BAT&SMART – RETHINKING THE SCOPE OF SUSTAINABLE DEVELOPMENT

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Abstract
Industrial facilities must comply with the ever stricter resource management and environmental regulations and the Best Available Techniques (BAT) documents are the reference for their performance. Smart Cities represent a voluntary initiative directed to implement sustainable development to human communities. The paper suggests that these two separate actions must conjugate their efforts and achieve sustainability at an integrated level. BAT&SMART would denote geographical, even trans-border areas where industrial development and human communities collaborate for sustainability. Smart Cities should well perform along at least 6 main co-ordinates: smart governance, smart economy, smart living, smart people, smart mobility and smart environment. At EU level, classifications since 2007 include several Romanian cities (Sibiu, Timisoara, Craiova) but their position is at the very end of the list (73, 76, 77 of a 77 city sample). Driving forces for BAT&Smart Projects: poverty, limited resources, environmental stress, social entropy. For industrial platforms adjacent to medium size cities the problem is acute because of few alternatives to existing industry, interest of private persons to replace the industry with profitable residential/commercial projects. Industry has the experts, city administrations are politically motivated - the paper presents authors' experience in developing BAT&Smart elements and details how these should be put together in a Road Map/Strategy by multidisciplinary teams applying the knowledge based development (BAT industry AND smarter communities). An important side result could be an intricate symbiotic relationship City-Industrial Platform that could prevent further destruction of the few industrial facilities remaining in Romania, encouraging their revival.

Keywords*: Knowledge-based Development, Smart Communities, Sustainability*

1. Driving Forces for a BAT&Smart Project

Sustainable development involves addressing a triple bottom line framework: economic, environmental and social in order to meet the challenges of globalization, resource depletion, environmental aggression, climate change, increased poverty and social entropy generation (social conflicts, criminality, disorganized communities). For the industry, the environmental aspects of the sustainability are well structured and, especially in EU, a well-established legal system requires companies to align their activity to the best-available technologies (BAT) as described in a comprehensive number of Best-Reference documents (BREF) covering, practically, all areas of industrial interest [1,2]. As a result, environmental expenditures (industry+public) in the EU have increased dramatically, reaching levels (difficult to accept by Romanians), as shown in Table 1.

Table 1. Environmental expenditures in EU-28 and Romania (2013) [3].

Entity	Environmental Protection Expenditures, MEuro				TOTAL
	Air	Wastewater	Waste	Other domains	
EU-28	13702.4	12868.2	15035.1	10010.4	51616.1
Euro/capita	27	25	29	20	101
Romania	283.9	494.5	166.6	768.3	1713.3
Euro/capita	15	25	8	38	86

For the case of Corporate Social Responsibility (CSR), an objective estimate of associated expenditures is very difficult to get. First of all because there is no clear and universally accepted definition of CSR. Dahlsrud [4] analyses no less than 37 such definitions. The United Nations Industrial Development Organization (UNIDO) defines CSR as,

"a management concept whereby companies integrate social and environmental concerns in their business operations and interactions with their stakeholders. CSR is a way in which companies achieve a balance of economic, environmental and social imperatives".

The EU defines CSR as,

"the concept that an enterprise is accountable for its impact on all relevant stakeholders. It is the continuing commitment by business to behave fairly and responsibly and contribute to economic development while improving the quality of life of the work force and their families as well as of the local community and society at large…"

There certainly is a strong correlations between company performance and their CSR and environmental expenditures [5,6] and the good-governance paradigm involves financial/economic, social and environmental components as well [7,8].

Sustainability must be endorsed also by communities in order to preserve resources, the environment, jobs and improve quality of life. The concept of SMART communities as accepted at EU level includes the intensive use of information and communication technology (ICT) and Internet of Things (IoT) solutions in order to improve efficiency of municipal services and meet citizens' (rational) needs.

Currently, there is a vast expertize in implementing SMART energy in various cities by inferring best (lowest cost, lowest environmental impact) way to provide power to communities. The power mix (thermal, hydro, wind, solar, geothermal, nuclear, secondary industrial sources) are continuously monitored and IT networks dictate what power production facility to operate at any moment. Efforts are made to cover all potential components of smart communities and to identify the essential key performance indicators that could assess their status, to monitor progress and to identify best practice and most successful smart communities [9,10]. A sample of 77 medium size EU cities are monitored. Romanian cities (Sibiu, Timisoara, Craiova) are situated at the very end of the list (places #73, 76, 77).

The economic, social and environmental challenges of the 21st Century suggest that sustainable development must be detailed in its structure, beyond the triple bottom line cited above. And at the EU level, this means the following directions [3,7] that can be readily apply to industry as well as to communities:

- Socioeconomic development
- Sustainable production and consumption
- Social inclusion

- Demographic changes
- Public health
- Climate change and energy
- Sustainable transport
- Natural resources
- Global partnership

Sustainability contributed to the major increase of business entities expenditures. In some cases this led to entities' bankruptcy. In other cases managers increased their economic performance by smartly using their environmental and social involvement. Obviously, this is the right way. Going on the same way, the paper suggests that industry (complying to BAT) and communities (becoming SMART) must work together and exchange expertize and information in order to integrate sustainability at all levels in a given geographical area. Their cooperation will certainly increase the favourable impact upon the geographical area involved and reduce expenditures.
This is the BAT&Smart Project concept. The elements of this concept are cooking in large global institutions (e.g., the World Bank) but there is no final, largely accepted, structured approach to it [11].

2. Background Expertize in the BAT&Smart Approach

This paragraph describes the authors experience in a limited number of former Projects - modules that could be inserted in a BAT&Smart approach. This suggests that a BAT&Smart project will not be a greenfield one but will be a rational extension of existing expertize.
Circular Economy. Two major Projects dedicated to the Circular Economy paradigm, more specifically to the Industrial Symbiosis tool will be detailed here [12,13]. Projects were carried out in the NE-development region of Romania. Essentially the projects identified the existing non-used resources (waste were *a priori* considered resources but the Projects looked for other resources as well: non-used industrial capacities, laboratory and training facilities, equipment, transportation fleets, secondary energy sources, etc.). They gathered together local managers, during a number of workshops and encouraged exchange of resources via "synergies" or industrial symbiotic partnerships. The project team collected all potential partnerships and identified the ones that will have the most important impact (economic + social + environmental). Managers were then advised to formalize their partnership into business contracts.
Main findings of the Projects:
1. There is a marked interest at a horizontal level, among local managers, especially from SMEs to get rid of their waste and unused resources that generate costs.
2. All resources subjected to business partnership contracts contributed to the eco-innovative approach of sustainable development of the focal zone
3. There is little awareness of BAT – BREF documents among local managers. Therefore, a special component dedicated to training in the field of Cleaner Production and Environmental Management Accounting / Material&Energy Flow Cost Accounting was inserted in the PAZEWAIA Project.
4. Workshops organized were the first such events dedicated to the real-world problems of local managers.

5. Partnerships between private and public entities became possible (and successful), proving how business and communities could cooperate for mutual benefits, in the same way they would, in a BAT&Smart project.
6. Once a good partnership started, it proved an attractor for other entities to join, without any intervention from the Project team. The Projects simply triggered a developing process.
7. Both Projects demonstrated that a bottom-up approach to solving the waste problem in Romania is working without Government intervention and spending but only based on local initiative and innovative approach.

Knowledge-based development of local communities. The Project was based upon the EU Strategy component in the field and addressed a number of communities in an under-developed area of Romania [14]. Main findings:
1. It was the first time that local Administration and specialists from local business, retired experts, schools, etc. were gathered around the same table and tried to address community problems using, firstly, local expertize.
2. The formation and activity of a *Project Advisory Board* (PAB), including local mayors, acknowledged specialists, managers of important companies, etc. was the way in which the Project gained legitimacy, acted along directions stringently relevant for the local community and sorted-out conflicting situations. The role of an external, neutral facilitator was also important as a referee and reference.
3. Local community development must start with what local people know and need (reviving local traditional construction and risk management techniques, cuisine, artifact production).

Integrated Resource Management. The project [15] addressed the fresh water and wastewater management in an area including chemical platforms and the adjacent communities. Project details and findings:
1. The local industrial platform was the manager of local freshwater sources. Various fresh water qualities (potable, industrial, de-mineralized) were provided to neighbouring business companies and communities.
2. The same stands for wastewater treatment facilities. The industrial platform managed not only its own generated wastewater but also flows from other sources.
3. In the initial step, local water consumers were advised and took actions to align their consumptions to BAT Documents, avoiding prodigality.
4. Contingency plans for cases of severe drought were devised so that fresh water will be continuously supplied at a decent level to communities. Special IT allocation programs indicated which industrial capacities should be maintained in operation and which should be closed to spare water. Special plans for compensation of business entities affected by such actions were devised (procedures to share the profit from operational facilities to the one stopped by the drought).
5. Again, a Project Advisory Board was set in order to base all difficult decisions upon legitimate actors and avoid arbitrary actions.

3. Components of a BAT&Smart Project

Following the EU smart city approach, a BAT&Smart project will address medium size communities (tipically 100000-200000 inhabitants), having a major industrial platform. Usually, in Romania, this is the case of single-industrial profile areas (Ramnicu Valcea or Targu Mures - chemical, Galati – metallurgy, Jiu Valley or Baia Mare – mining, etc.) and in most cases private, obscure interests and political corruption led to the complete destruction of the industrial platforms, generating enormous social problems (unemployment, school abandon, mass migration to the Western Europe, disorganized families, suicides).
In such areas, remaining business entities have the experts and know-how to address difficult aspects as resource allocation and management, energy savings, environmental compliance, material and energy flow accounting, implementation of best available techniques. They also operate equipment and facilities that could help local communities (technical support in case of natural disaster, laboratory facilities to assess the quality of various materials, etc.).
Local communities offer the working force for the adjacent industrial platforms. The know-how and expertize in local communities must not, in general, be looked for in the political Administration but in schools, retired persons, successful managers, NGOs. Yet the local Administration could (and should be encouraged to) provide an essential ingredient for the succes of a BAT&Smart Project: committment. Local mayors and public employees could spread the mission and vision for a BAT&Smart approach, could be interested in its fast implementation (in order to be re-elected), could mobilize public institutions (law-enforcing, health, schools, public transport, etc.) and direct funding needed for such a project.
Table 2 summarizes the components of a BAT&Smart Project [10] detailing some potential contribution of business and communities. The lists below are, obviously, not exhaustive.

Table 2. Components of a BAT&Smart project. Role of contributors

Component and content of BAT&Smart Project	Role of business entities	Role of Administration and Communities
General: *components that will assist all other elements in the BAT&Smart project toward their successful implementationa*	Building up a *Project Advisory Board* that will guide the Project team and give legitimacy to decisions. Adopt a Communication Strategy: establish rules, monitoring procedures, reporting needs, key performance indicators. Procedures for decision making	
Smart Governance: *citizens' participation to public life, decent social services for all, transparency of administration and public funding, zero-corruption, public involvement in decision making*	Support building an e-governance system, Expertize and training in decision making procedures, Technical help in creating local social services Sound financial procedures, including transparent audits	Creating the institutional framework needed for this BAT&Smart component Mobilizing local specialists. Interfacing with citizens: conveying the Mission, Vision and components of the Project Disseminating results
Smart economy: *encourage innovative spirit, entrepreneurship, promote economic image and local trademarks, stable and flexible labour market, aligning to EU and global trends*	Establishing a framework for collecting innovative ideas from employees Help in promoting image and local trademarks.	Establishing a framework for collecting innovative ideas from citizens Local incentives for entrepreneurs

	Detecting and detailing global and EU trends	Identifying, reviving and marketing local traditions and products
Smart living: *economic welfare, health conditions, decent housing, quality of education, individual security, cultural facilities, tourism*.	Comply to strictest Health and Safety regulations and convey experience to communities. Help in designing sustainable building Help in identifyong alternative low-cost construction materials (e.g. recycling waste) Identify educational priorities and finance classes that prepare graduates to be employed on the industrial platform.	Identify and respect traditional construction style and materials, sound way of life Ensure best educational conditions in schools and similar entities Identify and sustainably exploit local cultural and touristic attractions Policy for social inclusion (e.g., people with disabilities).
Smart people: *improving qualification of employees, lifelong learning, ethnic plurality, creating open-mindedness of local people*	Provide specialists for continual learning Identifying needs of new qualifications and help in ensuring it	Provide conditions for continual learning Encourage contacts amng all ethnic communities in the area
Smart mobility: *local and international accessibility, sustainable transport systems, availability and performance of IT-Infrastructure*	Devising optimal transportation networks structures Help in assessing transport sustainability Support for assessing investment in advanced local IT networks (hardware, software)	Developing a transportation network taylored to local needs Attract private companies Co-operate with transport companies in other regions to optimize international transport provided to locals Investing in IT
Smart environment: *protecting habitats and environment, high air / water / soil quality (zero-pollution), generating ecological awareness, sustainable material resource and energy management*	ZERO-waste, Circular economy and industrial symbiosis Optimal resource allocation and management Wastewater and waste treatment facilities and know-how offered to communities Contribution to environment reconstruction Help SMEs to align to BAT Help in the maintenance in environmental protection facilities.	Identifying critical areas in the environment and set up priorities Establish and maintain an inventory of waste (material, energy) that could be turned in valuable resources Organize workshops in Circular Economy.

A potential *Road Map* for a BAT&SMART Project will include:

a. Expressing publicly the commitment of local business and Administration.

b. Start working on the Mission-Vision-Strategy and establish the Key Performance Indicators (KPI) of the BAT&Smart area covered by the Project. A list of possible KPI is included in [10]. This will cover the entire timespan of the Project as the Strategy will be continuously revised and adapted.

c. Establish the Project team, communication, co-operation, decision making procedures and a Project Advisory Board - set up its role in the Project. The Project Team should be multidisciplinary and flexible. Only a limited number of experts should work permanently in the Project (managers, IT, communicators). The Project

managers should select specialists from a comprehensive list and include them in "task-forces" that could carry out a given component of the Project. Facilitators from renowned R&D entities or Academia should be included in the Project team. (2 months)

d. Identify and engage all stakeholders as early in the Project as possible (health and educational system, law enforcing, transport companies, public services, Environmental Authorities, etc.). Explain the rationale of the BAT&SMART Project, its Vision-Mission and ask for their contribution(2 months)

e. Establish the IT infrastructure of the Project, the format of the databases, identify sources of data and ask owners for their contribution, adopt access and confidentiality procedures; nominate the IT team that will take care of this component. Specialists in BigData and DataMining processing of large databases should be members of the IT team. A BAT&Smart Project without a vast, as complete as possible data background from every source relevant to business and community is not possible (3 months).

f. *Benchmarking*: identify periods of time where the performance of local business and Administration were the best, analyze why and establish how these performances could be replicated (4 months)

g. Set up a list of priorities and start working on those components that are the most important for the area of the Project and for which there already are local experts and resources available (allocate resources and responsibilities, define deadlines, milestones, ask for feedback. It is important that local people sense as soon as possible the benefits of the Project in their everyday life. Usually these components are: public transport, openness and transparent governance, environmental protection actions addressing main polluting sources. A timeframe for the easiest actions to be taken could be 12 months)

h. Monitor progress, redirect resources, adopt correcting measures.

It will take 3-5 years to complete the most relevant elements of the Project but the work should continue to apply new techniques, to overcome future barriers, etc.

The BAT&Smart Joint Strategy adopted by consensus by the industrial platform and the local Community Administrations:

1. Should adapt existing objectives (e.g. include extra stakeholders, expand the spectrum of environmental and social actions, diversification by identifying new areas for business, etc.)
2. Should include new objectives (e.g., services for the communities, new educational facilities, etc.)
3. Should develop Additional Action Plans for interactions between the main actors of the Project, for emergency situations, etc.
4. The system of Key Performance Indicators should be revised and adapted to the new objectives as well as to the existing KPI system used by EU to assess Smart Communities [10].

4. Conclusions

A BAT&Smart project is intended to integrate current evolutions toward sustainable development at industrial level (BAT) and trends in transforming communities in SMART organisms functioning along the knowledge-based development coordinates, taking advantage of newest potentialities of the IT sector (increased computational speed, large interconnected databases, online monitoring of municipal activities, DataMining and BigData tools for the management of large data sets, etc.).

But a secret outcome of such a project should be helping the Romanian Industry to continue to exist and thrive sustainably, conjointly with adjacent communities, by working together with them, thus creating a robust symbiotic connection that could resist future actions directed to the destruction of industrial platforms, as happened in the last 25 years.

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