

**Research Article**

## **SOLID WASTE MANAGEMENT, WITH THE APPROACH CLEAN DEVELOPMENT IN URBAN ENVIRONMENTS (CASE STUDY: ARAS FREE REGION)**

**Abbas Fakhraee<sup>1</sup>, Mahnaz Akbari<sup>2</sup>, Sara Kamangar<sup>3</sup>, Kamal Mohammadi<sup>4</sup> and \*Amir Rahmani<sup>5</sup>**

<sup>1</sup>Department of Urban Planning, Hamedan Branch, Islamic Azad University, Hamedan, Iran

<sup>2</sup>Young Researchers club, Central Tehran Branch, Islamic Azad University, Tehran, Iran

<sup>3</sup>Department of Geography and Urban Planning, University of Kharazmi, Tehran, Iran

<sup>4</sup>Department of Urbanism, College of Arts and Architecture, Hamedan Branch, Islamic Azad University, Hamedan, Iran

<sup>5</sup>Young Researchers and Elite Club; Hamedan Branch, Islamic Azad University, Hamedan, Iran

\*Author for Correspondence

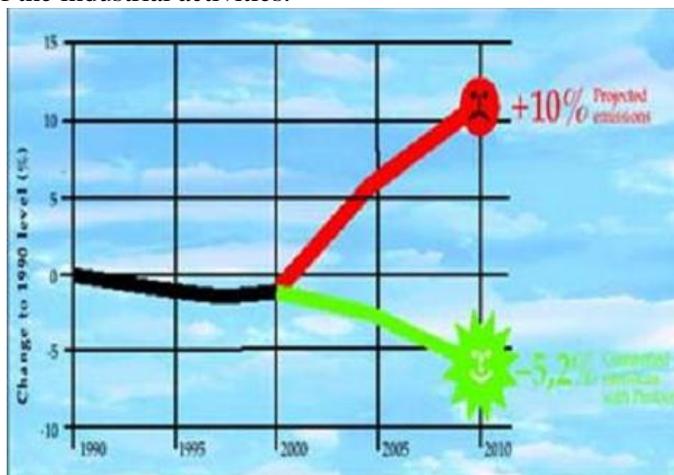
### **ABSTRACT**

Keeping Natural environment and all God gifts for human being which exists in vast amount on the earth is one of the fundamental principles for saving human and all creature life on earth. One important part of this duty is controlling the solid wastes which have important role in the new era of sciences based on economic health. This article will attempt to illustrate the importance of the problem, recognition and classification of the waste, collection, transportation and excretion of them. Based on the surveys have been done so far, generally the holding of the wastes are done in non- standard and insanitary methods and include many variety ways which have made big problems in the urban regions. Based on the surveys in a particular region in Aras free region, there are a few households which put their wastes in plastic bags and then put them in special dust bins. The rest of them put their wastes in inappropriate plastic bags with various colors or keep directly them in unsanitary containers such as tins, cartons, empty buckets and inappropriate bins and so on.

**Keywords:** Clean Development, Solid Waste, Urban Environments, Aras Free Region

### **INTRODUCTION**

He fast growth of human activities have caused significant drop in the human resources (UN Habitat, 2010; Rahmani *et al.*, 2014). This high consumption and production have affected the earth ecology and as a result the non- renewable energies have plummeted and some environmental problems have occurred in air, water and soil. The plant industry have confronted with energy consumption and waste management. Since last decade there have been some significant efforts in decreasing the negative environmental effects of the industrial activities.



**Figure 1: Kyoto Protocol aimed at reducing emissions**

**Research Article**

Nanotechnology supporters have mentioned that there is a revolution which is going to happen which will cause development of the industrial processes stable and cleaner products. However, there is a few knowledge about the nanotechnology on three factors of stability which are industry, environment and society (Julio *et al.*, 2009).

**Table 1: Global warming potential (GWP) of greenhouse gases**

GWP	Formula
1	CO <sub>2</sub>
21	CH <sub>4</sub>
310	NO <sub>2</sub>
11700	CHF <sub>3</sub>
650	CH <sub>2</sub> F <sub>2</sub>
150	CHF <sub>3</sub>
1300	CH <sub>2</sub> F <sub>10</sub>
2800	CF <sub>2</sub> H <sub>5</sub>
1000	CH <sub>2</sub> F <sub>4</sub>
1300	CHF <sub>2</sub> CF <sub>3</sub>
140	C <sub>2</sub> H <sub>4</sub> F <sub>2</sub>
300	C <sub>2</sub> H <sub>3</sub> F <sub>3</sub>
3800	C <sub>2</sub> H <sub>3</sub> F <sub>3</sub>
2900	C <sub>3</sub> FH <sub>7</sub>
6300	C <sub>3</sub> H <sub>2</sub> F <sub>6</sub>
23900	SF <sub>6</sub>

**The Flexible Mechanisms of Kyoto Protocol**

According to Kyoto protocol, the members (developed countries) can do some projects in other countries to implement the transmission reduction policies. So Kyoto protocol in order to make policies based on markets has organized three mechanisms which are:

- Clean development mechanism (CDM)
- Joint implementation (JI)
- Emission trading (ET) (Modak, 2010).

Clean development mechanism: developed countries receive CER due to implementation of projects in reduction of greenhouse emissions and helping in sustainable development in order to implement their commitments (ADB and IGES, 2008).

**Explanation of Clean Development and the Goals**

As mentioned above, Kyoto protocol has explained three flexible mechanisms which clean development mechanism is the only mechanism which developing countries can have cooperation. The act 12 of this protocol is devoted to explain clean development mechanism. Based on this act, the main goal of the clean development mechanism is to help developing countries to arrive at sustainable development (without Appendix I), their own goal and also with the help of the transition economics and developed countries (Appendix I members) in order to implement their commitments (Ranade *et al.*, 2008).

**According to the Clean Development Mechanism**

1. The developing countries take advantage of project actions which causes the issue of license for the reduction of emissions (CER). The project owners receive one CER by decreasing one ton equivalent to 2 CO.
2. The developed countries (appendix I) can use these licenses to operate their commitments based on Kyoto protocol (Nowosielski *et al.*, 2007).

In fact, the clean development mechanism allows developed countries to buy the credits of emission reductions in developing countries due to the operation of their projects. Instead, developing countries

**Research Article**

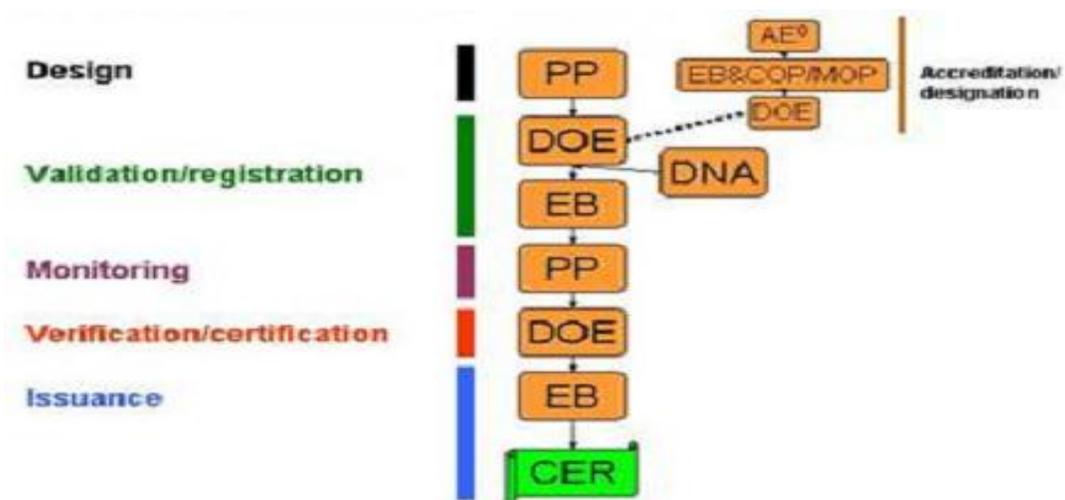
will have access to financial resources and necessary technologies for sustainable economy (McDougal et al., 2007).

**MATERIALS AND METHODS**

Any CDM project should do some steps before operation to receive the license. Those steps are as follows:

- 1- Regulation of the project design document (PDD)
- 2- Validation of the project
- 3- Registration
- 4- Monitoring
- 5- Review, verification and certification
- 6- Issuance of the CERs (Eggleston et al., 2006).

Three steps are done before the operation of the project and the next 3 ones will be done after the operation. The graphs below show the project cycles and the steps of the clean development mechanisms. In this part the steps will be described individually.



**Figure 2: The project cycles and the steps of the clean development mechanisms CDM project active cycle**

**Project Design Document**

In the first steps of the operation of the clean development mechanisms, after regulation of the contracts among partners, it is necessary to regulate a document for the design of the project and explain every single step in it (Nowosielski et al., 2007). The executive directors of the clean development mechanisms have designed a standard format for the completion of the project design document. The project design document which is called PDD consists of the followings:

- Project goal
- Explanation of the technical aspects
- Its role in the sustainable development
- Project borders and basis methodology
- The suggested equation to calculate the greenhouse gas emissions due to the project operations
- describe how the project is meeting the terms of redundancy
- Estimate the operational time of the project
- Analysis of the environmental threats of the project
- The suggestions of the beneficiary

Also the project design document should have a monitoring design (Medina, 2008).

## Research Article

### Validation of the Project

The validation of the project is the independent evaluation of the project by an international operational community. This evaluation is made based on the clean development mechanism requirements and considering the project design document. The operational community evaluates the conditions of the project design document and validate if it meets the requirements.

### Registration of the Project

The registration of the project is the official validation of the project as CDM project by executive directors. This is required to move to next steps (Makhdoum, 2006; Makhdoum, 2004).

### Monitoring of the Project

The monitoring is done based on the monitoring designs. The method should be accepted method or a new method of monitoring. This method should be accompanied by project design document to be accepted by executive directors.

### Review, Verification and Certification

It is regular and continuous view of the reduction of greenhouse gases emission in the operation of a CDM. This action is also done by operating entity. The verification by the operating entity is the document confirming that a project has decreased the emission of greenhouse gases due to human activities in a special period of time (Julio *et al.*, 2009).

### Issuance of the CER License

In this step, the CER license is issued by executive directors after confirmation of operating entity (if all the previous steps are done properly). So a certain amount of CER is issued and recorded in the UN (United Nations organization) office for that project.

### The Commence Time and the Expiry Time of the Project

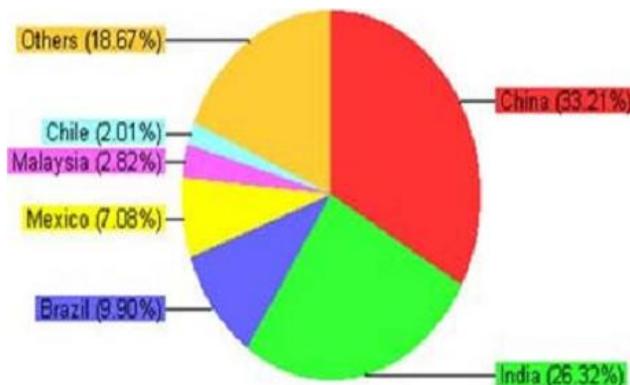
A Clean development mechanism project cannot produce CER until it has not been submitted and after verification by executive directors it will be able to produce it. After Review, verification and certification by operating entity, the CER license will be issued. The executive directors of the clean development mechanism have defined the commence time of a project as follows:

“The date which the real operation or activity of project begins” (Butler, 2000).

## RESULTS AND DISCUSSION

The evaluation of the submitted projects shows that the number of submitted projects is increasing dramatically. The countries hosting submitted projects:

The evaluation shows that almost 55 countries of the developing countries have defined and submitted the CDM projects.



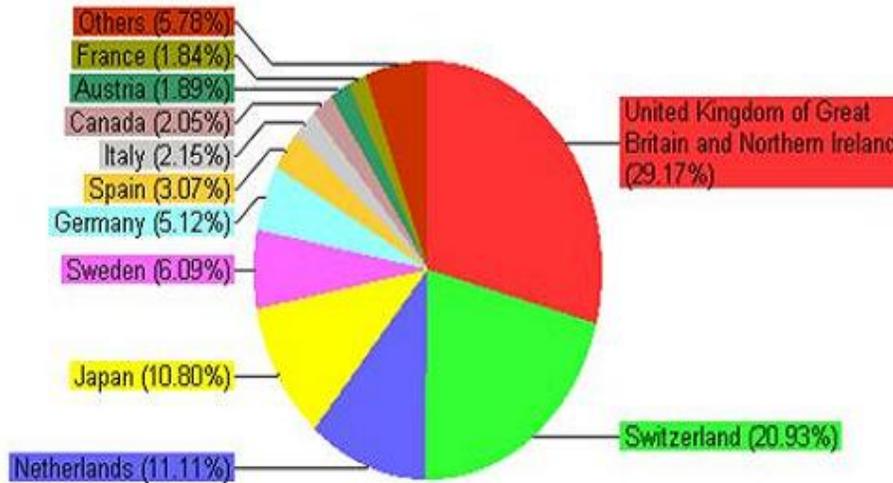
**Figure 3: The share of developing countries in the number of projects registered with the Clean Development Mechanism**

The graph below shows the contribution of different countries in the submission of the projects. At the current time the China, Brazil and India are in the top rankings by submitting 530, 420 and 158 projects respectively.

**Research Article**

**The Contribution of the Developed Countries in the Submitted Projects**

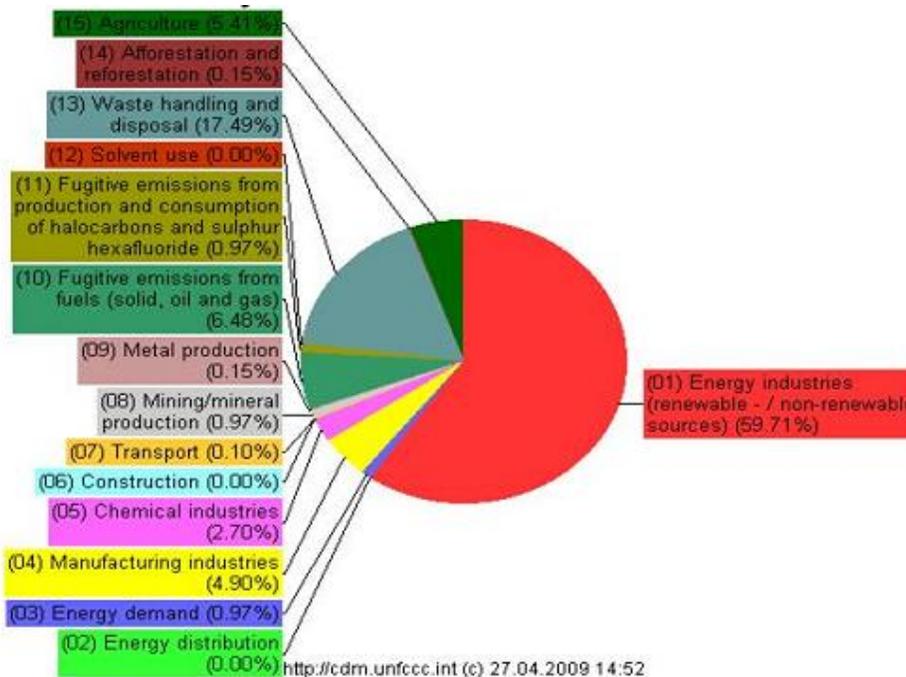
The hosting countries of the CDM have the options to submit the projects jointly with a country which is a member of Appendix I or submit individually. England and North Ireland by contributing in 570 projects, Swiss in 409, Netherland in 217 and Japan in 211 projects are in the top rankings.



**Figure 4: Participation of Member States in Annex I registered clean**

**Development Mechanism Projects the Activity Fields of the Submitted Projects**

There are different activity fields for the operation of the CDMs. The graph below shows the distribution of the submitted projects in these fields. As it can be seen the 60 percent of the projects is related to the energy industry (renewable and non-renewable energies). After energy industry, waste disposal is in the next rank, with 17 percent. The emission from fuels, agriculture, production industry and chemical industry are in the next orders of the distribution.



**Figure 5: Context of Clean Development Mechanism projects registered**

## **Research Article**

### **Sustainable Development**

The sustainable development allows the humanity to save their life in the different aspects. It also needs changes in values and principles which influence the development strategies and life patterns directly. The sustainable development commission contains the following: transportation, chemical materials, waste management, mining and ten years of sustainable production and consumption patterns (Samson, 2009; Salah, 2007).

### **Sustainable Industrial**

There are many problems in the sustainable industry. One reason for the lack of joint definition is the variety of the industry of the factories. The definition which can be mentioned in general is that “sustainable industrial is the technic of production development, processes and the services which obtain products for the society and create job with least outcomes and is made by proper using of resources especially human resources (Julio *et al.*, 2009). The main goal is to keep natural environment by using 100 percent of all kinds of wastes. In fact the final destination of the product is returning to primary raw materials or making another product.

### **Clean Technology**

Clean technology is the most important factor for the economic growth of the industries which plays important role in both clean production and sustainable development. The implementation of new technology is costly and in fact technology is one of the important factors which affect the quality of the products (Nowosielski *et al.*, 2007).

### **Clean Production**

The successful application of the clean production depends on the management, saving, sufficient infrastructure and the education of the people. There are three steps toward cleaner productions:

First step: the selection of the products which are designed along the sustainability and security. The industrialist should choose the elements which guarantee both the security and sustainability of the product. The second step: working with the producers of the materials because they manage the industrial outcomes with responsibility.

The key areas are: Reduction of the raw materials and the wastes during production The reduction of the energy and water The reduction of the emissions to the wastewaters and atmosphere specially controlling the hazardous particles to prevent any risk to human and environment The reduction of packaging the wastes and recycling the used packages Implementation of environmental management system Operation of new methods to prevent accidental emissions.

The operation of security and sanitary systems for saving the individuals The third step: the reduction of the environmental events which increase during cleaning operations. Reduction in the consumption of the product, packaging and energy by purchasing useful products and using them effectively in order to reduce wastes which are carried to landfill (Julio *et al.*, 2009).

### **Conclusion**

The clean development mechanism (generally the Kyoto protocol the convention of the weather changes) is to reduce the greenhouse gases and is different with other protocols and conventions related to the pollution of the air or other resources).

The greenhouse gases are carbon dioxide, Methane, Nitro oxide, Sulfur hexafluoride, CFCs and per fluorocarbon.

Any project regarding to the reduction of any of those gases are along the clean development mechanisms. If there are opportunities in the non-developed countries which can help to the reduction of the greenhouse gases, it can be supported financially by developed countries. In these projects the goal is to receive the investments for clean development mechanisms and the profit of those investments is effective parameter to attract investors for the project.

## **ACKNOWLEDGEMENT**

We are grateful to Islamic Azad University (Hamedan Branch and Central Tehran Branch) Authorities, for their useful collaboration.

## **Research Article**

### **REFERENCES**

- ADB and IGES (2008).** Toward Resource-Efficient Economics in Asia and the Pacific: Reduce Reuse Recycle. Asian Development Bank, Manila.
- Butler RW (2000).** Ecotourism-Has it Achieved Maturity or Has the Bubble Burst”, Keynote Address, Pacific Rim Tourism, Rotorua, Zealand.
- Eggleston S, Buendia L, Miwa K, Ngara T and Tanabe K (2006).** IPCC Guidelines for National Greenhouse Gas Inventories. Intergovernmental Panel on Climate Change.
- Julio L Rivera, Donna J Michalek and John W Sutherland (2009).** The role of nanotechnology in sustainable manufacturing. Department of Mechanical Engineering-Engineering Mechanics, Sustainable Futures Institute Michigan Technological University, USA.
- Makhdoum M (2004).** A handout of estimating carrying capacity (PhD program of environmental planning). College of Environment, Tehran University, Tehran, Iran.
- Makhdoum M et al., (2006).** Developing the spectrum model of productivity ecological capacity of parks and protected areas. *Journal of Ecology* **39** 101-118.
- Medina M (2008).** The Informal Recycling Sector in Developing Countries. Organizing waste pickers to enhance their impact. Gridlines Note 44.
- McDougal F, White P, Franke M and Hindle P (2007).** *Integrated Solid Waste Management: A Life cycle Inventory*, 2nd edition (Blackwell Publishing Company).
- Modak P (2010).** Community-based Waste Management and Composting for Climate/Co-benefits – Case of Bangladesh (2d) presented at the International Consultative Meeting on expanding Waste Management Services in Developing Countries, 18-19 March 2010, Tokyo, Japan.
- Nowosielski R, Babilas R and Pilarczyk W (2007).** Sustainable technology as a basis, *Journal of Achievements in Materials and Manufacturing Engineering* **20**(1-2).
- Rahmani Amir, Fakhraee Abbas and Kamari Zahra (2014).** Determining the ecological capability of forest park Heydareh in Hamadan city, approach to carrying capacity model, *Journal of Biodiversity and Environmental Sciences (JBES)* **4**(5) 64-76.
- Ranade M, Peterson C and Pinnoi N (2008).** Access to carbon finance for climate change mitigation in urban areas. In: *Proceedings of the 5th Urban Research Symposium*, Marseille, France.
- Salah El-Haggag (2007).** *Sustainable Industrial Design and Waste Management, Cradle-to-Cradle for Sustainable Development* (Academic Press).
- Samson M (2009).** Refusing to be Cast Aside: Waste Pickers Organizing around the World, Cambridge MA, WIEGO.
- UN Habitat (2010).** Solid Waste Management in the World's Cities, Earth Scan.