Environmental Security and Megacities: An Application of Q Methodology

Charis Gerosideris
Department of Humanities and Social Sciences,
Prince Mohammad bin Fahad University, Al-Khobar, Saudi Arabia

Abstract

Cities impact on the environment was always been visible and a serious matter of issue. Megacities or megaregions, with the overcrowding population and the uncontrollable destruction of the natural environment due to economic growth and the need of mega-amounts of energy, have not only regional but a global environmental impact. Even if the concept of environmental security is not yet well defined and properly promoted as the proper environmental protection security mechanism, it is more than ever appropriate to be the problem-solver and practical solution of the unmanageable and irresistible environmental disruption in megacities. This paper establishes and analyses the perspectives of two megacities’ inhabitants such as Cairo and London with the aims to understand the public’s needs and viewpoints and find out reasonable solutions of the megacities impacts on the environment. By applying Q methodology (a new research method for security studies) in two concepts such as megacities and environmental security, we open the discussion on the sensitive topic of ‘mega environmental crisis’ with the view of encouraging the further concentrate at the solutions in the subject matters. The purpose and motivation of this paper is to provide a brief overview of Q methodology and the connection between environmental security and megacities based on the impact that the last ones have on the environment and the solutions coming directly from the people living in these megacities.

Keywords: Climate Change; Development; Egypt; Environmental Security; Megacities; UK

1. Introduction

During September 2020, the world experienced the biggest and more intense fire in history in California’s megaregion (including the megalopolis/mega cities of Los Angeles, San Francisco and San Diego) having an immediate and direct effect in the daily lives of a population of 50 million people only in the US, named as megafire, (Kaur Harmeet, 06/10/2020) which is a term with no accurate and specific scientific definition. The attempt of NASA’s study to define the term megafire focused on the connection ‘between climate change and almost a century of fire exclusion, forest fires have become more extreme in size,
severity, complexity of behaviour and resistance to extinction. These fires are commonly referred as megafires and are at the extremes of historical variations’ (Joelle Zask, 2016). This linkage of climate change and forest fires explaining the reason why almost all the megafires have taken place during periods of extreme pollution, heat, drought, high temperature and human pressure. The megacities have been observed as large urban areas affecting in significant scale the environment in numerous studies and undoubtedly contributing over the air pollution (HTAP, 2010). For many years, megacities are not only seeing as large areas for huge economic growth and activity but also into mega hotspots of uncontrollable environmental-natural destruction.

In this paper the discussion briefly examines the reasons why environmental security is important concept of controlling the impact of megacities on the environment. Then the impacts of megacities on the environment is approached by explaining different issues and cases from different in terms of characteristics megacities such as London and Cairo. The last part of this analysis presents the application of Q methodology in security studies for those that they are not familiar with it and the perspectives of the people living in these two megacities examined in this study. Finally, there is a brief discussion suggesting ways of using environmental security as a policy related mechanism based on people’s viewpoints and needs on megacities’ environmental protection.

This study focuses on the hidden discourses of environmental security and megacities such as Cairo and London. Additionally, it evaluates the application of Q methodology as an especially useful tool of approaching megacities and environmental security related topics. It is really useful as it establishes perceptions of the people living in these megacities and it also starts the discussion based on the impact that the city has on the environment with the aim to disclose the most policy and practical related solutions. As the topic is enormous and immense and there is a limitation in terms of the space of presenting this research study, the topic tries to remain brief and somehow sketchy as the hope and aspiration of this study is to contribute in the direction of explaining the impact that the megacities have on the environment, in the direction of finding solutions within the environmental security context and in the direction of boosting the further interest of applying Q methodology in similar security topics.

Theoretical Framework

Megacities’ Impact on Environment

Megacity is an exceptionally large city, typically with a total population in an excess of 10 million people. A metacity is a metropolis containing more than 20 million people. For example, Tokyo is the largest metacity as it has 38 million people, Shanghai has 34 million people, New York has 23, Cairo has 19,128,000 and London has 13,842,667 million people (UN, 2011). The largest cities in the world have been labelled ‘megacities’ (UN, 2018) and they are urban agglomerations exceeding ten million inhabitants. The high population density and large number of businesses and productions facilities not only turn these megacities into hotspots of economic activity but also into large sources of pollutants that impact on their and our environment. Emissions to the atmosphere of trace gases and aerosol species such as carbon dioxide (CO2), nitrogen oxides (NOx), and volatile organic compounds (VOCs), ammonia (NH3), sulphur dioxide (SO2) and black and organic carbon (BC, OC), arguably, prominent by-products of human activity in megacities (Gerd A. Folberth, et al, 2014). These emissions of greenhouse gases and pollutants impact both, the composition of the atmosphere and the climate.
Megacities can affect the environment in several ways. The population consumes food and energy and produces waste in solid, liquid, and gaseous forms to sustain themselves and pursue business activity such as manufacture or services (Gerd A. Folberth, et al, 2014). Due to the exceedingly high population density in many cases neither food nor raw materials or energy can be produced locally. Consequently, additional impacts on the environment occur through transportation of goods and waste products in and out of the cities (Akimoto, 2003; Heald et al, 2003). The impact and its extension can be expressed in various forms of footprints reaching from the local to the regional and even the global scale (Gerd A. Folberth, et al, 2014).

Large agglomerations of human population and production facilities can have several severe impacts on the environment. Arguably the most important and most far-reaching impact of megacities is on the atmospheric environment (Gerd A. Folberth, et al, 2014). The extensive size and complexity of megacities give rise to enormous social and environmental challenges. Whether megacities can develop sustainably depends to a large extent on how they obtain, share, and manage their energy and material resources (Gerd A. Folberth, et al, 2014).

Most of the human activities that they take place in megacities produce plenty of waste products because of industrial and energy production or transportation and residential heating. Megacities are having almost 10% of the entire human population and that makes them also huge sources of waste production and atmospheric pollution. As consequence of these human activities, megacities are emitting a lot of greenhouse gases and atmospheric pollutants as well as carbon dioxide that they have an enormous impact on the climate. These emissions coming directly from megacities ‘would be responsible for a global average annual mean warming of 0.2K over the next 100 years’ (Gerd A. Folberth, et al, 2014). Briefly and superficially, megacities play an important role in the mega-environmental crisis that the world is facing as they are major pollutants and they need immediate solutions and policies to tackle their environmental issues and their impacts on the environment as well.

**Megacities of Cairo and London**

All the megacities are massive pollutants and having gigantic impact on the environment. Cairo has all the problems and challenges as a megacity as a developing country has. Most of the problems that Cairo has are starting from its huge population (around 19 million people). It is necessary to consider that every year 1.25 million people are adding extra to the already huge population of Cairo! All the citizens of Cairo and this every year expansion of population as well, are putting extra pressure on the already unsustainable environment as they definitely need access on water, dispose their waste, houses, energy and of course ways to travel (Marshall, 2006). In other words, Cairo is facing not only infrastructure issues but serious environmental destruction and pollution problems and some of the most serious public safety issues as well. However, Cairo is struggling to add and have, parks, new roads, subway, sewer system, waste management, fresh water and protect the already damaged environment. The city has tremendous problems with the sewer system as it is incredibly old (built by the British during World War I) and it is flooding the streets with raw waste quite often (Marshall, 2006). Additionally, due to the extended atmospheric pollution

---

1 There are three different types of footprints: the ecological, the dispersion and the chemical footprint. For more details see: Gerd A. Folberth, Timothy M. Butler, William J. Collins, Steven T. Rumbold, 2014. Megacities and climate change- A brief review, Environmental Pollution 203 (2015) 235-242, Elsevier.
and because of climate change heavy rains are also flooding the streets of Cairo for days creating many issues, such as power cuts, water cuts and of course killing a considerable number of citizens every year. Cairo was built alongside the River Nile. The river itself played a fundamental role in the further development of the city as it was crucial for expanding the population, the agricultural and industrial growth, and any kind of cultural, social, and economic expansion. The ancient Egyptians were protecting three resources of the environment such as the water, soil, and air. They protected the River Nile itself in that extent as they believed that if someone pollutes the river will not enter paradise (El-Sheekh M., 2009). However, there are at least three different sources of pollution that affect the river/water which are depending on human activities such as population density, industry, sanitation systems and the social and economic conditions in the countries of the basin (El-Sheekh, M., 2009). The River Nile gets pollution from all the countries alongside the river and especially from industrialized areas (Cairo is the most industrialized city of the Nile) and as a result the industrial wastewater, oil pollution, municipal wastewater and agricultural pollution contribute ‘heavy metals, pesticides, herbicides, and microbes to the water which also affect the health of the biosphere and poison humans’ (El-Sheekh, M., 2009). As a conclusion of this analysis, Cairo not only destruct the environment and the river which could affect the relationships or could lead into violent conflicts between the countries or megacities alongside the river but it also poison humans and it contributes to the overall global environmental change. Due to add more on the reader’s understanding of the extend of the River Nile’s pollution in Cairo, the researcher took some pictures as extra empirical evidence on megacities impact on the environment during his academic and research stay in the region for more than a year.
This research study is also targeting London, the only megacity of Europe, to compare the differences between these two megacities. London is one of the most important global cities as it is one of the most powerful and largest financial centres of the world with 12-14 millions of population. London is standing alongside Thames River which of course it is making it vulnerable to flooding (UK Environmental Agency, 2006) and major pollutant of the river as it is happening in the case of Cairo. However, London has a history on air pollution as it has started a record from 1700 and it is linked to the industrial growth of the city and ‘strongly linked to negative health impacts, and even premature death’ (Ritchie Hannah, 2017). According to the Mayor of London (2020), ‘London’s rivers are polluted as only one out of 41 river water bodies is classified as good- three are bad, five are poor and the rest are moderate under the EU Water Framework Directive’ which means that the rivers in London are not healthy and the species struggle to survive as well. In comparison to Cairo’s water pollution, London’s water pollution is treated as an individual responsibility of misconnections\(^2\) and road runoff\(^3\) (Mayor of London, 2020). However, the megacity of London has accepted its impact on the environment as a result of its economic growth and human activity and it tries to become the first sustainable megacity of the world with many different environmental and climate adaptation methods. Even if there is an acceptance of the environmental destruction in London area it does not mean that there are no impacts or pollution on the environment. Here there are some pictures to prove that the environmental destruction is huge, and that London needs a lot of effort and plenty of time towards being an example of a Green or sustainable megacity.

\(^2\) For more details see: [https://london.gov.uk/what-we-do/environment/climate-change/climate-adaptation/water-quality](https://london.gov.uk/what-we-do/environment/climate-change/climate-adaptation/water-quality)

\(^3\) For more details see: [https://london.gov.uk/what-we-do/environment/climate-change/climate-adaptation/water-quality](https://london.gov.uk/what-we-do/environment/climate-change/climate-adaptation/water-quality)
As megacities in general and Cairo and London in particular are great pollutants and they have an enormous impact on the global and regional environment due to human activity, security concept needs to find out immediate and practical solutions on protecting the environment and the public safety as it is presented as the only responsible concept.

**Why Environmental Security and Megacities?**

Security studies address the ‘political and social realities’ of the world and ‘create the structures and processes by which humankind lives or dies’ (Booth, 2005) and confirm that this characteristic of security presents a fundamental part of why security is an important need in human life. Even if there is not an agreed definition of environmental security, according to Critical Security Studies/Copenhagen School, ‘environmental security is about relationships between human activity and the planetary biosphere’ (Buzan, 1998, 7). Environmental security is the environmental viability for life support, with three sub elements: preventing or repairing military damage to the environment, preventing, or responding to environmentally caused conflicts, and protecting the environment due to its inherent moral value.

Environmental security is based on a very problematic/unclear theory which is the securitization theory. Critical security studies in the process of widening and broadening security and including new threats outside of the orthodox security thinking have highlighted the necessity for securitizing an issue or a threat as ‘a more extreme version of politicization’ (Buzan et al, 1998, 23). By securitization, the critical security studies mean ‘what in language theory is called a speech act’ in which a threat becomes a security issue ‘not necessarily because a real existential threat exists but because the issue is presented as such a threat’ (Buzan et al, 1998, 24). An ‘issue is securitized only when the audience accepts it as such’ and not necessarily during an actual discussion (Buzan et al, 1998, 25). Therefore, as Krause and Williams (1997) have noticed, ‘the concept of security is not empty’ as it includes five sectors which have been named as result of this securitization process. These are the Military security, Political security, Economic security, Societal security, and Environmental security.

There are many different theories and perspectives of analysing the concept of environmental security. One of the most important theories is the well know ‘ecological theory’ which links security and environmental change as result of human activity (Barnett, 2007). The strongest link between the environment and security is based on environmental degradation as it acts as a threat to human security and all life on earth (Barnett, 2007). This impact on the environment is a result of ‘civilian and military activities, ecology and the natural environment which should be protected from human activities’, which lead to enormous environmental
disasters (Graeger, 1996; Gerosideris, 2019). Therefore, ecological theory connects environmental destruction with violent conflict implying that this environmental change could lead even friendly or peaceful countries to violent conflicts/wars as a consequence of the resource management absencia (Gerosideris, 2019; Graeger, 1996). Additionally, ecological theory linked environmental degradation and security as security has the protection mechanisms such as ‘predictability, control, military forces, etc’ able to face issues such as ‘environmental migration and securing the state’ (Graeger, 1996). Furthermore, environmental security is ‘the proactive minimization of anthropogenic threats to the functional integrity of the biosphere and thus to its interdependent human component’ (Barnett, 1997) and/or ‘the relative public safety from environmental dangers caused by natural or human processes due to ignorance, accident, mismanagement or design and originating within or across national borders’ (Glenn et al, 1998). According to Barnett (2007), ‘the ecology theory is on the periphery of the environmental security thinking’ as it challenges and shapes the security thinking and ‘it is the reason for action from individual and national interests related to a concern for the overall welfare of the entire social ecological system of the planet’. It is obvious the need to bring ecological theory in the centre of environmental security thinking as it is targeting the impact of human activity on the environment. However, ecological theory has to exempt from any relationship with realistic or neo-realistic approaches (state-centric perspectives) and connections and it has to focus only on the environmental and ecological protection of the biosphere from the environmental destruction caused by human activity. Due to answer the crucial question why to connect environmental security and megacities, as it has been presented so far in this paper, environmental security as it has been defined by the ecological theory is the only security solution to tackle the evident and significant human made impacts of megacities on the environment. Ecological theory of environmental security seems to have all the answers on the megacities’ impact on the environment as it suggests to use the security mechanisms as tools to protect the environment and the cities from the anthropogenic activities that have created these issues. Finally, environmental security defined by ecological theory it brings predictability, control even military forces into the environmental destruction that megacities have created with the aim to protect the environment from the human activities that the are able to not only destroy the environment but to create violent conflicts or even wars between two megacities or countries based on any kind of environmental pollution.

The Application of Q Methodology in Environmental Security and Megacities

Traditional Methodological Approaches

In the field of security studies, ‘there is no one specific approach or methodology for studying the various and complicated phenomena and issues concerning the filed’ and this is the reason why most of the security analysts do not focus on their research method (Gerosideris, 2019). Traditional or non-traditional theories of security have been adopted by the security analysts and support their study by usually developing new theories to answer the essential questions in their studies. According to Sowerby (2018), in security studies ‘theory defines methodology in so much as it provides the framework for thoughts on the topic under consideration’. In other words, security analysts do not ‘intensively or primary focus on the methodology, as theory in security studies explain the methodology and provide the security framework for analysis’ (Gerosideris, 2019). Nowadays, security studies include more referent objects and new hazards in a movement of broadening and deepening the security term and the ‘very notion of a state-centric world’ (Fierke, 2007; Vogler, 2011). In order to include new threats for the field such as environmental destruction, diseases like SARS-CoV-2, terrorism, HIV, etc, new sophisticated and non-state centric theories and methodologies to study the disciple of security are more than necessary. ‘Critical security studies’ try to feel this gap based on criticising the
‘non-historical or ahistorical’ traditional problem solving theories as on its own is a historical-based theory taking into consideration past and future historical changes (Cox, 1981).

However, as Robert Cox (1981) mentioned, ‘theory is always for someone and for some purpose’ and as he explains even if critical security studies seem to try to deepen and broaden security outside of the state-centric approach it does not successfully doing it. These contrary theories bringing their problematic of meaningless defining security (Krause and Williams, 1997) into other security concepts such as environmental security, energy security, health security, etc.

Due to the economy of space, this study is not going into the details of this debate between the problem-solving and critical security theories\(^4\). However, one of the main issues is that the traditional and critical ways of reaching security have not allowed the politicians, the NGOs, the stakeholders as well as the academics to directly connect the impact on the environment with security and conflict. There are specific new methodological roots which have to be followed by the security studies with the aim to answer the raised questions and to include the perceptions of these people that leave in Megacities and to unify the academic and non-academic community against a common problem, like climate change, environmental destruction, any kind of environmental pollution, water pollution, etc. Due to answer the raised questions and feel this gap, this research study is suggesting the use of Q methodology as the solution for environmental security and megacities.

**Q Methodology**

This research study has applied Q methodology as it is a mixed-method, which is “commonly (and incompletely) known as the Q-sorting technique” (McKeown & Thomas, 1988). Q methodology is a research method of deriving the “human subjectivity” of a specific topic (Cross, 2005; McKeown & Thomas, 1988). Q methodology has been used as a very successful attitudinal research of bridging the gap between quantitative and qualitative applications in social discourses as it creates patterns of perspectives of certain groups of individuals and it utilizes the factor analysis as a statistical technique of allocating the range of these groups’ discourses (Barry & Proops, 2000).

Discourse in the lexicon of Q methodology simply means ‘a mode of communication’ or ‘a way of seeing and talking about something’ and this methodology has a remarkable way of collating and correlating perspectives in order to extract hidden discourses from the data which have been held by these groups of people (McKeown & Thomas, 1988). ‘Conversations, commentary and discourses of everyday life’ on a specific topic provide the basis for this particular research, which have been mentioned as the ‘flow of communicability’, which is known as the ‘concour’ in the Q-sorting technique (Brown, 1993).

In practice, Q methodology, aiming to be applied, uses six steps\(^5\) and these steps has been followed by this research study as well:

- Identification of the areas of discussion and the certain groups of individuals, in which the researcher wishes to focus on.
- A sample of the relevant participants share his or her viewpoints on an important issue with the investigator who is able through these interviews to collect series of statements raised by these participants and not by him or her.
- The statements selected by the researcher to use them in the Q Sorts (set of statements ranked by the participants)

---


• Q-sort ranked by the participants on the scale ‘Most agree with’ to ‘Most disagree with’. Each Q-sort ranked by a participant is an individual Q-sort.
• These Qsorts extract through statistical analysis (factor analysis) few ‘typical Qsorts’ known as Factors which include the common sense of the several individual Qsorts.
• The researcher interprets verbally the Factors in order to get the social discourses out of statistical analysis. Finally, these discourses symbolize a new and actual way of seeing the world.

Q methodology has many reasons for being the recommended research method of human subjectivity for many studies. Q requires only a small number of participants which is a corresponding reason of applying this research method in this research topic because it is interesting in people living in Megacities such as Cairo and London and a large number of citizens was not reachable. This research method provides specific techniques available on a small research budget, as it needs only a computerized statistic program and basic knowledge of research statistics. Moreover, it is a sophisticated methodology and it has been used in many different fields of analysing subjectivity with the view to informing efficiently the policy-makers and the academics on perceptions/opinions/attitudes on real matters which are also key issues of proposing this research method for this study as it seeks to bridge the gaps between policy-makers, academics and megacities’ inhabitants.

Q methodology has some limits as it is not indicating the individuals who hold these viewpoints if they are affected by their age, gender, or race (Barry & Proops, 2000). This research focuses on establishing the perceptions of inhabitants of megacities in relation to environmental security. Additionally, it has as its main aim to understand how the academic discussion on environmental security and the megacities impact on environment influence their viewpoints. This was the target of this research study and it has been achieved by applying Q methodology in environmental security and megacities.

KenQ Analysis versus PQMethod
This research study is using instead of the PQMethod6 program the KenQ Analysis7 program to analyse the results. KenQ Analysis program is a new free online program which is easy to use and you do not need to be an academic statistical expert in comparison to PQMethod program which is very old fashioned program and difficult to use and it requires to know DOS and be an expert with statistics. The problem of using KenQ Analysis instead of PQMethod is that KenQ is not yet accepted in the Q community and further in the wider academic community as it is relatively new, and it is not widely tested. However, even if PQMethod is considered much more sophisticated, accepted and tested as a program, the suggestion here is to use both programs and try to find out if there are any statistical differences or errors and create new and clear results only from KenQ Analysis program. By using the results only from KenQ Analysis program we are introducing and establishing a new sophisticated program for analysing the Qsorts. This study gave the opportunity to work more on this transition and move from the traditional Q-sorting technic to an online version of Q-sort8. As this research contacts people from two different continents not only countries it seems a lot easier to use and create an internet-based Q-sort instead of a traditional-offline one.

This research study is adapting what Jeffares and Dickinson (2016) has designed ‘a new online tool that it is engaging, comprehensive, methodologically grounded, inclusive’ as well as ‘ compatible, secure, engaging, user friendly and adaptable webtool’ such as POETQ9 due to create the statements and the

6 http://schmolck.org/qmethod/downpqwin.htm
7 https://shawnbanasick.github.io/ken-q-analysis/
9 http://poetqblog.blogspot.com
individuals Q sorts. This online tool in the case of this research study includes a process of sorting a set of statements related to environmental security and megacities of Cairo and London.

2. Discussion and Results

This research study is providing a unique example of applying Q methodology on environmental security and megacities by explaining the ways of doing it online (using POETQ and KenQ) and finding out policies and security solutions on the megacities’ impact on the environment. Due to collect the necessary details about the megacities of Cairo and London interviews were conducted with citizens from both regions (8 in total, 4 from Cairo and 4 from London). The statements were generated from the literature review, the diverse opinions on the discussion around the topic and the conducted interviews and that is the concourse of this study. There were collected 340 statements and the researcher selected 48 statements excluding those statements that there were more general in terms of environmental destruction/climate change or overlapping the examined topics. Some examples of statements are ‘Our city is operating under high sustainable/green standards’ and ‘Environmental protection mechanisms are not useful for the city’. Statements of this study consider the pollutions of air, water, and soil as well as environmental security issues threatening the megacities of Cairo and London. By using the POETQ, the participants (20 citizens in total, 10 from Cairo and 10 from London) sort the 48 statements selected by the researcher and then the created individual q sorts entered into KenQ and PQMethod in order to compare the extracted factors and if there is any statistical error or completely different factor from the factor analysis (usually by person centroid factor analysis). The results were completely the same (2 Factors) proving that KenQ is highly significant sophisticated program and it has to be tested even more in many other studies to convince that it is valuable and respected tool for Q methodology as PQMethod is.

The established perspectives of environmental security and megacities (Cairo and London) are composited in two factors. The first perspective: ‘Environmental Protectionists of the City’ is including all of these viewpoints of these participants (15 out of 20 are significantly associated with this factor) who are asking for protecting the water or air of the city from the human activity which pollutes them. The most agree statements of this factor are ‘Environmental security to protect the environment from the human activity’ and ‘Economic growth of the city is destroying the natural environment (air, water, soil) of the city’ explaining the need for environmental protection from the concept of environmental security but in the way of the ecological theory has defined it. This factor is suggesting the need of changing the megacities economic development as well as our environmental security thinking into more sustainable and environmental-centric perspective. The second perspective ‘Against Population Growth of the City’ is having all these opinions of these participants (5 out of 20 are associated with this factor) who are thinking that the uncontrollable population growth of the city is responsible for all the types of environmental destruction. The most disagree statements played a vital role in creating the dominant perspective of this factor as there are focusing on population’s environmental impact on the megacities, such as ‘Population growth is not responsible of destroying the natural environment of the city’ and ‘The millions of people living in the city do not create or pollute extra the water, air and soil. The economic development is destroying the nature’. It is quite significant to mention that all the participants associated with this perspective are citizens of Cairo as in this megacity there is every year a population growth of almost 2 million people. This factor is suggesting that the mega-population of the cities is responsible of polluting the environment and these participants associated with it are asking the limitation of people living in the city due to protect the environment.

The article provides the ways of connecting environmental security and megacities by applying Q methodology to open a useful discussion for how policymakers and practitioners should protect the environment based on inhabitants’ viewpoints. Policies for environmental protection of megacities’ natural environment could be tested and developed based on asking the opinion of the people living there. In most
of the cases these public perspectives are suggesting radical solutions of how to protect the environment, that the stakeholders are not willing to focus on, as they are against the economic growth or the known ways of living.

3. References


