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# Assessing Public Attitudes and Behaviour to Household Waste Management in Cameroon to Drive Strategy Development: A Q Methodological Approach

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**Abstract:** Household waste is an environmental and public health problem, especially for the large cities in Sub-Saharan African countries. While the improper management of household waste in Cameroon is linked to the systematic failure of policy makers and municipal authorities to identify the most sustainable ways of dealing with it in such a manner that is in line with their socio-economic aspirations, the impact of public attitudes and behaviour has been neglected. It is in this context that this paper uses Q-methodology, a powerful methodology for identifying the different trends in behaviour in the management of household waste in Douala, Cameroon.

**Keywords:** Q methodology; public attitudes and behaviour; household waste; composting; education; capacity building; third sector organisations

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## 1. Introduction

Research into attitudes and behaviour towards household waste both in the industrialized and third world countries has in many cases utilized both qualitative and quantitative approaches from the social sciences and the strengths/weaknesses of such techniques are well documented [1,2]. Some examples include interviews, questionnaires, focus groups, and multi-criteria mapping [3]. The Waste and

Resources Evidence Strategy for England 2007–2011 [4] considers social science, including research into behavioural change a central component for the research requirement for waste management. Social science research has been documented as being of increasing importance in government policy making, especially within waste and resource policy, because of the need to encourage wider behavioural change in individuals, institutions and society. It is on this basis that this work uses Q methodology, a social science methodology in the analysis of subjectivity of household waste management in Douala, Cameroon.

### *1.1. History of Q Methodology*

British psychologist William Stephenson is considered the father of Q Methodology. Stephenson introduced some of the main concepts of a substitute technique for applying factor analysis, thus initiating the development of what has come to be known as Q methodology [5-11].

Q methodology has for over 60 years been a deep-rooted research methodology gaining importance in social science research [9]. Q is used to study subjectivity in a structured way, by combining the strengths of a rigorous statistical analysis (factor analysis) with the benefits of in-depth qualitative research methods [5,8,10-13]. This paper, using Q methodology, assesses the different attitudes and behaviour to household waste management in Douala, Cameroon. It highlights the strengths of the Q method with the aim to develop a social science-based evidence essential for vigorous strategy and policy development for household waste management in Cameroon. The results obtained in Douala were used in the development of an education led strategy for third sector organizations in Cameroon in the area of waste management [14].

### *1.2. Strengths of the Q Method*

Q methodology combines the strengths of both qualitative and quantitative research. Dennis and Goldberg [15] have indicated that the statistical assumptions upon which Q methodology is based, do hold for even lower numbers of participants [5,6]. In this study, 30 participants were involved. Q methodology is more focused than a general attitude questionnaire because it reveals subjective structures, attitudes and perspectives from the standpoint of the person or persons being observed [16]. Q methodology's versatility aligns with the principles and concepts of contemporary science; hence it can be used in a variety of settings, on the same individual, multiple times and with short inter-test intervals [17]. The fact that Q methodology respects the integrity of the respondents makes it easy for results to be recorded anonymously with the impossibility of predicting factorial results [11]. The range of subjects which can be studied using Q is unlimited, but classic examples include attitudes, 'representations' of social objects and understandings [17]. Nevertheless, it is not based on estimating population statistics; rather, the aim is to sample the range and diversity of views expressed, by identifying groups or 'types' of persons who share similar attitudes toward a phenomenon, not to make claims about the percentage of people expressing them [18].

## 2. Characteristics of the Study Area

Douala is Cameroon's economic capital, with an estimated population of over 2 million inhabitants, about 11% of the country's population and 20% of Cameroon's urban population [19]. Douala occupies a land area of 20,000 hectares with an annual growth rate of 5%, compared to a national average growth rate of 2.3% [19]. Table 1 shows some socio-geo-demographic characteristics of Douala.

**Table 1.** Socio-geo-demographic characteristics of Douala in 2007 [14].

Zones	Residential areas	Population	Daily waste generation (tonnes)
Douala 1	High Income Residential Area	260,795	250
Douala 11	Medium Income Residential Area	240,878	417
Douala 111	Medium Income Residential Area	1,000,000	300
Douala 1V	Low Income Residential Area	92,540	298
Douala V	High Income Residential Area	304,233	210
Manoka		304,233	No data
		2,202,300	1,466

## 3. Methodology

### 3.1. Q Methodology in Attitudinal Research

Attitude is difficult to define and even within the expert psychological realm there is little agreement as to what is understood by it. According to a range of researchers [20-24], attitude is defined as a predilection to behave in a particular way. Current opinion is that attitudes facilitate cognitive relationships, which in turn may prompt behaviour [25,26].

Early attitudinal research assumed a strong relationship between attitudes and behaviour [22]. Attitudes may influence behaviour and in turn, be influenced by it [27]. It is thought that attitudes are concealed and not directly observable in themselves, but they cause actions and behaviours that are observable [28] and so prompt pro-environmental behaviour.

What Q does is to analyze people's responses to a series of statements in a way that groups them in terms of fundamental general patterns of response. These groups of response patterns are then taken to comprise several discourses, i.e., ways of "seeing and talking about something" [29], which are seen to bring about responses. Q methodology has been successfully applied to many diverse topics such as:

- 1 Attitudes to waste [30];
- 2 Public attitudes and behaviour to household waste [14];
- 3 Attitudes to environmental issues [31];
- 4 Operant subjectivity [32];
- 5 Attitudes toward respite care [33];

## 6 Attitudes of patients towards death and dying [34];

This paper presents an exploratory study using Q methodology to investigate public attitudes and behaviour to household waste management in Douala, Cameroon from a developing country context and to use this to design sustainable waste programmes.

### 3.2. Research Design of the Q Study

This is based on six stages:

- 1 Development of Q sample statements;
- 2 Selection of participants;
- 3 Administration of the Q study;
- 4 Data entry and analysis;
- 5 Factor interpretation;
- 6 Post sort interviews.

#### 3.2.1. Development of Q Sample Statements

Q sample statements are a matter of opinion rather than fact, hence subjective in that sense [13,31]. The original 100 Q sample statements were generated from expert opinion, focus group discussions, interviews, newspaper articles, research reports, policy documents and journal articles covering a wider variety of views available on the theme in Cameroon and the UK. These were categorized by issues under the following themes: composting; best practice and pro-environmental behaviour; environmental and health impacts; market for recyclates; recycling and reuse; waste prevention and minimisation; incentives; public participation and acceptability. These were subjected to a piloting exercise to get 50 Q statements suitable for the sorting process. The 50 statements chosen for the sorting process were in line with previous research [31] and based on:

- 1 Data on balance -add up all agrees and disagrees for all statements;
- 2 Data on comprehension- 'problematic' statements (rewording);
- 3 Data on coverage - suggestions for ideas 'not covered'.

#### 3.2.2. Selection of Participants for the Q Sort

Thirty participants for the Q study were selected by purposive sampling from different socio-geodemographic backgrounds in Douala [14]. This was to ensure participation of all groups holding different opinions on the subject matter [7,33]. Thirty participants for the study is acceptable because according to some researchers [5,6], using large numbers of participants can be problematic as it "can easily cancel out some of the essential qualities contained in the data". Participants were between the ages of 22–64 with 18 being male and 12 female (see Table 2). Participants were contacted face to face, by telephone or through e-mails. They were briefed on the aims of the study and after informed consent with assurances of confidentiality and anonymity duly signed the informed consent form and collected the Q sort information pack.

**Table 2.** Sociogeo-demographic characteristics of participants in Douala [14].

<b>Residential area</b>	<b>Gender</b> % Male (M) % Female (F)	<b>Age</b> <b>range</b> (years)	<b>Employment</b>
High Income Residential Area (HIRA)	70% M 30% F	25-63 28-65	Health expert, politician, waste consultant, postgraduate student, university lecturer, local government official, environmental activist, farmer, owner of internet café, agric- extension officer.
Medium Income Residential Area (MIRA)	50% M 50% F	36-59 22-64	Horticulturist, waste picker, high school teacher, undergraduate student, youth activist, town planner, farmer, unemployed resident, sales agent—second hand goods shop, recycling agent.
Low Income Residential Area (LIRA)	60% M 40% F	25-60 24-54	Veterinary officer, farmer, female activist, owner of internet café, horticulturist, primary school teacher, compost producer, compost sales agent, recycling agent, representative - young farmers group.

### 3.2.3. Administration of the Q Study

Participants for the Q study were each handed a Q sort information pack containing guidelines for the sorting procedure. The Q sort information pack included:

- 1 Q grid (a pyramid shaped structure of boxes, in this case the number was 50);
- 2 Envelope containing Q items (cut-up statements);
- 3 Envelope containing a set of markers (going from -5 to +5);
- 4 Q response booklet;
- 5 Participant details form (an envelope for anonymous responses);
- 6 Self address envelopes to return the materials.

### 3.2.4. Data Entry and Analysis

Four basic steps were involved:

- 1 Input of participants Q sorts using a Qcom.exe programme;
- 2 Correlation of the Q sorts using SPSS for windows V 11.5;
- 3 Extraction of Q sorts using Principal Component Analysis;
- 4 Rotation of the extracted factors using Varimax with Kaiser Normalization (Table 3) to identify significant uncorrelated factors [7].

**Table 3.** Rotated component matrix.

P	Component								
	1	2	3	4	5	6	7	8	9
P23	<b>*0.834</b>	-0.125	-0.114	-0.102	0.039	-0.007	0.022	0.56	0.065
P8	<b>*0.728</b>	0.062	0.076	-0.059	0.126	0.033	-0.154	0.177	-0.343
P27	<b>*0.696</b>	0.113	-0.115	-0.131	-0.008	-0.126	0.128	-0.336	0.051
P9	<b>*0.626</b>	0.323	-0.150	-0.020	-0.102	0.119	0.003	0.136	0.227
P7	<b>0.595</b>	-0.068	0.038	0.212	0.158	-0.131	-0.182	0.248	0.405
P21	<b>0.468</b>	-0.160	-0.423	-0.455	0.039	0.114	0.111	0.287	0.081
P3	<b>0.423</b>	0.370	-0.076	-0.245	-0.149	-0.012	-0.286	0.350	0.300
P18	-0.070	<b>*0.718</b>	0.082	0.368	-0.071	-0.184	0.247	0.159	-0.150
P11	0.040	<b>*0.716</b>	0.025	-0.175	-0.043	0.098	0.142	0.094	0.236
P6	0.004	<b>*0.677</b>	-0.138	0.134	0.056	0.279	0.172	0.108	-0.048
P2	-0.461	<b>0.546</b>	-0.190	-0.141	0.081	-0.084	-0.223	-0.246	0.257
P10	0.351	<b>0.454</b>	0.140	0.342	0.176	0.024	0.018	0.195	0.259
P4	-0.085	-0.223	<b>*0.736</b>	0.004	0.130	0.164	-0.132	0.029	0.036
P17	-0.240	0.443	<b>0.565</b>	-0.013	0.013	-0.076	-0.065	0.364	-0.141
P12	0.062	0.137	<b>0.561</b>	-0.109	0.344	0.558	0.003	0.281	0.107
P24	0.440	-0.344	<b>-0.462</b>	-0.024	-0.014	-0.012	-0.156	0.269	0.337
P28	0.202	0.407	<b>-0.437</b>	-0.181	0.121	0.255	-0.194	0.205	0.034
P26	0.137	0.067	-0.085	<b>*-0.803</b>	-0.031	0.014	0.184	-0.099	0.113
P30	-0.098	0.158	-0.143	<b>0.577</b>	-0.019	0.245	0.469	0.129	0.214
P5	0.010	0.506	-0.289	<b>0.527</b>	0.046	0.308	-0.076	-0.081	-0.139
P19	0.125	-0.098	0.177	-0.038	<b>*0.719</b>	0.060	0.226	0.130	-0.073
P15	-0.042	0.327	-0.018	0.223	<b>*0.706</b>	0.120	-0.052	0.016	0.043
P14	-0.217	0.191	-0.237	0.243	<b>*-0.613</b>	-0.052	0.431	0.128	0.083
P13	0.124	0.096	0.356	-0.025	<b>-0.557</b>	0.368	0.273	0.254	-0.138
P25	-0.090	0.148	-0.006	-0.019	0.116	<b>*0.752</b>	-0.113	0.153	0.052
P29	0.015	-0.023	0.123	0.210	-0.131	<b>*0.721</b>	0.182	-0.344	0.032
P16	-0.013	0.175	-0.019	-0.167	-0.015	-0.002	<b>*0.859</b>	-0.109	0.064
P22	0.169	0.251	0.068	0.142	0.012	0.027	-0.053	<b>*0.786</b>	-0.046
P20	-0.181	-0.112	-0.007	0.066	0.094	-0.154	-0.064	0.11	<b>*-0.826</b>
P1	0.091	-0.04	0.109	0.092	-0.301	0.142	-0.381	0.252	<b>-0.496</b>

Extraction method: Principal component analysis;

Rotation method: Varimax with Kaiser Normalization.

Note: Statistically significant factor loadings in bold;

\* Pure loadings;

P: Participants.

When significant loadings were considered to be equal to or greater than 400, all the Q sorts loaded significantly on 9 factors (Table 3). The nine factors were produced and re-expressed as the “best

estimate” of the Q sort that represents them. The factors underwent further analysis through a ‘Weighting Calculations’ that merges the Q-sorts to produce nine reconstructed Q- sort grid. However, on the basis on their significant and pure loadings, four factors (1, 2, 3, and 5) were chosen and represented by item scores as shown in Table 4.

**Table 4.** Q Statements and item score (ranking) for Douala.

Statements		Factors			
		1	2	3	5
1	Waste is anything without value	-5	+2	+1	-5
2	Clear instructions are provided on how to compost my household waste	-2	-1	-1	-3
3	Doing what my parents think I should do is important to me.	+2	0	-2	-2
4	Doing what the municipal authority thinks I should do is important to me	0	0	-3	-4
5	I think recycling household waste is everybody’s responsibility	+1	-3	-4	-5
6	I think composting household waste is everybody’s responsibility	-1	-3	-5	+5
7	Diverting household waste away from landfill is important	+5	-1	0	+2
8	I am aware of the benefits of recycling	0	0	+2	+2
9	I am aware of the benefits of composting	+3	-5	+3	+3
10	I am aware of the price of compost.	-3	-4	+4	+4
11	I am aware of the existence of markets for compost.	-2	-1	+3	-1
12	I think that learning changes behaviour	+4	+3	0	0
13	I think that information and awareness campaigns change behaviour	+5	+4	0	0
14	Active and effective participation in curbside recycling schemes is good	0	+1	-2	-3
15	Incentives to encourage recycling are important	-2	+1	-2	-4
16	I think home composting has economic and environmental benefits	+3	+1	-3	-3
17	I am aware of the role of community based organizations in composting	-1	-2	-4	-1
18	I am aware of the role of municipal councils in waste collection and disposal	+4	-3	-5	-1

Table 4. Cont.

19	I think public /private partnership is good in waste management	+2	-5	+4	-2
20	I buy organic food when I can	0	-4	+5	0
21	I buy goods with the minimum of packaging when I can	-4	-4	+5	+1
22	Incinerators should be located far away from the population	-3	-1	+2	-1
23	I have great passion for a clean environment	+4	+1	+1	0
24	I think recycling is a moral obligation	-3	-1	-1	-1
25	I think junk mail is wasteful	-5	0	-3	-1
26	I know how to compost household waste	0	-1	0	-2
27	I think a community composting scheme is necessary	+2	-2	0	-2
28	I re- use plastic bags when I can	-1	-3	-1	+1
29	We need to develop new waste management technologies	+1	0	+2	-1
30	I think second hand goods are better	-3	0	+1	+1
31	I prefer using recycled paper	-4	-2	0	+1
32	I would recycle more if I was aware of the benefits	-1	+1	-1	+2
33	I would compost more if I was aware of the benefits	+2	-2	-2	+5
34	I would recycle more if provided with free recycling bin	+1	+1	-1	+3
35	I compost more if provided with free compost bin	+1	+2	-2	+1
36	Over-consumption is wasteful	-4	0	+2	0
37	I would compost more if I am taught	+2	-1	+3	0
38	Bad smells discourage composting	-2	-2	+3	-2
39	Recycling is a personal decision	+2	0	+4	-4
40	I do think I should be told by municipal authorities to compost my waste	0	+1	+1	-3
41	Encouraging people to pay as they throw will prevent throw away	-1	+4	+1	+2
42	Recycling is time consuming	-3	+2	0	+4

**Table 4.** *Cont.*

43	Composting is a dirty activity	-1	+3	+1	+3
44	Composting will stop the waste problem	+1	+2	-1	+2
45	Legislation can help the waste problem	+3	+3	-3	0
46	I do think waste is a resource	0	+2	-4	0
47	Discouraging fly tipping can help the waste problem	0	+3	+1	+1
48	Composting is the responsibility of women	-1	+4	-1	+1
49	Avoiding compost made from peat can help the environment	+1	+5	+2	+3
50	I think the participation of youths in composting is a moral obligation	+1	+5	0	+4

By convention, only (unrotated) factors with eigenvalues greater than or equal to one (Table 5) are significant and retained for further analysis [8]. A factor or item score for a statement is an average of the scores given to that statement by all of the Q sorts associated with the factor, and it represents distinct attitudes easy for interpretation [1].

**Table 5.** Total variance explained.

Component	Initial eigenvalues			Extraction sums of squared loadings			Rotation sums of squared loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.893	16.308	16.308	4.893	16.308	16.308	3.685	12.283	12.283
2	4.065	13.549	29.857	4.065	13.549	29.857	3.422	11.408	23.691
3	2.783	9.278	39.135	2.783	9.278	39.135	2.224	7.413	31.104
4	2.052	6.841	45.976	2.052	6.841	45.976	2.180	7.266	38.370
5	1.941	6.469	52.446	1.941	6.469	52.446	2.109	7.030	45.400
6	1.708	5.695	58.141	1.708	5.695	58.141	2.040	6.801	52.201
7	1.403	4.676	62.817	1.403	4.676	62.817	1.921	6.403	58.604
8	1.267	4.225	67.041	1.267	4.225	67.041	1.869	6.229	64.832
9	1.185	3.949	70.991	1.185	3.949	70.991	1.848	6.159	70.991

Extraction method: Principal component analysis.

Based on the factor score, Q methodology can reveal the main shared viewpoints on a particular subject but cannot provide information about the proportion of the population that adheres to it. Notwithstanding, the differences between two or more factor scores helps identify which statements have some degree of common ranking and the degree of disagreement between the factors [5,17].

### 3.2.5. Factor Interpretation

In interpreting the factors, statements that receive the most negative (-5, -4) and most positive (+5, +4) were identified. Nevertheless, it is perfectly possible for a single factor to have both positive and negative significant loadings as shown in Factors 3, 4, 5 and 9 (Table 3). This is known as a ‘bipolar’ factor. This bipolarity implies that two diametrically opposed viewpoints are being expressed by the participants who load on such a factor, each viewpoint having a factor exemplifying item configuration which is the ‘mirror-image’ of the other [6].

### 3.2.6. Post Sort Interviews

While Q does not directly give an indication of the relative strengths with which the various discourses are acted upon by the population, the discourses identified can be related back to the individuals participating, to give at least an impression of what likely adherence there is in a wider population to each discourse [9]. It is for this reason that post sort interviews were carried out to provide insight into people’s viewpoint of household waste and their apparent role in managing it [14].

## 4. Results

In this study, Principal Component Analysis (PCA) was used to reduce the data set into a more manageable size while retaining as much of the original information as possible [35]. With PCA, each participant had an equal opportunity to cluster to any one of the factors (see Table 3). The research found a majority of the participants clustering on a sub-set (factors 1, 2, 3 and 5) of the nine factors. In an attempt to identify some key elements which can be interpreted to show the difference between the components, these four factors (sub-set of the nine factors) were chosen for further discussion (see Table 4). In naming the factors, factor one ‘environmentally concerned information seeker’ has a number of variables associated with measures relating to the acquisition of information pro-environmental behaviour (S12, S13) and green lifestyle (S7, S23). A similar approach was used in naming the other factors.

### 4.1. Factor 1, ‘Environmentally Concerned Information Seeker’

Factor 1 had the largest number of statistically significant loaded participants (7 with 4 pure loadings) (see Table 3) and described as a majority discourse. It had 12.3% of total variance as shown in Table 5. Analysis of the viewpoint was done using reconstructed Q sorts corresponding to Factor 1 as shown in Table 4.

#### Discourse from factor 1

Discourse 1 is characterized by a strong support for a clean environment “greens” (S23). In this light it acknowledges strongly the role of municipal authorities in achieving a clean environment (S18). Landfill is considered the last option in the waste management hierarchy and as such the

discourse strongly supports the diversion of household waste from landfill (S7). The discourse holds strongly that learning, information and awareness campaign are important drivers to behaviour change (S12, S13). Transcripts from post sort interview with the university lecturer and waste expert indicated that:

*I was amazed when informed of the formation of a Community Initiative Group (CIG) by the unemployed wastes management graduates. The aim is to raise awareness and build capacity, generate income, fight unemployment and solve the problem of social exclusion in Cameroon. The major problem is with the acquisition of a permanent piece of land and planning permission for the composting of the biodegradable waste. The success story is that households are willing to pay £2 a month.*

Transcript, from another post sort interview indicated that:

*Cameroonians are prepared to go “green” but need assistance with regards to advocacy, capacity building, information and education (formal and informal). A waste expert at a waste management company was asked to find out the possibility of financial and technical assistance to the CIGs and the transcripts indicated that:*

*We are interested to work with any group or organization that are duly registered and recognized by the municipal authorities. I hope they get in touch with us in the future to discuss their projects. We are prepared to help but must be convinced they have already begun with the ground work.*

#### 4.2. Factor 2, ‘Pragmatist’

Factor 2 had 5 statistically significant loaded participants with 3 pure loadings (see Table 3). It had 11.4% of total variance as shown in Table 5. Analysis of the viewpoint was done using reconstructed Q sorts corresponding to Factor 2 as shown in Table 4.

#### Discourse from factor 2

Discourse 2 strongly acknowledges the role of gender in composting as there is gender bias. Post sort interviews revealed the cultural underpinnings attached to this belief. Research highlighting gender differences to risk perception [36] has tended to conclude that women typically report higher levels of concern about environmental and technological hazards in the management of household waste compared to men [37].

A distinguishing feature of this discourse is the strong support of youth participation in composting as a moral obligation. According to Inglehart [38], younger people are more environmentally aware and active than older people but the reasons for their passivity in recycling could be linked to prioritizing other areas of their lives rather than waste management. There was also a very strong agreement on information and awareness campaigns (S13) in influencing behaviour change. According to Davies [39], the relationship between communities and governments (local and national) could be improved through a two way communication, enhanced information provision and more transparent ways of working together. Similar findings also emerged from studies of waste management planning in the UK highlighting successes in decision making and policy implementation [40].

#### 4.3. Factor 3, 'The Concerned Consumer'

Factor 3 had 5 statistically significant loaded participants with 1 pure loading (see Table 3) and a 7.4% total variance as shown in Table 5. Analysis of the viewpoint was done using reconstructed Q sorts corresponding to Factor 3 as shown in Table 4.

##### Discourse from factor 3

This discourse is characterized by concerns of over consumption. It highlights waste minimisation and recycling (S21 and S39) as positive attitudes in household waste management, in line with [41]. The discourse believes strongly that recycling is a personal decision (S39) and individual actions count. Notwithstanding, it considers public /private partnership an important aspect in sustainable waste management (S19). Although the discourse emphasizes having a strong knowledge for compost, it strongly disagrees with the fact that community based organizations play a role in composting.

#### 4.4. Factor 5, 'Inactive Composter'

Factor 5 had 4 statistically significant loaded participants with 3 pure loadings (see Table 3) and a 7.03% total variance as shown in Table 5.

##### Discourse from factor 5

The discourse is very sceptical when it agrees (S6) that composting is everybody's responsibility and disagrees strongly (S5) that recycling is everybody's responsibility. By agreeing strongly that recycling is time consuming (S42) and the strong belief that composting activity can increase only if the benefits were known (S33) makes factor 5 a passive or inactive composter or recycler. Notwithstanding, neutral statement (S12), emphasizes the role of learning in changing behaviour. The discourse also disagrees, although not strongly, that composting is the responsibility of women.

The discourse (S1) strongly disagrees with the fact that waste is anything without value. However, there is a strong feeling of the benefits of recycling (S8) as well as a strong belief that learning (S12), information and awareness campaigns (S13) change behaviour. As (S11) strongly disagrees with having any knowledge of the existence of compost markets or price for compost, it only goes to support the fact that the municipal authorities have an important role to play in this domain. According to some researchers [42,43] this should involve:

- 1 The identification and characterization of actual and potential compost users;
- 2 Determining their attitudes, experiences and perceptions towards the use of compost;
- 3 An analysis of farmer ability and willingness to pay (WTP) for compost as a resource;
- 4 The need for a Contingent Valuation Method (CVM) to value the total economic benefits/costs associated with an environmental good such as compost.

## 5. Discussion

In Q methodology, subjective input produces objective structures yet Q methodological interpretation is essentially constrained by and can always be checked against the subjective input of the participant group [6]. The accurateness and value of the produced interpretations can also be verified via a second source by asking significantly loaded participants (see Table 3) to comment upon them. Post sort interviews were also conducted to highlight participant's viewpoint of household waste and their role in managing it [14]. Although such interpretations are intended to communicate a 'shared' viewpoint, they need not provide a conclusive picture of a participant's own opinion [6]. Nevertheless, according to Barry and Proops [29], information from Q can support environmental policy making in two ways:

- 1 Identify for policy makers the ways environmental issues are perceived by various groups. Policies directed towards any such commonly shared concerns would be likely to receive good social and political support and be effective.
- 2 The identification of divergent and consensus views in the population, would suggest what policies would be likely to receive support.

The research found a majority of the participants clustering in Factors 1, 2, 3 and 5, highlighting participants concerns, opinions and beliefs. The revealed attitudes and behaviour in the management of household waste in Douala are represented by four factors (as a sub-set of the nine factors) as shown in Table 4. Consensus and divergent views in recycling and composting was in many cases linked to the socio-geo-demographic characteristics of the participants as indicated Tables 2. However, this does not necessarily translate into participation in recycling initiatives because other factors such as economic incentives and absence of 'visible' recycling centres can limit participation in recycling initiatives. Therefore education must be complemented by direct incentive [44].

According to Evison and Read [45], education, publicity and promotion are fundamental for the success of any recycling scheme. Quality promotional material on a regular basis is required, including regular leaflets to help maintain public awareness. However, little information exists on the quantitative effects that various information and promotional campaigns have on recycling behaviour because most campaigns are not adequately monitored long-term to assess the sustainability of any increased recycling behaviour [46].

The core promotional strategies used so far have been based around rewards (which are not successful if they are withdrawn) and prompts (such as persuasive verbal or written messages), where impact depends on the credibility of the source. They argue that negative messages or personally relevant messages tend to work best and that feedback is infrequently used in recycling literature to date. In this regard Tucker and Speirs [46] recommended three classes of educational materials:

- 1 Newsletters and media campaigns on pro-recycling attitudes and composting;
- 2 Specific information/ awareness campaigns (reminds the public to put out bins on certain weeks);
- 3 Personal letters- these reinforce the idea that every individual's action counts.

With regards to pro-recycling attitudes, Tucker and Speirs [46] requested residents to accept personal moral responsibility for waste as well as being aware of the fact that landfills are running out of space hence the need to divert waste away from them (S7). This will however, require an active and

effective participation in recycling and composting. Notwithstanding, some researchers [47-50], look at the main reasons behind the non-participation, “the less concern” in recycling and composting. They recommend guidelines for an audit to be undertaken in a given area before designing collection schemes.

With regard to the factors influencing consumer behaviour (S20 and S36) the consumer preference model acknowledges the role of information in allowing consumers to make ‘rational’ choices [51]. Placing more emphasis on information and communication can help change paradigms, to reduce the information breakdown, and to improve information asymmetries between producers and their consumers [51]. However, there are rather two restricted points of intervention in the model, for policy-makers seeking to achieve social goals. They:

- 1 Must ensure that consumers are provided with the necessary information to make realistic choices;
- 2 Must adjust private costs and benefits to reflect the existence of social costs and benefits that may lie outside the realm of individual choice [52].

The initial results show that it created awareness. The results of this research were used to design a five year pilot project (2009-2013) [53] via a low-cost method for composting household organic waste. This will involve education and capacity building in third sector organizations in Douala and Limbe. Third sector organizations (27 in Douala and 13 in Limbe) will be provided with 200 used computers on a rolling basis to provide online information to producers and sellers of compost in targeted areas to drive the market for compost for use in agriculture in the local catchments. The existing computers will be replaced with 200 more after 2-3 years.

## 6. Conclusions

The result shows a strong concern for a clean environment and the belief that learning, information and awareness campaign are important drivers to behaviour change. However, this does not necessarily translate into an increased participation in recycling or reuse initiatives because other factors such as economic incentives can hamper participation rate. It is for these reasons that this work recommends robust actions by key agents in Cameroon to:

- 1 Identify and remove barriers to education, publicity and awareness campaigns. This must be written using Cameroonian experts. This is what authorities must do in Cameroon for their public;
- 2 Stimulate and promote frequent and effective understanding through information to a range of groups such as schools and women’s institutes in Cameroon;
- 3 Foster increased participation in reuse through supporting recognition and promotion and link to possible rewards (not just financial ) to increase performance;
- 4 Provide training and education for key stakeholders as they design new approaches.

This work using Q methodology examined behavioural trends in household waste management in Douala, Cameroon. But despite the fact that Q methodology has proven useful in the analysis of people’s subjectivity, the impact of cultural issues on recycling and composting behaviour should in future be investigated to provide a holistic and general overview of household waste management practices in Cameroon and Sub-Saharan Africa.

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