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A method to implement BAT (Best Available Techniques) in South Mediterranean countries: the experience of BAT4MED project

Abstract

The paper aims to describe a method to introduce and disseminate Best Available Techniques (BAT) in two key industrial sectors in three South Mediterranean countries: Egypt, Morocco and Tunisia. The method has been applied during an on-going European project named BAT4MED co-funded by the Seventh Framework Programme of EU.

The paper illustrates the results of the methodology developed in the project and aimed at identifying two key common industrial sectors in the participating countries. The methodology has taken into account the economic and environmental relevance of the sectors and has selected the food and textile sectors as the sectors where the dissemination of BAT will have the highest environmental benefit for the countries.

The paper concludes by illustrating a methodology for determining BAT at sector level (VITO, 2011) in order to provide support to policy makers and officers in general in the selection of BAT (Georgopoulou et al., 2008).

Keywords: Best Available Techniques (BATs), integrated pollution prevention and control, methodology for BATs implementation.
JEL Classification: Q55.

Introduction

Industrial production processes account for a considerable share of the overall pollution in the Mediterranean (for emissions of greenhouse gases and acidifying substances, wastewater emissions and waste) (Daddi et al., 2010). In South and East Mediterranean countries, the main environmental problems of coastal water pollution are due to poor treatment of urban waste and management of chemicals, compound by inadequate technical capabilities and economic incentives. In North Mediterranean countries, particularly in the EU with its more prescriptive regulations, considerable effort has gone into wastewater treatment, chemicals management, pollution prevention or more curative measures (UNEP, 2009).

It has been estimated that more than 80% of the total pollution load in the Mediterranean comes from land-based activities and therefore the Contracting Parties to the Barcelona Convention adopted in 1980 the Protocol for the Protection of the Mediterranean Sea Against Pollution from Land-Based Sources, which led to a set of actions, such as the assessment of major pollutants and the adoption of a number of common pollution control measures (UNEP, 2004).

The European Member States are combating this industrial pollution mainly through the implementation of the EU Directive on Industrial Pollution Prevention and Control (IPPC Directive) (Schoenberger, 2009), adopted in 1996 by the European Commission (EC, 1996), codified in 2008 (EC, 2008), which has been recently recast along with other six environmental-industry directives into the current EU Directive on Industrial Emissions (EU, 2010) including the IPPC Directive (EC, 2008), the Large Combustion Plants Directive (EC, 2001), the Waste Incineration Directive (EC, 2000), the Solvents Emissions Directive (EC, 1999), and 3 Directives on Titanium Dioxide (EEC, 1978; EEC, 1982; EEC, 1992).

The IPPC Directive introduced a regulatory system that uses an integrated approach to environmental protection by controlling emissions to air, water and land, generation of waste, use of raw materials, energy efficiency, noise, prevention of accidents, and restoration of the site upon closure from those industrial activities falling within the scope of the Directive and listed in Annex I of the Directive (Honkasalo et al., 2005; Samarakoon and Gudmestad, 2011). The application of the IPPC Directive has important consequences for the installations under its scope, as all licenses are brought together with an integrated approach meaning that they must consider the environment as a whole (Raya and Vázquez, 2009; Daddi et al., 2011), introducing thus the figure of the single authorization (Styles et al., 2009), the *Integrated Environmental Authorisation*, so-called "permit".

Given this, the BAT Reference Documents (BREF), published by the European IPPC Bureau, are the tools to meet the requirements of the IPPC Directive (Kocabas et al., 2009). In general, a BREF document gives information on a specific industrial sector in the EU, techniques and processes used in this sector, current emission and consumption levels, techniques to consider in the determination of the BAT and emerging techniques (Silvo et al., 2002).

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1. The BAT4MED project

To this respect, the BAT4MED project, "Boosting Best Available Techniques in the Mediterranean Partner Countries", co-financed by the European Commission under the 7th Framework Programme for Research and Technological Development, aims to analyze the potential impact of the introduction of the Integrated Pollution Prevention and Control concept in the Mediterranean partner countries – Egypt, Morocco and Tunisia (hereinafter MPCs). More specifically, the project aims to understand if this concept can contribute to minimize the negative impacts associated with polluting industries and their related activities, products and services from key industrial sectors ensuring thus a higher level of environmental protection.

The project will support the adaptation of relevant EU information on BAT for key industrial sectors to the MPCs, with special focus on regional and local conditions. The information on BAT will demonstrate the environmental but also the economic benefits arising from their application, in order to motivate industrial managers for their implementation (Iraldo et al., 2009; Testa et al., 2011).

Though BAT4MED is tackled from the perspective of key industrial sectors, the goal of the consortium is to design and implement universal tools and methodologies, allowing thus easily the replication of the whole project in other countries and industrial sectors. To this end, particular efforts will be put into the development of each methodology, to ensure its applicability within the context of the project but also beyond it.

The project aims to help implement the Eco-innovation Action Plan (EC, 2011), building on the lessons-learnt of EU Technologies Action Plan (EC, 2004), by supporting the transfer and uptake of environmental technologies in developing countries. To that aim, the possibilities for and impact of diffusion of the EU IPPC approach to the MPCs will be assessed and the implementation of BAT in the national environmental programmes will be promoted and supported.

Specific objectives of the project are as follows:

- To identify, assess and select the BAT for pollution prevention and control in key industrial sectors with the highest Environmental Benefit Potential (hereafter EBP).
- To promote and spread the use of BAT through dissemination activities.
- To assess the possibility and the impact of disseminating the EU IPPC approach to MPCs.

To achieve these objectives the project relies on a concise working methodology and structure. Firstly, BAT4MED analyzed the industrial context in the MPCs to select the most promising sectors with the highest Environmental Benefit Potential. Secondly, a methodology for BAT assessment was designed and applied: BAT will be selected for each identified sector taking into account specific sector and local conditions in the participating MPCs. Additionally, an analysis of potential convergence of MPCs policies with the EU-approach will be carried out in order to assess the potential for the future adaptation of the existing MPCs permitting procedures to integrate principles based on the IPPC approach.

In the following sections of this paper the methodology of the first phases of the project will be illustrated.

2. The selection of key industrial sectors

The methodology for the analysis aims to select and analyze key industrial sectors with significant negative impacts on human health and environment in Egypt, Morocco and Tunisia. In particular the methodology aims to analyze several industrial sectors in order to select the ones with the highest Environmental Benefit Potential.

The key industrial sectors of the project have been selected starting from the 27 sectors covered by the IPPC (Integrated Pollution Prevention and Control) Directive with an approved version of BREFs (Best Reference Documents).

The methodology has foreseen the collection of quantitative and qualitative data related to three classes of data: economic aspects, environmental aspects and social, health and institutional aspects.

The first step of the methodology has foreseen a pre-selection phase. It aimed to pre-select 15 IPPC sectors of each MPC among the 27 ones covered by IPPC Directive.

For the pre-selection each partner calculated, for the 27 sectors, one of the indicators of Table 1.

Table 1. Indicators applied for the sectors pre-selection

1.	$\frac{\text{Number of firms of analyzed sector above the IPPC size threshold}}{\text{Total number of firms of analyzed sector}}$
2.	$\frac{\text{Turnover in \$ of analyzed sector}}{\text{Total national turnover in \$ of all IPPC sectors}}$
3.	$\frac{\text{Capital in \$ of analyzed sector}}{\text{Total national capital in \$ of all IPPC sectors}}$

The use of the first indicator has been recommended by the methodology. In case that was not possible, each MPC was able to use alternatively the second or the third indicator. The project has developed a ranking in each Mediterranean country according to the above mentioned indicators and the pre-selection has been concluded selecting the first 15 sectors of each country.

The further steps of the methodology are developed applying three classes of criteria to the 15 pre-selected sectors: (a) economic; (b) environmental; and (c) social-health-institutional criteria.

For each class of criteria the methodology provides a score from a minimum of 1 to a maximum of 3. The score attributed is based on the relevance of the answer.

For economic criteria, the score is applied according to the ranking of the sector.

This is the case for the most of the economic data belonging to the economic criteria.

In this case the sector obtained score 1 if it is ranked lower than 6 position with respect to all considered sectors; score 2 if it is ranked in the 4th, 5th or 6th position; and score 3 if it is ranked in the first three positions.

For environmental and social-health-institutional criteria the sector obtained the score (1, 2 or 3) according to the answer related to each applied criteria (see sections 2 and 3).

2.1. Economic criteria. This group of criteria aims to assess the economic relevance of the pre-selected sectors in the involved Mediterranean countries. The kind of economic data considered, the applied criteria by MPCs and the attributable scoring system are indicated in the table below. All the data have been referred – when possible – to the last year available. Data have been collected from official sources, specified in the report elaborated to select the sectors.

Table 2. Economic criteria and scoring system

Kind of economic data	Applied criteria	Score attributed	
Turnover	*Turnover in $ of the analyzed sector* / *Total national turnover in $ of all IPPC sectors*	The sector is ranked lower than the 6th position	1
		The sector is ranked in the 4th, 5th or 6th positions	2
		The sector is ranked in the first three positions	3
Share of the gross national product (GNP)	Considering a ranking according to the contribution (in percentage) of each IPPC sector to the GNP of all IPPC sectors	The sector is ranked lower than the 6th position	1
		The sector is ranked in the 4th, 5th or 6th positions	2
		The sector is ranked in the first three positions	3
Number of firms	*Number of firms of the analyzed sector* / *Total number of firms of all IPPC sectors*	The sector is ranked lower than the 6th position	1
		The sector is ranked in the 4th, 5th or 6th positions	2
		The sector is ranked in the first three positions	3
Number of employees	*Number of employees of the analyzed sector* / *Total number of employees of all IPPC sectors*	The sector is ranked lower than the 6th position	1
		The sector is ranked in the 4th, 5th or 6th positions	2
		The sector is ranked in the first three positions	3
Export value	*Export value in $ of the analyzed sector* / *Export value in $ of all IPPC sectors*	The sector is ranked lower than the 6th position	1
		The sector is ranked in the 4th, 5th or 6th positions	2
		The sector is ranked in the first three positions	3
Added value	*Added value in $ of the analyzed sector* / *Added value in $ of all IPPC sectors*	The sector is ranked lower than the 6th position	1
		The sector is ranked in the 4th, 5th or 6th positions	2
		The sector is ranked in the first three positions	3
Economic trend	This criteria aims to give a score to each analyzed sector on the basis of the economic trend of the last 2 available years	The added value of theanalyzed sector in the last year available decreased more than 5%	1
		The change of the added value of the analyzed sector in the last year available is in a range of ± 5%	2
		The added value of the analyzed sector in the last year available increased more than 5%	3
Size of firms	*N. of firms of the analyzed sector above the IPPC size threshold* / *Total number of firms of the analyzed sector*	The sector is ranked lower than the 6th position	1
		The sector is ranked in the 4th, 5th or 6th positions	2
		The sector is ranked in the first three positions	3

A score has been assigned to each of data type on the basis of the relevance of the data collected. For example, in the case of the data on the number of firms, each MPC ranked each sector after having applied the proposed indicator. The data about number of firms have to be collected through the ratio among the number of firms of the analyzed sector and the number of firms of all IPPC sectors. The sectors with the rank lower than the 6th position obtain 1 score, the sectors ranked between the 4th to 6th position obtain 2 scores and the sectors ranked in the first three positions obtain 3 scores.

2.2. Environmental criteria. The environmental criteria aim to assess the environmental relevance of the industrial sector considered. Taking into account hypothetical difficulties in the collection of quantitative data about the environmental aspects, the method follows a "qualitative" approach.

This approach aims to attribute the relevance according to the environmental characteristics of the production process of the analyzed sectors or in some cases according to international and European documents (e.g. Directives) that identify priority sector from an environmental point of view. Table 3 indicated – for each class of data – the kind of data considered for the data collection, the corresponding applied criteria and the possible score to assign.

Table 3. Environmental criteria and scoring system

Kind of environmental data	Applied criteria	Score attributed	
Water consumption	The sector presents only domestic use of water or water use in production process	The sector presents only domestic use of water	1
		The sector uses water in production process	3
CO_2 emissions	The sector is or not in the scope of the European Emission Trading System (ETS)[1] Directive	The sector is not in the scope of the European Emission Trading System (ETS) Directive	1
		The sector is in the scope of the European Emission Trading System (ETS) Directive	3
Air emissions	The air emission pollutants of the sector belonging up to 2/from 3 to 4/more than 4 categories of pollutants of the section air of Annex II of the IE Directive 2010/75/EU[10]	The air emission pollutants of the sector belonging up to 2 categories of pollutants of the section air of Annex II of the IE Directive 2010/75/EU	1
		The air emission pollutants of the sector belonging from 3 to 4 categories of pollutants of the section air of Annex II of the IE Directive 2010/75/EU	2
		The air emission pollutants of the sector belonging more than 4 categories of pollutants of the section air of Annex II of the IE Directive 2010/75/EU[2]	3
Waste production	The main part (51%) of the waste produced are or not hazardous	The main part (51%) of the waste produced are not hazardous	1
		The main part (51%) of the waste produced are hazardous	3
Risk of contamination of soil and groundwater	The sector uses or do not use dangerous[3] liquid materials (chemicals) in the production process	The sector does not use dangerous liquid materials (chemicals) in the production process	1
		The sector uses dangerous liquid materials (chemicals) in the production process	3
Energy consumption	The energy consumption of the sector could be considered not significant[4] or significant	The energy consumption of the sector could be considered not significant	1
		The energy consumption is a relevant environmental aspect for the sector	3
Wastewater: categories of pollutants	The sector presents in discharged wastewater, pollutants belonging up to 2/from 3 to 4/more than 4 categories of pollutants of the section water of Annex II of the IE Directive 2010/75/EU[5]	The sector presents in discharged wastewater, pollutants belonging up to 2 categories of pollutants of the section water of Annex II of the IE Directive 2010/75/EU	1
		The sector presents in waste water discharged, pollutants belonging from 3 to 4 categories of pollutants of the section water of Annex II of the IE Directive 2010/75/EU	2
		The sector presents in waste water discharged, pollutants belonging more than 4 categories of pollutants of the section water of Annex II of the IE Directive 2010/75/EU	3
Wastewater: priority substances	The wastewater of the analyzed sector includes priority substances/includes one or more priority substances but they are not considered hazardous/ has one or more priority substances identified as hazardous	The wastewater of the analyzed sector doesn't include priority substances	1
		The wastewater of the analyzed sector include one or more priority substances but they are not identified as hazardous	2
		Discharged wastewater has one or more priority substances identified as hazardous	3
Raw and auxiliary materials	The main important raw and auxiliary materials are not virgin but re-used or recycled from other productive sectors are virgin and not re-usable	The main important raw and auxiliary materials are not virgin but re-used or recycled from other productive sectors	1
		The main important raw and auxiliary materials are virgin and not re-usable	3
Environmental complexity	The sector is considered with a low/medium/high environmental complexity by IAF[6] classification	The sector is considered with a low environmental complexity by IAF classification	1
		The sector is considered with a medium environmental complexity by IAF classification	2
		The sector is considered with a high environmental complexity by IAF classification	3

Note: [1]Directive 2003/87 EC amended by Directive 2009/29/EC. [2]The Project Technical Board checks this data on the basis of technical documents (e.g. BREF). [3]According to international dangerous label. [4]According to technical report of the sector (e.g. BREF). [5]The range has been decided by the Project Technical Board taking into account the number of pollutants listed in Annex II of the IE Directive 2010/75/EU. [6]International Accreditation Forum.

The methodology foresees to give a higher relevance to the environmental aspect "water". So, three different indicators related to this environmental issue are foreseen: water consumption, wastewater: categories of pollutants and wastewater: priority substances.

2.3. Social, health and institutional criteria. The third class criteria is focused on social, health and institutional related aspects. The applied criteria and the corresponding scoring system are indicated in Table 4.

Table 4. Social, health and institutional aspects, criteria and scoring system

Kind of social, health and institutional data	Applied criteria	Score attributed	
National policy priorities	The improvement of environmental and/or health impact of the sector is not a priority mentioned in the official National policy acts. The improvement of environmental and/or health impact of the sector is a National policy priority	The improvement of environmental and/or health impact of the sector is not a priority mentioned in the official National policy acts	1
		The improvement of environmental and/or health impact of the sector is a National policy priority	3
Health and environmental perception of the citizens	The environmental aspects of the sector are or not considered significant by the population according to the results of National or local survey	The environmental aspects of the sector are not considered significant by the population according to the results of National or local survey	1
		The environmental aspects of the sector are considered significant by the population according to the results of National or local survey	3
Environmental and corporate social awareness	The sector has been/has never been involved in voluntary initiatives to raise the environmental and social awareness of the companies	The sector has been involved in voluntary initiatives to raise the environmental and social awareness of the companies	1
		The sector has never been involved in voluntary initiatives to raise the environmental and social awareness of the companies	3
Dangerous substances	The sector uses or not substances dangerous for the health of the workers	The sector doesn't use substances dangerous for the health of the workers	1
		The sector uses substances dangerous for the health of the workers	3
International policy priorities	The improvement of environmental and/or health impact of the sector is or not a priority mentioned in the official international policy acts (e.g. LBS Protocol)	The improvement of environmental and/or health impact of the sector is not a priority mentioned in the official international policy acts (e.g. LBS Protocol)	1
		The improvement of environmental and/or health impact of the sector is a priority mentioned in the official international policy acts (e.g. LBS Protocol)	3
Proximity of industrial areas to the urban areas	The sector is usually located out from urban areas and residential zones/ is usually located close urban areas and residential zones	The sector is usually located out from urban areas and residential zones	1
		The sector is usually located close urban areas and residential zones	3
Environmental legislation	In the last five years have been/have been not approved environmental laws related with the main environmental aspects of the analyzed sector	In the last five years have been approved environmental laws related with the main environmental aspects of the analyzed sector	1
		In the last five years have not been approved environmental laws related with the main environmental aspects of the analyzed sector	3

Note: Partners could use results of survey on the theme that involved a sample of national population (e.g. local survey of a specific area of the Country with results that could be considered representative for the country).

The first criteria aims to assess the policy priority of each participating country. The partners identified national acts that report about the environmental and/or health policies and identify the priority sector. The methodology requires that national analysis of MPCs have to specify why the sector has been or has not been considered a National priority. This is the unique mandatory criteria of the methodology. It means that if a sector cannot be considered as a National priority, it is automatically excluded from the selection.

3. The identification of the key industrial sectors

Based on the collected data, the three Countries identified the "relevance" of each of the criteria for each IPPC sector. It means that the scoring system has been applied to each industrial sector and the relevance of criteria has been defined through the arithmetic mean of each kind of data.

Moreover, the "Environmental Benefit Potential" of each sector has been identified according to the following formula that foresees different weight to the criteria. All partners of the BAT4MED project decided to give a higher weight to the Relevance of Environmental aspects, since in the call of the project the European Commission asked to focus on sector with high Environmental Benefit Potential.

Environmental Benefit Potential (EBP) = 25% x Relevance of economic aspects + 50% x Relevance of environmental aspects + 25% x Relevance of social health and institutional aspects.

In bold font are highlighted the 8 common sectors among the three countries, on which the Benchmarking Analysis (described in the following section) has been focused.

In Egypt the textile sector obtained the highest EBP value out of all 15 priority sectors. In Morocco is the manufacture of organic fine chemicals the sector with the highest value, while in Tunisia is the large volume inorganic chemicals – ammonia, acids and fertilizers industry sector.

Table 5. The EBP values for priority sectors and 8 common sectors identified

Egypt – Pre-selected sectors	EBP value	Morocco - Pre-selected sectors	EBP value	Tunisia – Pre-selected sectors	EBP value
Cement, lime and magnesium oxide manufacturing industries	2.118	**Cement, lime and magnesium oxide manufacturing industries**	2,165	**Cement, lime and magnesium oxide manufacturing industries**	2,011
Ceramic manufacturing industry	1.868	**Ceramic manufacturing industry**	2,011	**Ceramic manufacturing industry**	2,053
Ferrous metals processing industry	2.708	Chlor – alkali manufacturing industry	2,149	**Ferrous metals processing industry**	2,203
Food, drink and milk industries	2.375	**Ferrous metals processing industry**	2,232	**Food, drink and milk industries**	2,357
Glass manufacturing industries	1.694	**Food, drink and milk industries**	2,357	**Iron and steel production**	2,341
Intensive rearing of poultry and pigs	1.875	Glass manufacturing industries	1,819	Large combustion plant	2,060
Iron and steel production	2.326	**Iron and steel production**	2,357	**Non-ferrous metals industries**	2,299
Large combustion plant	2.152	Manufacture of organic fine chemicals	2,774	Manufacture of organic fine chemicals	2,269
Large volume inorganic chemicals – ammonia, acids and fertilizers industry	2.625	Mineral oil and gas refineries	2,649	Large volume inorganic chemicals – ammonia, acids and fertilizers industry	2,691
Mineral oil and gas refineries	2.5	**Non-ferrous metals industries**	2,311	Production of polymers	2,228
Non-ferrous metals industries	2.514	**Pulp and paper industry**	2,157	Production of speciality inorganic chemicals	2,679
Production of polymers	2.375	Slaughterhouses and animals by-products industries	2,090	**Pulp and paper industry**	2,157
Pulp and paper industry	2.340	Surface treatment of metals and plastics	2,552	Surface treatment of metals and plastics	2,148
Tanning of hides and skins	2.514	Surface treatment using organic solvents	2,261	Surface treatment using organic solvents	2,189
Textiles industry	2.764	**Textiles industry**	2,290	**Textiles industry**	2,624

3.1. The benchmarking analysis. The Benchmarking Analysis aims to select – among 8 common sectors – 2 sectors to focus during the following phases and activities of the BAT4MED project. Among all pre-selected sectors, 8 common sectors in the three Mediterranean partner countries have been identified (indicated in Table 6).

The final step of the Benchmarking Analysis aims to select the final two common sectors in order to valorize the transferability of the approach also in other countries.

For this reason the 5 sectors with the highest TEBP are further selected according to the following procedure:

1. We calculate the position of each sector in the ranking of EBP of each National Analysis.
2. We summarize the numbers related to the positions in that ranking identifying unique final value. With this approach a low value indicates that the sector have a high position in each National EBP ranking. On the contrary high value indicates that the sector is ranked in low positions considering the EBP calculated in the National Analysis.
3. We select the two sectors with the lowest value.

The methodology for the final selection has been elaborated in order to avoid the selection with an high relevance in a participating country but with a not so high importance in the other two countries. The approach described is summarized in the following table.

Table 6. Method and results about the final identification of 2 common sectors among 5 final sectors

Common sectors	EBP *E[1]	EBP *M[2]	EBP *T[3]	Ranking E	Ranking M	Ranking T	Total ranking
Ferrous metals processing industry	2.708	2.232	2.202	2	5	5	12
Food, drink and milk industries	2.375	2.357	2.357	4	1	2	7
Iron and steel production	2.326	2.357	2.340	6	1	3	10
Non-ferrous metals industries	2.514	2.311	2.299	3	3	4	10
Textile industry	2.764	2.290	2.624	1	4	1	6

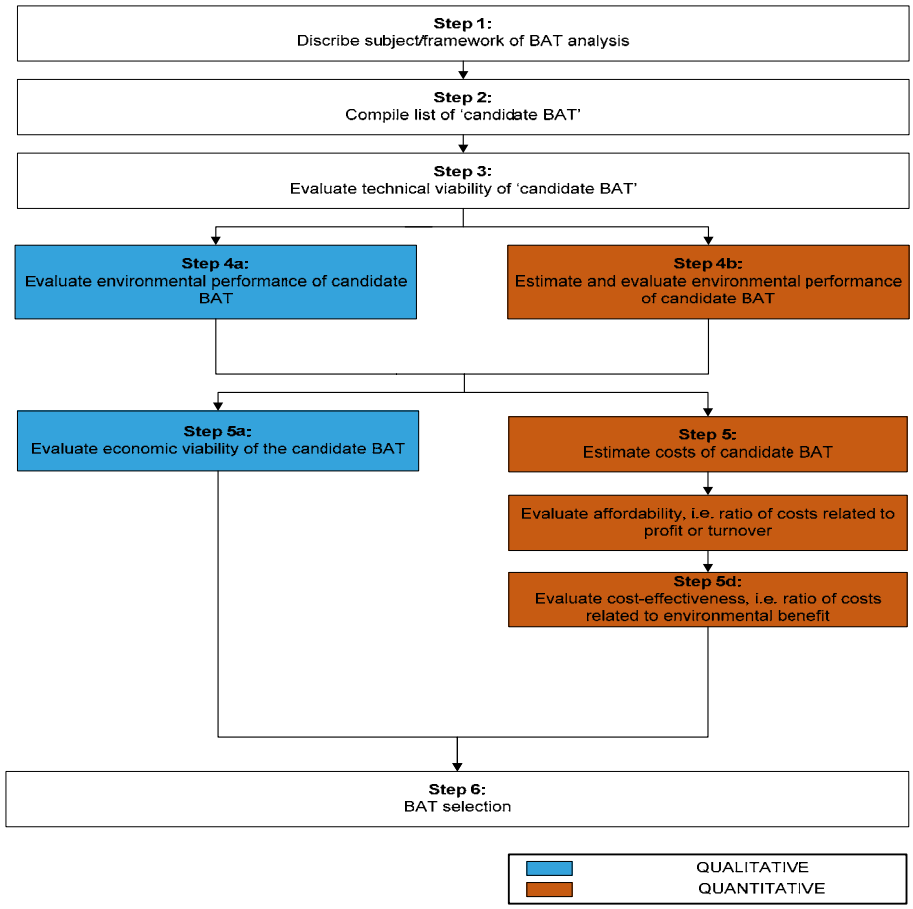
Note: [1] Egypt, [2] Morocco, [3] Tunisia.

As showed in the table above, the sectors selected are food, drink and milk industries, and textile industry. In the framework of the food sector the partners of BAT4MED project decide to focus the project activity to the dairy sector, being this the most important one in the framework of the activity covered by the BREF of food sector.

5. The methodology for determining BAT at sector level

The primary objective of the methodology for determining BAT at a sector level is to provide support to policy makers and permit writers in general in the selection of BAT. The methodology allows a detailed assessment of the available environmentally friendly techniques, so-called candidate BAT, at a sector level. In the BAT4MED project the methodology will be used for selecting the BAT at a sector level, i.e. for the dairy and textiles industry, and for 3 Mediterranean Partner Countries (MPCs), i.e. Egypt, Morocco and Tunisia.

5.1. Stepwise methodology. The methodology for the selection of BAT consists of 6 steps. These steps, shown in Figure 1, must be completed one after the other.



Source: Flemish BAT Center, 2010.

Fig. 1. Flow chart of the methodology

Depending on the desired depth of the analyses, the complexity of the processes and data availability, these 6 steps will be defined qualitatively (expert analysis) or quantitatively. Due to the limited data availability in this project, the methodology will mostly be based on qualitative expert judgement.

To be able to use the methodology (not only for evaluating the technical viability, but also for evaluating the environmental benefit) the reference situation of the sector concerned (e.g. techniques applied and environmental impact) should be clearly defined in the BAT sector report. National issues which can have an impact on the selection of the BAT will also be addressed.

Step 1: Describe the subject or framework of the BAT analysis. The first step of the BAT analysis at a sector level is to describe the activities, the products, the production processes of interest and the reference situation, and to define the subject or framework of the BAT analysis.

Step 2: Compile a list of candidate BAT. In the second step of the BAT analysis, the executor of the analysis must compile a comprehensive list of techniques; techniques that could qualify as solutions for the environmental problem. These techniques are called the candidate BAT.

Step 3: Evaluate the technical feasibility of the candidate BAT. In principle, the technical viability of a particular technique is demonstrated (or disproved) on the basis of practical experiences or based on data in European BAT sector reports (BREFs) or regional/national BAT-studies. Techniques that have only been tested at experimental scale are, in principle, not technically viable. A good indicator for the technical viability is the rate of implementation in companies under comparable conditions. A qualitative scoring system supports the technical evaluation.

Step 4: Evaluate the environmental performance of the candidate BAT. There are two possible approaches: a qualitative approach and a quantitative approach to evaluate the environmental performance of the candidate BAT. The quantitative approach can supplement or replace the qualitative approach, and depends on the availability of data on the initial emissions, the environmental performances (reduction efficiencies) and the cross-media effects of the candidate BAT.

Step 5: Evaluate the economic viability of the candidate BAT. Once again, there are two possible approaches: a qualitative and a quantitative approach to evaluate the economic viability of the candidate BAT, to analyze the affordability (is it too expensive for the industry?) and the cost-effectiveness (is it too expensive compared to the environmental effects/benefits?) of the candidate BAT. The quantitative approach can supplement or replace the qualitative approach, and depends on the availability of data on investment and operational costs of the candidate BAT and the environmental effect/benefits.

Step 6: BAT selection. Based on the technical, environmental and economic evaluation, the BAT can be selected as follows:

- Candidate BAT is not technically viable: technique is not a BAT.
- Candidate BAT has no benefit for the environment (as a whole: technique is not a BAT).
- Candidate BAT is not economically viable (not affordable and/or not cost-effective): technique is not a BAT.

However, in some cases the selection of BAT based on the affordability and/or cost-effectiveness leads to very high emission levels, which in practice would result in a high environmental or health impact. Since the general goal of BAT is to limit the impact on the environment as a whole in some cases candidate BAT, which do not seem economically viable, will be considered BAT since they allow achieving an acceptable emission level.

Conclusions

The first step of BATMED project aimed to identify the sectors with the highest Environmental Benefit Potential in the participating countries.

The environmental relevance of BAT4MED selected sectors is confirmed in several international documents. Both the textile and food sector are listed in the "Protocol for the Protection of the Mediterranean Sea against Pollution from Land - Based Sources and Activities" (LBS Protocol). The Protocol, adopted on May 17, 1980 by the Conference of Plenipotentiaries of the Coastal States of the Mediterranean Region for the Protection of the Mediterranean Sea Against Pollution from Land-based Sources, aims to foster among the Mediterranean Regions all appropriate measures to prevent, abate, combat and eliminate to the fullest possible extent pollution of the Mediterranean Sea Area. The Protocol is a legally binding instrument for the 21 Mediterranean countries which are Contracting Parties to the Convention of the Barcelona for the protection of the Mediterranean region, including Morocco, Tunisia and Egypt.

Another important document that confirms the high relevance of the food sector in the Mediterranean Regions is the "Regional Plan for the Reduction of BOD5 in the Food Sector as Part of the Implementation of Art. 15 of the LBS Protocol". This document is drawn up in the framework of the meeting of MED POL focal points of the United Nations Environment Programme. The document aims to invite the companies of the food sector to adopt BAT and BEP listed in the Plan.

Finally, in accordance with the reports "Textile industry Pollution prevention in the within the Mediterranean region" (RAC/CP, 2002b) and "Prevention of pollution in the Dairy industry" (RAC/CP, 2002a) published by Regional Activity Center for Cleaner Production (RAC/CP) in the year 2002, we could made some considerations about the transferability of the results of BAT4MED in other South Mediterranean countries not involved in the project. The first report highlights how the textile represents an impor-tant sector for the whole Mediterranean Area. Countries like Syria, Libya and Turkey have a high number of firms and textile sector represents a high percentage of their GDP. With the same approach the second report identifies the Turkey as a very important country for the dairy sector.

Future paper and research articles linked with the BAT4MED project will aim at how the BAT Reports are developed in the participating Countries following the methodology presented in section 5.

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