematic critics

Figure 2. The evaluation of the impact on the environmental factors and framing

N <input type="checkbox"/>	Deseuri textile	textile	da	nu	da	nu	nu	nu	da	6	M	<input type="text"/>	<input type="text"/>
A <input type="checkbox"/>													
U <input type="checkbox"/>													
N <input type="checkbox"/>	Zgomot	Emisii/Imisii	nu	da	nu	nu	nu	nu	da	3		<input type="text"/>	<input type="text"/>
A <input type="checkbox"/>													
U <input type="checkbox"/>													
N <input type="checkbox"/>	Zgomot	Zgomot	nu	da	nu	nu	nu	da	7	M	<input type="text"/>	<input type="text"/>	<input type="text"/>
A <input type="checkbox"/>													
U <input type="checkbox"/>													
N <input type="checkbox"/>	emisii/imisii	Emisii/Imisii	nu	da	nu	nu	nu	nu	da	0		<input type="text"/>	<input type="text"/>
A <input type="checkbox"/>													
U <input type="checkbox"/>													
N <input type="checkbox"/>	pulberi	alte deșeuri cu conținut de substanțe periculoase de la procesarea fizică și chimică a minereurilor metalifere	da	da	da	nu	nu	nu	da	3		<input type="text"/>	<input type="text"/>
A <input type="checkbox"/>													
U <input type="checkbox"/>													
N <input type="checkbox"/>	hartie carton	deșeuri de la sortarea hârtiei și cartonului destinate reciclării	da	nu	da	nu	nu	nu	nu	4		<input type="text"/>	<input type="text"/>
A <input type="checkbox"/>													
U <input type="checkbox"/>													
N <input type="checkbox"/>	Sticla	sticla	da	nu	da	nu	nu	nu	da	4		<input type="text"/>	<input type="text"/>
A <input type="checkbox"/>													
U <input type="checkbox"/>													
N <input type="checkbox"/>	plastic	deșeuri de sticla, altele decât cele specificate la 10 11 11	da	nu	da	nu	nu	nu	nu	4		<input type="text"/>	<input type="text"/>
A <input type="checkbox"/>													
U <input type="checkbox"/>													
N <input type="checkbox"/>	Apa uzata	ape uzate menajere	da	nu	da	nu	nu	nu	nu	3		<input type="text"/>	<input type="text"/>
A <input type="checkbox"/>													
U <input type="checkbox"/>													

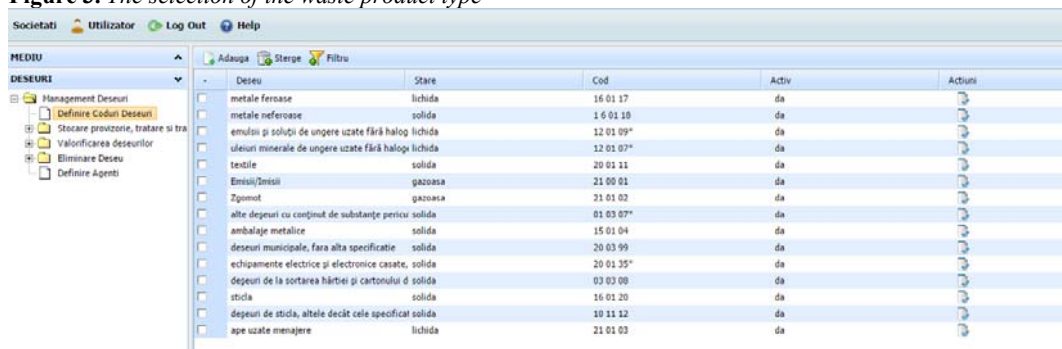
Note: the English equivalents for the labels in the above interface (in Romanian) are presented below: *Deseuri textile* – Textile waste; *Textile* – Textile; *Da* – Yes; *Nu* – No; *Emisii/Imisii* – Emissions/Ambient emissions; *Zgomot* – Noise; *Pulberi* – Powders; *Alte deseuri cu continut de substante periculoase de la procesarea fizica si chinica a minereurilor metalifere* – Other waste containing dangerous substances from the physical and chemical processing of metal ore; *Hartie carton* – Paper carton; *Deseuri de la sortarea hartiei si cartonului destinate reciclarii* – Waste from sorting paper and carton destined to recycling; *Sticla* – Glass; *Deseuri de sticla, altele decat cele specificate la 10 11 11* – Glass waste, other than those specified at 10 11 11; *Apa uzata* – Wastewater; *Ape uzate menajere* – Domestic wastewater.

The above figure describes the impact of the environmental pollution factors, the examples taken into account refer to textile waste, noise, powders, paper waste, glass, plastic and wastewaters. The interface includes and displays the description of each individual factor, useful in the construction of the profile.

3. The waste products management

The stage of the waste products management bases on the general structure resulted from the previous stage and supposes the precising of the data concerning the quantities of the waste products generated, valorized or eliminated (data, generating structure, quantities, stage, the agent/company/plant where there will be valorized/eliminated) (Figure 3 and Figure 4 are captures from the waste products management program).

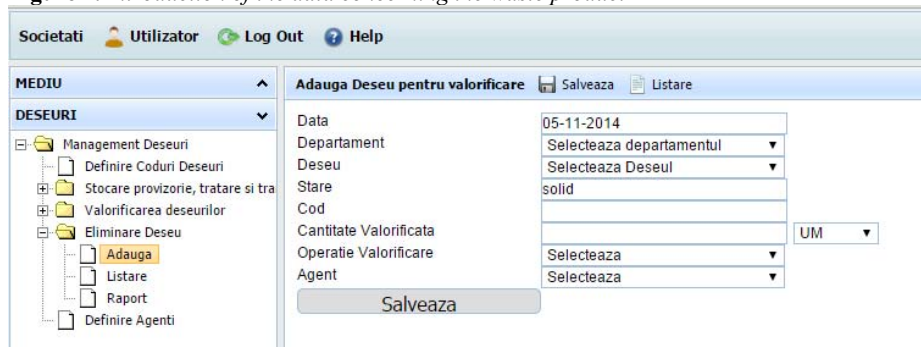
Figure 3. The selection of the waste product type



Note: the English equivalents for the labels in the above interface (in Romanian) are presented below: *Societati* – Societies; *Utilizator* – User; *Mediu* – Environment; *Deseuri* – Waste; *Adauga* – Add; *Sterge* – Delete; *Filtru* – Filter; *Stare* – Status; *Cod* – Code; *Activ* – Active; *Actiuni* – Actions; *Lichida* – Liquid; *Solida* – Solid; *Management deseuri* – Waste Management; *Definire coduri deseuri* – Define waste code; *Stocare provizorie, tratare* – Provisional storage, treatment; *Valorificarea deseurilor* – Capitalization of waste; *Elimina deseuri* – Waste disposal; *Definire agenti* – Define agents; *Metale feroase* – ferrous metals, *Metale neferoase* – Non-ferrous metals, *Emulsii si solutii de ungere uzate fara halogen* – Emulsions and waste lubricant solutions without halogen; *Uleiuri minerale de ungere uzate fara halogen* – Waste lubricant mineral oils without halogen; *Textile* – Textiles; *Emisii/Imisii* – Emissions/ Ambient emissions; *Zgomot* – Noise; *Alte deseuri cu continut de substante periculoase* – Other waste containing dangerous substances; *Ambalaje metalice* – Metallic wrappings; *Deseuri municipale, fara alta specificatie* – Municipal waste, without other specification; *Echipeamente electrice si electronice, casate* – Electrical and electronical equipments, cashiered; *Deseuri de la sortarea hartiei si cartonului* – Waste from sorting paper and carton; *Sticla* – Glass; *Deseuri de sticla, altele decat cele specificate* – Glass waste, other than specified; *Ape uzate menajere* – Domestic wastewater.

The interface in Figure 3 allows also the specification of the waste type, its physical state (solid, liquid, gas), the standard code and the active status.

Figure 4. Introduction of the data concerning the waste product



Note: the English equivalents for the labels in the above interface (in Romanian) are presented below: *Societati* – Societies; *Utilizator* – User; *Mediu* – Environment; *Deseuri* – Waste; *Management deseuri* – Waste Management; *Definire coduri deseuri* – Define waste code; *Stocare provizorie, tratare* – Provisional storage, treatment; *Valorificarea deeurilor* – Capitalization of waste; *Eliminare deseuri* – Waste disposal; *Adauga* – Add; *Listare* – Print; *Raport* – Report; *Definire agenti* – Define agents; *Adauga deseuri pentru valorificare* – Add waste for capitalization; *Data* – Date; *Departament* – Department; *Selecteaza departamentul* – Select department; *Deseu* – Waste; *Selecteaza Deseul* – Select waste; *Stare* – State; *Cod* – Code; *Cantitate valorificata* – Capitalized quantity; *Operatie valorificare* – Capitalization operation; *Selecteaza* – Select; *Salveaza* – Save.

In the folder Waste Product Report there are stocked all information on stock, quantities valorized and eliminated quantities in real time (Figure 5).

Figure 5. The situation of the quantity of the waste products generated by tool section

Luna	Departament	Deseu	Cantitate_stocata	Tip stocare	Cantitate tratare	Mod tratare	Scop tratare	Mijloc transport	Destinatia	Actiuni
Octomb	Scule foraj extractie	metale feroase	100.00 kg	container fix	0.00 kg			auto nespecial	valorif pentru agenti e	

Note: the English equivalents for the labels in the above interface (in Romanian) are presented below: *Societati* – Societies; *Utilizator* – User; *Mediu* – Environment; *Deseuri* – Waste; *Management deseuri* – Waste Management; *Definire coduri deseuri* – Define waste code; *Stocare provizorie, tratare* – Provisional storage, treatment; *Adauga deseuri* – Add waste; *Listare Deseuri* – List waste; *Raport deseuri* – Waste report; *Valorificarea deeurilor* – Capitalization of waste; *Eliminare deseuri* – Waste disposal; *Adauga* – Add; *Listare* – Print; *Raport* – Report; *Definire agenti* – Define agents; *Generare raport DESEURI pentru eliminare, stocare, transport* – Generate Waste Report for disposal, stowage, transport; *Luna* – Month; *Octombrie* – October; *Departament* – Department; *Scule foraj extractie* – Drill extraction tools; *Deseu* – Waste; *Metale neferoase* – Non-ferrous metals; *Cantitate_stocata* – Stowed quantity; *Tip stocare* – Stowage type; *Container fix* – Fixed container; *Cantitate tratare* – Treatment quantity; *Mod tratare* – Treating mode; *Scop tratare* – Treating purpose; *Mijloc transport* – Transportation mean; *Destinatia* – Destination; *Valorificare pentru* – Capitalization for; *Inregistrari de la ... la ...* – Records from ... to...; *Pagina* – Page; *...randuri pe pagina* – ... rows per page.

For the companies having a complex structure the waste products report may be made centralized, the program cumulating all the quantities of the waste products generated by the company structures, according as there are introduced in the system (Waste products evidence card – Figure 6, according to HG no. 856/2002).

Figure 6. Waste product evidence card

Anexa Nr.1: EVIDENȚA GESTIUNII DEȘEURILOR

Agentul economic S.C. Confind S.R.L.
 Anul 2014
 Tipul de deșeu metale feroase cod 16 01 17 (conform codificarii din Anexa Nr. 2)
 Starea fizică lichida
 Unitate de masura kg

Generarea deșeurilor

NR. CRT	LUNA	Cantitate deseuri			
		Generata	Din care		
			Valorificata	Eliminata	Ramasa in stoc
1	Octombrie	100.00	20.00	56.00	24.00
1	Noiembrie	180.00	20.00	56.00	104.00
	Total AN	280.00	20.00	56.00	204

Note: the English equivalents for the labels in the above interface (in Romanian) are presented below:
Anexa nr. 1: EVIDENȚA GESTIUNII DEȘEURILOR – Annex no. 1: Evidence of waste management; *Agentul economic* – Economic agent; *Anul* – Year; *Tipul de deșeu metale feroase cod 16 01 17 (conform codificarii din Anexa nr. 2)* – Waste type, ferrous metals code 16 01 17 (according to the codification in Annex no. 2); *Starea fizică lichida* – Physical state liquid; *Unitate de masura* – Measurement unit; *Generarea deșeurilor* – Waste generation; *Nr.crt.* – ID; *Luna* – Month; *Cantitate deseuri* – Waste quantity; *Generata* – Generated; *Din care* – Of which; *Valorificata* – Capitalized; *Eliminata* – Eliminated; *Ramasa in stoc* – Remaining; *Octombrie* – October; *Noiembrie* – November; *Total AN* – Total year.

The waste products management based on the utilization of this software program may have influence not only on the improvement of the environmental conditions taking into account the durable development, but also on the company economic activity.

An evaluation process of the environmental aspects with this program has the advantage of a correct monitoring of the activities (taking into consideration also the identified prevent measures), presenting thus all the options that have to be taken into account by the decisional factors. Another major advantage of the elaborated program is that it allows the decrease of the monitoring costs.

The correct evaluation of the organizational environmental performances leads to an evaluation of the global environmental system. This allows the identification of some alternative solutions in order to reduce the impact on it environmental significant aspects.

In order to evaluate the advantages and the disadvantages of the presented program “conturweb environment”, there will be made a comparison with the reporting imposed by the Environmental National Agency, according to the environmental authorizations.

On the agency site there are selected fields – waste products – questionnaires, according to Figure 7.

Figure 7. Questionnaire waste products evidence (Environmental National Agency)

The screenshot shows a web-based questionnaire form with the following sections and fields:

- Navigation:** Home, **Chestionar** (selected).
- Owner Information:**
 - Detinatorul echipamentelor/materialelor:
 - Domnul/Doamna: [input field]
 - Detalii de contactare a detinatorului echipamentelor sau materialelor:
 - Adresa: [input field]
 - Telefon: [input field]
 - Fax: [input field]
 - Descrierea echipamentelor/materialelor: [text area]
 - Descriere: [text area]
 - Echipamentele sau materialele sunt:
 - [a] In prezent in functiune? Da NU
 - [b] Depozitate inainte de folosire? Da NU
 - [c] Depozitate dupa folosire? Da NU
 - [d] Altele (specificati): [input field]
 - Concentratie:
 - [a] Concentratia compusului desemnat a fost masurata sau estimata? [input field]
 - [b] Concentratia compusului desemnat: [input field]
 - Se completeaza numai de autoritatea publica teritoriala pentru protectia mediului
 - Numere de cod: [input field]
- Personnel Information:**
 - Persoana care completeaza formularul, daca este alta decat detinatorul:
 - Domnul/Doamna: [input field]
 - Detalii de contactare a persoanei care completeaza, daca nu este detinatorul:
 - Adresa: [input field]
 - Telefon: [input field]
 - Fax: [input field]
 - Local unde se afla echipamentele/materialele:
 - Persoana de contact:
 - Domnul/Doamna: [input field]
 - Adresa: [input field]
 - Telefon: [input field]
 - Fax: [input field]
- Designated Compound Information:**
 - Compusul desemnat:
 - [a] A fost identificat pozitiv sau numai dedus? [input field]
 - [b] Numele compusului desemnat: [input field]
 - Volum:
 - [a] Volumul compusului desemnat a fost masurata sau estimata? [input field]
 - [b] Volumul compusului desemnat: [input field]
- Buttons:** **Salvare Chestionar**, **Salveaza si Finalizeaza**
- Footer:** Copyright ANPM @ 2012, Internet | Protected Mode: ON, 100%

Note: the English equivalents for the labels in the above interface (in Romanian) are presented below: *Chestionar* – Questionnaire; *Detinatorul echipamentelor/materialelor* – Owner of equipment/materials; *Domnul/Doamna* – Mr/Ms; *Detalii de contactare a detinatorului echipamentelor/materialelor* – Contact details of equipments and materials owner; *Adresa* – Address; *Telefon* – Phone; *Descrierea echipamentelor/materialelor* – Description of equipments/materials; *Descriere* – Description; *Echipamentele sau materialele sunt* – Equipments or materials are; *In prezent in functiune* – Presently operational; *Depozitate inainte de folosire* – Stowed before use; *Depozitate dupa folosire* – Stowed after use; *Altele (specificati)* – Other (specify); *Concentratie* – Concentration; *Concentratia compusului desemnat a fost masurata sau estimata* – The concentration of the designated compound has been measured or estimated; *Concentratia compusului desemnat* – The concentration of the designated compound; *Se completeaza numai de autoritatea publica teritoriala pentru protectia mediului* – To be completed only by the territorial environment protection public authority; *Numere de cod* – Code numbers; *Persoana care completeaza formularul, daca este alta decat detinatorul* – The person who fills the form, if is different from the owner; *Domnul/Doamna* – Mr/Ms; *Detalii de contactare a persoanei care completeaza, daca este alta decat detinatorul* – Contact details of the person who fills the form, if is different from the owner; *Local unde se afla echipamentele/materialele* – The place where the equipment/materials are; *Persoana de contact* – Contact person; *Compusul desemnat* – Designated compound; *A fost identificat pozitiv sau numai dedus* – Has it been positively identified or only was deducted; *Numele compusului desemnat* – The name of the designated compound; *Volum* – Volume; *Volumul compusului desemnat a fost masurat sau estimat* – The volume of the designated compound has been measured or estimated; *Volumul compusului desemnat* – The volume of the designated compound; *Salvare chestionar* – Save questionnaire; *Salveaza si finalizeaza* – Save and end.

As it may be observed purchasing the report made by the Environmental National Agency there is not foreseen the monitoring of the waste products quantities that have direct implication of the environmental factors, but only some waste products types generated by the company/organization.

Conclusions

The waste products management method based on the utilization of a software system assure a correct and real monitoring of the activities that may generate environmental aspects (taking into account the identified preventing measures).

This program allows the reducing of the waste products administering costs and the conformity with the legislation in force.

The advantages of the “conturweb environment” program utilization are the following:

- it creates automatically forms that might be registered directly in the waste products national reports;
- it allows the evaluation according to the national legislation in force;
- it continuously evaluates the environmental performances;
- it reduces the waste products administering costs;
- it stocks the registrations;
- it systemizes the generated waste products and permanently evaluate it;
- it is easy to use it.

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