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► To cite this version:

Jacques Jaussaud, I. Alvarez, David Carassus, E. Bled. French smart cities : which factors are key to manage a sustainable development?. "Special Track : Sustainability Accounting and Monitoring for Smart Cities ", 21st Conference of the Environmental and Sustainability Management Accounting Network (EMAN), Jun 2017, Liège, Belgium. hal-02142219

HAL Id: hal-02142219

<https://hal-univ-pau.archives-ouvertes.fr/hal-02142219>

Submitted on 9 Nov 2019

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‘Smart’ French cities: which factors are key to managing sustainable development?

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Abstract: Despite the advent of local Agenda 21 in 1992, marking the beginning of local authorities' ownership of sustainable development, there is unanimous agreement that global environmental degradation will continue. It is therefore necessary to study the results of these Agenda 21s and to understand the factors for their successes and their failures. In this study, we first characterise local sustainable development under its four dimensions (environmental, social, economic, governance). Then we identify, in particular with the aid of neo-institutional and organisational contingency theories, its influencing factors. On this basis, we carried out a quantitative study on all French municipalities working with a local Agenda 21. The results show a mixed and unbalanced picture of sustainable development in the implementation of its four dimensions, and reveal the preponderance of technical and administrative leadership in the slowing down of the establishment of local sustainable development.

Key words: sustainable development, smart cities, Local Agenda 21, new institutionalism, contingency

I. INTRODUCTION & RESEARCH QUESTION

Concerns related to demographic issues date back to the 16th century and the first French decrees on industrial nuisances were issued in the 19th century [1]. However, studies on the accumulation of pollution in urban areas where the population is concentrated [2] and the notion of urban ecology [3] did not occur before the middle of the 20th century.

Local authorities and especially city authorities were designated accountable for sustainable development in 1987 by the Bruntland Report. Local authorities are supposed to be the institutional body responsible for its enforcement in their locality. The United Nations established their first local action plan programme, local Agenda 21, for continuous improvement in sustainable development, in 1992.

Despite the interest of cities in this problematic issue, with 6, 200 local Agenda 21s in 2002 dispersed over 1 00 countries, the overview of local Agenda 21s to date is disappointing: « *carried out actions (...) have not succeeded in reversing the trend of the global deterioration until now* » [4].

It should be noted that the definitions of a sustainable city are quite varied. The 2007 Leipzig Charter model is interventionist and insists on the social dimension of sustainable urban development, while the National Federation of Town Planning Agencies (FNAU in

French), which is more flexible, proposes to overturn the territorial nature of the projects. The characterisation that we have retained in our analysis does not take into account certain issues, such as wealth distribution and market regulations that are not within its domain, but takes into account spatial and temporal solidarity. It thus responds to the original definition of sustainable development, with its focus on green growth and the idea of consultation and achieving consensus with stakeholders.

Furthermore, the challenge of sustainability for local authorities has to be articulated and for that purpose we need to develop a set of performance indicators based on innovation requirements set up by New Public Management (NPM). NPM calls for increased efficiency in the public sector worldwide, including at local levels [5]. The sustainable development challenge however, necessitates viewing differently the efficiency requirement, as economic efficiency alone is an insufficient consideration, as it also should be looked at from a sustainability viewpoint. The same criteria should be applied to private firms, as they implement from this perspective new management control indicators and systems [6]. It is from this perspective that the French State legislated in 2015 on the adoption of new indicators of wealth in the evaluation of governmental public policies [7]. This is to put an end to the hegemony of GDP, which « *measures everything in short, except that which makes life worthwhile* » [8].

The ecological footprint was until then the synthetic international indicator which made it possible to raise awareness among the general public of environmental impacts. From this perspective, territories must develop their own indicators [9]. According to Emelianoff, some 20% of cities have developed an environmental management system, and 60% have implemented indicators relating to sustainable development [10]. In that sense, Boutaud identifies several academic contributions in this field [11].

One of the main goals of this research, is the development, design and testing of an evaluation tool in respect of public policies relating to local Agenda 21, and we expect that this tool will be useful in identifying implementation factors. The tool has been developed in a French context, with the aim of adapting it in the near future for international comparisons.

This research intends to situate the intentions of the management of local organisations, and not solely by a reversal of the top-down bureaucratic approach [12]. It is also not simply stakeholder participation in decision-making [13], but above all, a recasting of management

tools [14]. With that purpose in mind it is necessary first to study all the organisational levels, which are stacked with different management tools. This approach allows us to perceive the balance of power and pressure factors, in order to clearly articulate the power stakes related to these devices.

This is, for instance, what researchers in social accounting are trying to do. To date, accounting principles broadly implemented do not fit in with the objective of sustainability. They encourage short term approaches [15]. They could however, be adapted in order to modify the relationship between people, businesses and the environment [16].

II. ACADEMIC BACKGROUND & THEORY

Therefore, the characterisation of local sustainable development, and the assessment of its results seem to be essential to « *get a better idea of current context in terms of sustainable advances* » and highlight « *advances and obstacles in the way of sustainable development* » [17]. In trying to solve this problem academics should apply theories and methodologies to explore and study this reality, in order to develop new knowledge that helps local authorities to implement these kinds of political tools in more efficient ways [18].

This research contributes to the literature in the field, trying to map the different factors that influence the adoption of sustainable practices by cities and public institutes for inter-municipal cooperation (EPCI in French). In other words, our paper should help local authorities understand why some policies fail while other succeed, and what is more, what kind of factors, human or institutional, are key for those results.

In trying to answer these questions, we have designed an analytical framework of local sustainable practices, those of municipalities, the territorial level responsible for the living environment of its catchment area citizens, and subject to specific issues, which require innovation and participation [19]. Our framework describes pressures that constrain organisations in sustainable innovation, and impede progress to become « smart cities ».

A. Characterisation of local sustainable development practices

This framework has been designed according to the four dimensions of local sustainable development i.e. environmental, social, economic and governance [20]. The necessity for the latter pillar is not unanimously agreed among actors seeking to define sustainable development, and is not included in the Brundtland Report. However, this new idea of governance is reflected in Principle 22 of the Rio Declaration on Environment and Development [21], in the French legislative framework [22] and in local practices for sustainable development [23] [24]. We also know that, as with all indicator systems, « *the pillar or sector approach*

has (...) a major disadvantage resulting from its main advantage, namely a risk of insignificance » derived from its consensual aspect and sometimes its diversion by « *the business or political circles* » [18].

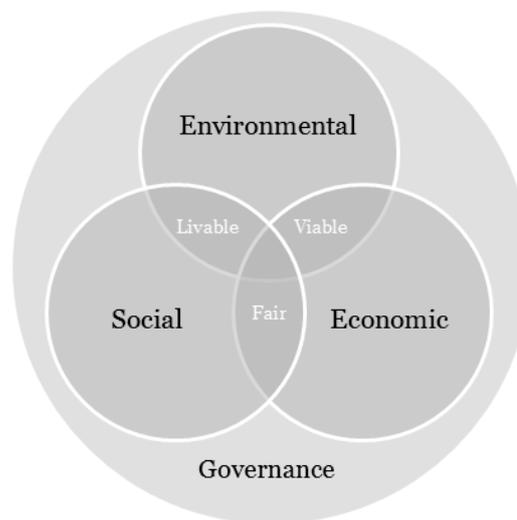


FIGURE 1: DIAGRAM OF LOCAL SUSTAINABLE DEVELOPMENT [20]

In this context, one can note that the environmental policies and the local Agenda 21 of municipalities and the EPCIs, which are groupings of municipalities constituting agglomerations, are the most developed in the literature, and the most widely deployed in municipality action programs [25]. The priorities and resources allocated are thus unbalanced compared to other themes [26]. The linking of Agenda 21 to the section devoted to the environment thus often limits it as an « *environmental action program* » [10]. Emphasising environmental issues is seen by some others as a historical consequence of social movements for the environment, with the most environmentally aware cities engaging the first [27] [28].

In this way, we can find the policy themes of municipalities or EPCIs on property management, urban planning, transport, waste prevention, energy, air quality preservation, water and sanitation, landscape and biodiversity preservation, noise control, management of public spaces, risk management and construction sites.

Our framework is drawn from an analysis of « *the list of actions taken in the framework of local Agenda 21s, the list of prize-winners of 'good practices' which can be taken as examples by others places* » [17]. This identification of the items of public policies undertaken for sustainable development was made possible by the significant use of studies on urban geography, and also on the so-called *Grenelle I for the Environment*, a government initiative under the aegis of President Nicolas Sarkozy, in 2007, for the promotion of sustainable development. Our framework refers successively to the preservation of the environment, social progress, the viability of the economy and finally participatory governance.

The variable of property management is discussed under three headings: the renovation of existing buildings [29], the quality requirements for new buildings [30], and finally the preservation of cultural and historical buildings [31] [32] [33]. Urban planning policies are based on the major theme of the fight against urban sprawl [34] [35], with the use of the tools available to local authorities [4], social mix [30], but also actions to promote urban density [36].

Six major measures will support changes in mobility policies to achieve greater sustainability in cities: reducing reliance on the car as a means of transportation [37], the introduction of public transport [33], traffic safety [38], dedicated bike lanes [39], the implementation of integrated transport plans [40] and the sustainable management of parking [41].

In relation to waste prevention, some researchers in sustainable urban planning associate the themes of waste reduction [42] and waste recycling, with urban cleanliness [43], urban congestion, and health and environmental issues.

As regards energy policy, two local challenges concern the eco-management of energy: on the one hand, the limitation of energy consumption in cities, [44] and on the other hand, the development of renewable energy sources [45]. Air quality preservation as an item refers both to the quality of the air outside buildings [46] and indoor air quality [47].

Regarding water and sanitation management, control of stormwater at source appears as a long term solution to flooding and pollution problems caused by urban rainwater [48]. Four main themes are linked to this: rainwater retention [49], soil infiltration [50], recycling [51], and the creation of a master plan for wastewater and rainwater [52].

From the perspective of preserving landscapes and biodiversity, the return of nature to the city is a major challenge for sustainable cities [53]. In addition, the entrance to cities, districts and peri-urban areas also represents a particular challenge to the protection of landscape, due to the presence of commercial, industrial and advertising facilities [54]. Green spaces, which were aesthetic elements of nineteenth century cities, today see their ecological benefits analysed [55] and their management modernised [56], while biodiversity is part of both property preservation concerns and of ecosystem services rendered [57].

Municipalities will also have to fight against noise pollution, as noise is one of the factors that disrupt the quality of life of city dwellers [58]. It has a negative effect on people's concentration, sleep, communication and relaxation [59]. Transport systems, on the one hand, and commercial activity, on the other hand, are the main sources of noise in cities [60].

Cities will also need to modify their management of public spaces. Municipal facilities represent one of the challenges of urban transformation, in order to create places where people can live together without disturbance [61]. The quality of public spaces is determined under five headings [62]: security [63], choice of street furniture [64], lighting [65] and more broadly, public places contribution to socialisation [66].

Territorial action is an important driver in reducing urban vulnerability [67] and their participation is required in risk management. Henceforth, prevention is concerned with knowledge and control of risk, but also with land use and public awareness [68]. Two themes characterise this management: the prevention of natural disasters and floods [69] and the monitoring of the sanitary quality of the environment [70].

The green building site approach seeks to reduce as much as possible the nuisance building works generate, and in particular to tackle noise pollution, waste generation and waste reprocessing [71]. Other measures concern the protection of vegetal matter and the control of water runoffs [72].

Where sustainable development policies differ from environmental policies, is in the consideration of the social dimension and the implementation of policies of social progress. Sometimes environmental protection creates ecological and social inequalities [73]. Other times environmental issues are relegated behind policies for social progress, increased purchasing power and growth [74]. The promotion of collective interests by local authorities requires social mixing and access to housing for all [75] with the fight against sub-standard housing [76] and finally, international solidarity between North and South with the sharing of knowledge on the needs of people [77] [78].

Comeau et al. [79] emphasise the social economy as a response to the challenges of creating a new development model focused on the long term and the general interest. Local authorities can support this model in many ways: by mobilising companies, in particular SMEs, around the CSR concept [80] [81], by encouraging the new forms of economy [82] like social and solidarity-based economy, by supporting the structures of professional integration [83], and by fostering the creation of new employment in the social and environmental fields [84].

As regards urban governance, Local Agenda 21 instituted the concept of the participation of local inhabitants and interest groups in urban governance. Some see this as a sign of the reign of consensus, or even a neoliberal recommendation, which places public authority as a facilitator of dialogue between actors [85]. This new governance implies new rules for participation and decision-making [86], stakeholder integration through social accounting [87], action to raise awareness of democracy and sustainable development, and then power struggles with higher institutional levels [17]. It

also requires exemplary social responsibility [19], particularly in the management of human resources [88] and the involvement of the local authority in the networks of sharing and cooperation [63].

Figure 1 shows the set of variables that helps us characterise local sustainable development.

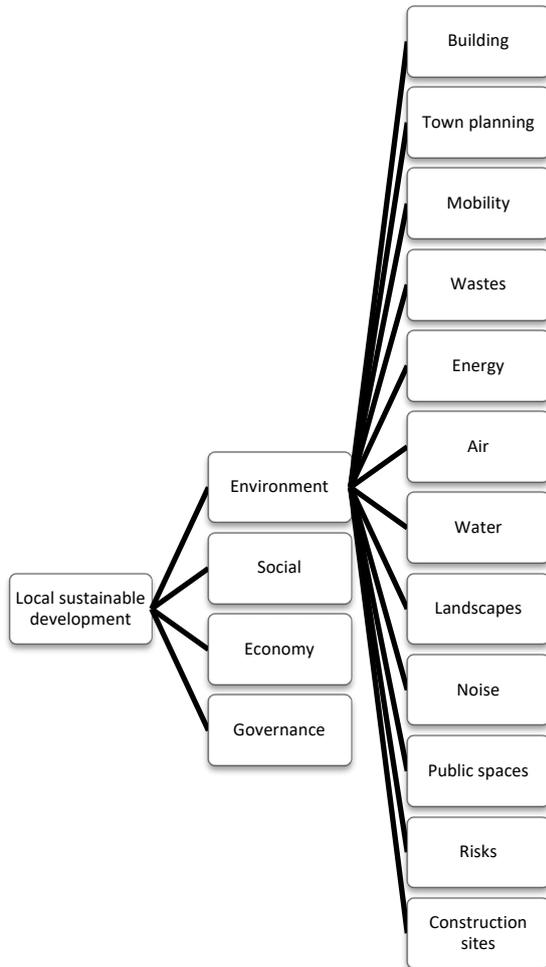


FIGURE 2: CHARACTERISATION OF LOCAL SUSTAINABLE DEVELOPMENT [89]

B. Analysis of factors influencing local sustainable development

Our literature review is broadly based on the contingency theory and new institutionalism. We have however, carried out a broad literature survey in order to understand the issue of local sustainable development from a wide perspective. Sociologists, architects, territorial civil servants, researchers in geography and political or managerial sciences have contributed greatly to the characterisation of local sustainable development and its origins.

Our framework has been developed with both local and global levels of analysis, with « *two background movements* » [30]; we carried out on the one hand, a deep analysis of both behavioural factors, local and internal factors [90] [91], and on the other hand, institutional and global factors [92].

First, the behaviour of individuals within a local institution who exert significant influence because of their responsibilities may play a role in the dissemination of a managerial culture and thus the propensity of the organisation for change [93]. This also refers to the leadership within a local authority. Indeed, such people « *endorse, stabilize or contest various institutions or social movements, through games of power* » [94]. Sustainable development as an innovation is no exception. However, it is possible to differentiate between two types of leaders who do not play the same role in local innovation: political leaders provide political leadership and civil servants provide technical leadership [95].

Political leaders, by supporting the whole process of change, ensure the support of the entire organisation [96]. The executives and managers of the institution see signs of commitment over time, through human, equipment and financial support [97]. Some elected officials see the process of sustainable development as a modern and optimistic one [25], although it may remain « *more a slogan than an expression of genuine political will* » [98]. Political action can thus « *change the course of history* », as evidenced by the case of the town of Loos-En-Gohelle (France), endowed with an ecologist mayor [33].

Civil servant leaders will be required to have good relations with the stakeholders in order to overcome opposition to change [99]. Through information provision and motivation [100], the creation of support leagues and the long term allocation of resources [101], these leaders have a huge influence on the attitude of the organisation facing change [102]. Concerning sustainable development, the rebuilding of social bonds and the link to nature will also depend on the power plays between management actors, such as employees and trade unionists [94]. Public servants also face deliberate resistance from those who seek to defeat environmental projects [103]. Even when in a minority, leaders must want to change public policies from within [104] and must be prepared to encounter obstacles and to confront sometimes violent actors, responsible for ecological damage. The personality of these leaders, whether conservative or progressive, will constitute a relational basis conducive to the establishment of a local Agenda 21 [105]. Bologna [33] is an example of a city where local officials stimulate sustainable change, specific to their own vision, in this case more economic than technological. Long term involvement crystallises « *a memory of the project* » which should help the continuation of the efforts to attain the initial objectives [106].

On the basis of such theoretical developments, we have formulated our first hypothesis:

H1: Political and administrative leadership positively influence the implementation of local sustainable development.

Apart from local personalities, other local settings can influence municipal initiatives. Some authors have

established the existence of influences related to the organisation and composition of the municipality, its capacity for innovation being largely influenced by its size, conferring diversified expertise and resources [107], as well as better levels of information. The needs and priorities are different according to the size of the municipalities. Large cities are struggling to reconcile long term preoccupation with sustainability with current employment levels [37]. Contrasts in size lead to differences in the processes and tools used in the field of sustainable development [33]. For example, cities with less than one million inhabitants are more sustainably virtuous, due to reduced travel distances, so the distribution of skills and administrative procedures can influence cross-cutting approaches such as Agenda 21 [108].

The economic context and financial resources will also affect innovation as they determine expertise availability [109], the capacity to draw up programmes, and to communicate and involve stakeholders [110]. The involvement of certain economic actors in projects can also create a form of dependence, as sometimes urban development is shared with the private sector. The openness of professionals can play a major role in achieving goals [111].

The commitment of local actors, either as individuals or in groups, will also modify the behaviour of the local authority and its disposition to change. With 40% of the French population volunteers and close to 25% in associations in 2013, these actors are influencing decision-making. The market town of Totnes (United Kingdom) illustrates the sustainable changes related to citizen initiatives, in this case in respect of energy and food self-sufficiency. Income disparities, poverty, and social inequality will also benefit from some ecological progress.

The political context, with its electoral cycles, local electoral competition and media coverage, also plays an important role. Citizens can be hungry for information [112], and organise associated interest and pressure groups [113]. Electoral competition also represents « *an interest in long-term territorial projects* » [37]. In addition, the increased longevity of the executive, whatever kind of organisation, seems to favour change [114]. Thus, the electoral calendars linked to the career of elected officials [115] create temporal constraints.

Furthermore, local culture has to be linked to the historical dimension of the municipality and local authority, and to the events encountered over time « *in the melting pot of sustainable development, urban thinking is now being invented on the basis of multiple experiences* » [37].

Second hypothesis:

H2: Other local factors positively influence the implementation of local sustainable development.

Following Di Maggio and Powel [92], some authors have revealed that external pressures lead to isomorphic changes in organisations, and to homogeneity under common conditions. Many studies emphasise the differentiation of private enterprises as far as corporate social responsibility practices are considered, in particular according to national characteristics [116] [117]. This is also the case for local authorities. Di Maggio and Powel [92] consider three forms of institutional isomorphism: coercive, mimetic and normative pressures.

Coercive pressure is that which comes from large institutions, formal or informal, and which can constrain change, for example, by funding. Some climate policies depend on a legislative and regulatory framework. The United Nations were the first institution to have promoted local Agenda 21. In France and in Europe, numerous laws and regulations force local authorities into promoting sustainable development (European Green Paper, *Grenelle de l'Environnement*, Territorial Climate Plan, Chevènement Law, Potential Carbon Tax, etc.).

Mimetic pressure plays both on private firms and on public organisations, all seeking legitimacy, reputation [118], and inspiration, especially in the environmental and social field [119]. In general, « *the example of the German (...) and Scandinavian (...) towns has succeeded in convincing elected representatives and French professionals: the approaches to a 'sustainable and desirable' urban life are today in full effervescence* » [30].

Normative pressures evoke the influence of organisations advising, standardising or normalising processes in their field of interest, professional or other, in order to ensure the legitimacy of their practices [92], thus creating social control at the heart of a sector of activity [120].

Third hypothesis:

H3: Institutional factors of isomorphism positively influence the implementation of local sustainable development.

Economic factors, such as economic crises, intervene spontaneously, being linked to the structure of the economy, resource finiteness, increased consumption or other factors [121]. However, they also affect local authorities. Commodity prices for instance, particularly affect the cities of the South [122]. The role of the informal sector in the economy also plays a role. The turnaround initiated by certain municipalities towards the ending of fossil fuels has to some extent been favoured by the different oil shocks [123].

With 15% of the French population at risk of poverty, the varying social situations and inequality levels lead to differing political responses to poverty by local authorities [124] and require them to innovate. This is particularly the case where politics at a national level fails to fight social exclusion [125] in terms of housing, social

mixing and land use [3], transport, energy, access to water [126], solidarity and integration.

The variety of ideologies [17], myths, rituals and values [127] is broad in the literature on institutional changes and sustainable development in organisations. The tunnel vision in respect of growth and GDP [128], for example, has a strong influence on the environmental issue, burying the idea of « *zero growth* » [129]. The financialisation of the economy, economic performance requirements, corporate social responsibility (CSR) and its voluntary commitment, consumerism and the role of the State [94] are linked to the existence of values, social realities and beliefs. In Agenda 21, « *zero growth when mentalities have changed, economic and financial objectives will no longer be given the highest priority (...) to overcome the paradigms and visions of the world that prevent progress* » [17].

Moreover, the general theory of systems [130] applied to geography [131] reveals the existence of isomorphisms linked to geographical situations. For example, local authorities in mountain regions demonstrate similarities in their economic and ecological specificities, from winter tourism to biodiversity, which requires adaptable approaches [132]. The same is the case in respect of littoral zones [133]. It can be said that the climatic variability that affects agriculture and irrigation policies [134] will influence urban policies and their social consequences.

On a different scale from local leadership, global political matters depend on international relations and on those who drive these relationships. International and national decision-makers positively influence sustainable development and transparency policies [135], for example when they associate themselves with « *green growth* » [136], or negatively when they divert institutional processes for the purposes of corruption. Energy policies are particularly dependent on geopolitics, since the European source of fossil energy is mainly external [29].

Technological innovation and the advancement of research in general favour the development of practices affecting sustainability. In relation to transportation policies and mobility, the democratisation of motorisation has led to the reduced use of bicycles. Medical research has highlighted the health consequences of these motorised life styles, arising from decreasing physical activity [137]. Also, it seems that in the South, the advancement of ICT has fuelled social unrest and revolutions [122].

Final hypothesis:

H4. Global isomorphism positively influences the implementation of local sustainable development.

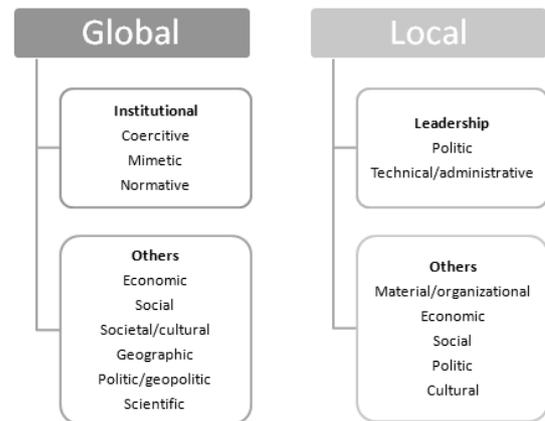


FIGURE 3: DIAGRAM OF FACTORS WHICH ARE KEY TO MANAGING LOCAL SUSTAINABLE DEVELOPMENT [89]

III. METHOD & RESULTS

We empirically test our set of hypotheses, using a quantitative method. The sample of the study is based on more than 300 French cities and EPCIs registered with an Agenda 21. Only one type of municipality was chosen: either a city or EPCI with an Agenda 21. We collected information from those local governments by questionnaire survey, adapted to our variables set (Figure 1). Each item in our variables represents a question in the questionnaire. The first part contains 51 items on the progress of Agenda 21, spread over 15 variables. The second part, on the factors, includes 16 items for our 4 variables. And finally the third part is about the profile of the local municipality, its associated Agenda 21 and of the respondent interviewee.

The entire data collection stage lasted 6 months. The study achieved a response rate of 40%. Answers included responses from the majority of the biggest cities in France (by population). We conducted univariate, bivariate and multivariate analyses, with SPSS software. These analyses allowed us to describe the sample according to each variable. Then we recoded our variables into metric ones and constructed composite variables in order to reduce their number. The bivariate analysis allowed us to extract significant correlations between our explained and explanatory variables as regards our hypotheses. The links were then studied more precisely with multivariate analyses, using regression analysis.

Regarding our two types of variables, explained variables for the practices, and explanatory variables for the factors, we are at this stage in an exploratory study since there is no theoretical *a priori* nor a pre-established factorial structure. We use factor analysis to precisely identify the underlying model for our data. The size of our sample provides sufficient statistical power, since it exceeds 100 subjects. In this exploratory framework, we have kept variables with a KMO index greater than 0.5 for factorisable items i.e. all variables.

We first look at descriptive statistics.

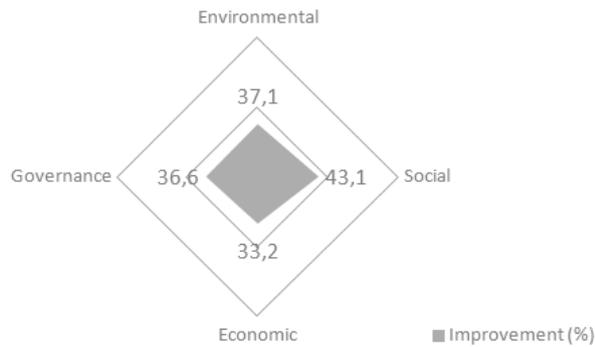


FIGURE 4: OVERVIEW OF LOCAL SUSTAINABLE DEVELOPMENT IN FRANCE

This chart summarises the rather disappointing results our survey reveals on the different dimensions of local sustainable development. We measured to what extent actions that were planned in the local Agenda 21s have actually been implemented, and found that it was less than 40% in most dimensions, with an imbalance in favour of social issues.

A more detailed analysis is available, with 12 sub-variables of the dimension *Environment preservation*, a field where much remains to be done, according to Emelianoff [10].

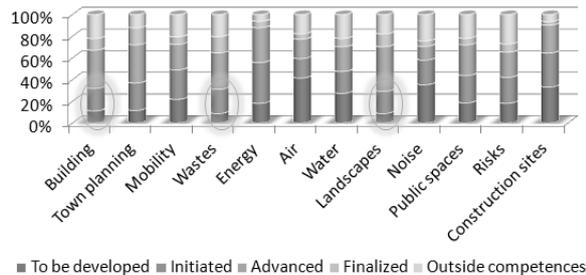


FIGURE 5: OVERVIEW OF LOCAL ENVIRONMENTAL PRACTICES IN FRANCE

The analysis of correlations, linear regressions and analysis of variances in our variables allowed us to empirically test our set of general hypotheses H1 to H4 on each of the dimensions of local sustainable development, in order to establish a general conclusion by factor type.

The results confirm, on the one hand, the significance of some of our factors, namely Leadership, and its relation to several dimensions of local sustainable development (Mobility, Water, Landscape, Public spaces, Risks), on the other hand.

Correlations		
		Leaderships
1. Mobility	Pearson correlation	-0,253**
	Sig. (bilateral)	0,005
	N	122
2. Water	Pearson correlation	-0,249**
	Sig. (bilateral)	0,006
	N	122
3. Landscapes	Pearson correlation	-0,188*
	Sig. (bilateral)	0,038
	N	122
4. Public spaces	Pearson correlation	-0,209*
	Sig. (bilateral)	0,021
	N	121
5. Risks	Pearson correlation	-0,212*
	Sig. (bilateral)	0,019
	N	122

*. The correlation is significant at level 0,05 (bilateral)
 **. The correlation is significant at level 0,01 (bilateral)

TABLE 1: CORRELATION ANALYSIS OF SEVERAL LOCAL SUSTAINABLE DEVELOPMENT VARIABLES AND LEADERSHIP FACTORS

By decomposing our Leadership variable into two sub-variables for more accurate correlation tests, we note that only the Technical Leadership sub-variable is significant. It is therefore with this sub-variable that we practice linear regression.

Model	Unstandardized coefficients		Standardized coefficients Bêta	t	Sig.
	B	Standard error			
1 Constant	3,737	0,399		9,374	0,000
Leadership t.	-0,310	0,126	-0,218	-2,448	0,016
2 Constant	4,334	0,468		9,255	0,000
Leadership t.	-0,507	0,149	-0,297	-3,412	0,001
3 Constant	3,754	0,356		10,546	0,000
Leadership t.	-0,218	0,113	-0,174	-1,931	0,056
4 Constant	4,092	0,466		8,778	0,000
Leadership t.	-0,393	0,147	-0,238	-2,668	0,009
5 Constant	4,020	0,447		8,992	0,000
Leadership t.	-0,404	0,142	-0,251	-2,846	0,005

Dependent variable : 1. Mobility, 2. Water, 3. Landscapes, 4. Public spaces, 5. Risks

TABLE 2: LINEAR REGRESSIONS OF SEVERAL LOCAL SUSTAINABLE DEVELOPMENT VARIABLES AND THE TECHNICAL LEADERSHIP FACTOR

The linear regressions and analyses of the variances in our variables lead us to reject the hypothesis of the positive influence of technical leadership on our five significant variables of sustainable development practices, the beta being systematically negative. The R2 tells us that the technical leadership variable is involved in between 3% to 8.8% of variations in our variables, depending on the theme, with the greatest influence on water, water management and sanitation.

Our main results reveal several findings. Firstly, we establish that French cities demonstrate a mixed picture of local sustainable development: some themes are more developed (Building, Waste, Landscape) than others (Water, Mobility) and the achievements are imbalanced as far as the four dimensions of local sustainable development are concerned. On average, less than 40% of all sustainable practices listed in Agenda 21 are implemented, and there is greater emphasis on social and environmental variables. This complements the theories on the hygiene endeavours of municipal services, which only work for the environment in the field of urban ecology, through health preservation [37].

Secondly, we found that the leadership of the local administration is the most influential factor in developing

these kinds of activities. Only this variable is significant, and in particular, the sub-variable of technical and administrative leadership achieved the highest values. However, this analysis leads to the inversion of our H1 hypothesis, as there is a negative influence i.e. a barrier to change set up by local leaders. This result confirmed some assumptions whereby « *the professional culture of civil servants (could be) more or less die-hard* » on the themes of sustainable development [138]. This also confirms that the behaviour of individuals internally in the local administration plays an influential role in the dissemination of a managerial culture and propensity to change [93], even in the case of sustainable development. This bears out in respect of France the fact that « *officials and elected representatives are well placed to give the strategic overview and general policy context for local sustainability initiatives* » [139].

This research « *produces analyses that enlighten and facilitate the task* » of the environmental actors, i.e. local officials, elected representatives, associations, so that they understand the system, participate in their strategic roles of pushing for change, though often handicapped by collective resistance. Thus, we can create paths of change, fuelling political debate and democratic arbitration and highlighting « *power relations, responsibilities (explanatory variables) on the problems observed (variable explained)* » and show that poor environmental management « *is not a natural consequence of development, but results from precise choices, often deliberate, which can be identified and made legible for the public* » [94].

IV. CONCLUSION

Like most of the authors who contributed to our literature review, we were aware that the recommendations and expectations of the 1992 Rio Summit were not being met, and that it is still too early to be satisfied with the progress to date in the realisation of Agenda 21s more than 20 years after their official launch. In France, the measure of this failure has not yet been understood in a systematic way. Currently, a critical approach to urgently change this situation is required. Once this has been established, the origins and influence factors diagnosed by our research can act as levers of action at different scales.

This research allows us to perform an « *interscalar diagnosis* », which isn't limited to an observation of global constraints, but enables the emergence of local levers of action, while also identifying other levers for « *global operators* » [94].

We carried out an original approach outside the pre-established geographical and organisational frameworks, following the advice of certain researchers in this field: « *It's clear that the environmental problems and conditions of their treatment are now deeply affected by the dynamics of globalization under way (...) For NGOs it requires the action of multi-level networks and for public environmental organizations, the interlocking of the*

politico-administrative levels. The diagnosis of each problem of environment (mis)management refers to an analysis that mobilizes different geographical and organizational levels. However, care must be taken not to introduce into the analysis a bias which could focus on « higher level » influences (which we have called « global ») rather than lower ones (« local »). (...) If not, we would go against a true strategic analysis, attentive to reducing possible leeway for real actors » [94].

Our study, however, revealed the prevalence of only one significant factor out of the four, leadership, and it is often mentioned by researchers in public management [95]. It also made clear that technical leadership i.e. the role of civil servants, had a negative influence on five sub-variables of local sustainable development. Therefore, the contingency theory whereby each entity is differentiated to fit its own local environment, is predominant here [91], with a majority of behavioural factors [90].

The administrative leaders act to motivate the agents [100] on the one hand, and to realise coalitions to silence the opposition [99], on the other hand. The involvement of these leaders over the long term crystallises "*a memory of the project, which should in particular guarantee good performance in relation to the initial objectives*" [106]. In an organisational context that inhibits or is unfavourable to change [102], sustainable development does not seem to be an exception to the rule [139]. It is also possible that administrative decision-makers use the opinions of citizens in order to divert political decision-making towards technical decision-making, thereby avoiding general debate.

Some of the concerns in our conclusions are addressed to local actors of change, to those who do not « *give in to scepticism or inaction* » [140], but are planning to overcome obstacles between them and the « *smart city* ». According to the definition of the forms of classification by Thom and Ritz [141], improvements and profound transformations can take different forms, for which we can be the force for propositions in the local management of sustainable development.

On the political side, the adoption of a sustainable development strategy by the elected representatives of local authorities, sometimes requires new political opinions, and their transcription into programmes. This strategy includes the implementation of a territorial approach focused on sustainable development, to better match the needs of the citizens on the one hand, and on the other hand, to raise citizens' awareness of sustainable development.

The second recommendation is at administrative level, with a change of focus for operational management and a redefinition of priorities, incorporating the principles of Agenda 21, along the same lines as the policy strategy set out earlier.

Finally, social innovation concerns in particular, human resources. It is for local sustainable development

to implement training for managers and even agents for the decartmentalisation of services and the establishment of cross-departmental missions and policies. This also applies to sustainable practices, which are specific to each service, each subject, and are currently particularly neglected in urban planning and economic development services and must therefore receive special treatment. Managing human resources according to the principles of local sustainable development governance is also part of the so-called "social" recommendations and innovations. In addition, awareness-raising / training sessions for elected officials can also be implemented, in order to strengthen their resolve and also, in turn, that of civil servants in sustainable development projects. This will, in turn, motivate the agents, so that all are in league for the implementation of sustainable projects and the fight against opposition to these projects.

These recommendations attempt to situate the action in a critical approach to sustainable development as pursued to date, having failed to achieve the objectives set by the international community. In this spirit, Club France Rio + 20 (the French network created in 2011 to promote the contribution of civil society actors to major international events, such as the Rio+20 conference) has established in its manifesto a programme for sustainable, solidarity-based and humanistic territorial governance so that « *twenty years after the Rio Earth Summit, the actors of the French territories (...) note that the assessment of the commitments of the States in 1992 is generally unsatisfactory* » and that « *the state of resources, poverty and social fractures have been aggravated* » [142].

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