WHAT SHAPES YOUNG PEOPLE'S CONCERNS ABOUT WATER-USE RESOURCES? THE CASE OF HO CHI MINH CITY, VIETNAM

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ABSTRACT

The climate is changing and, accordingly, changes in water quality, quantity and availability for human and other uses are observed and projected. Despite recent advances in climate research, great uncertainty remains concerning how and when the climate will change and how these changes will affect the supply and demand for water. Beside climate-induced uncertainties, rapid urbanization is one among other socio-economic and political factors that influence water supply and demand. Since the public are the primary beneficiary of water supplies and the first to experience the consequences of water quality and quantity degradation, relevant water-related information from the ground is crucial for decision-making regarding water use. In addition, young people play an important role in development as they are identified as one of the major stakeholders, with the right and responsibility to participate in decision-making for sustainable development. Through an online survey using Qualtrics, conducted in a rural–urban transition area in District 7, Ho Chi Minh City (Vietnam), targeting young people living and studying in this district, this study focused on understanding two dimensions of young people's concerns about recent water quality and quantity changes in urban and peri-urban areas: perceived climate risks and experienced urbanization impacts. The research findings showed that although young Vietnamese people believe in climate change and the climate risks that affect water availability, they are more concerned about inadequate water management policies and the health risks associated with water pollution resulting from unsustainable urban development. The result implies that governmental institutions need to be more aware of water quality issues and develop appropriate policies for water-use resource management within the context of climate change and rapid urbanization. In addition, the engagement of youth participation in public policy should be enhanced in order to promote active citizenship and the empowerment of future generations in order to engage them in sustainable development governance.

Keywords: climate risks, urbanization impacts, sustainable development, public participation, water policy, Qualtrics survey.

1 INTRODUCTION

The climate is changing and, accordingly, changes in water quality, quantity and availability for human and other uses are observed and projected [1]. Despite recent advances in climate research, great uncertainty remains concerning how and when the climate will change and how these changes will affect the supply and demand for water [2]. Beside climate-induced uncertainties, rapid urbanization is one among other socio-economic and political factors that influences water supply and demand [3], [4]. In the context of balancing the needs of development with the needs of protecting the environment and natural resources, many countries have long struggled with the planning and management of water resources amid growing populations and resource use, as well as widespread ecosystem and environmental degradation.

Water, the most challenging issue of our times, has been paid much attention by worldwide scientists, planners and communities. Research outcomes suggest that the integration of public recognition and concerns for water-use resources into water planning and management decision-making would help to address the complex, interdependent,

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interdisciplinary nature of water challenges (e.g. [5], [6]). Since the public are the primary beneficiary of water supplies and the first to experience the consequences of water quality and quantity deterioration (e.g. [7], [8]), reliable and relevant water-related information from the ground and the participation of the public and stakeholders is crucial and critical for decision-making regarding water use. Public perceptions of changes in water resources affect the public's thought processes and responses to the perceived risks of water-use resources. The success of water-use management is often predictable based on the public concerns that are strongly influenced by public perceptions and experiences of impacts, as well as opinions of management and governance.

Vietnam is considered one of the countries that will be severely affected by climate change. Modified rainfall patterns are already affecting average levels of river run-off and the annual distribution of peak flows both in high- and low-lying areas [9]. Moreover, in low-lying areas, groundwater levels are estimated to be depleted considerably by the next decade due to both overexploitation and decreased natural groundwater recharge during the dry seasons. The Vietnamese Ministry of Natural Resources and Environment reports that in several southern areas of Vietnam, groundwater levels may decrease by some tens of meters, compared to the current level, if the flow of the rivers decreases by 15–20% in the dry season [10], [11].

Within the context of a changing climate, Vietnam has been also experiencing rapid urbanization and industrialization process. Population growth in the two largest cities of Hanoi and Ho Chi Minh City (HCMC) and their surrounding suburbs has accelerated, leading to the growth of urban water demands and aggravated water pollution and scarcity. Many rural, agricultural areas have become industrial and residential areas, and water resources previously used for agriculture and environmental systems have been transferred to urban systems. Therefore, water-related problems induced by rapid urbanization have become one of the key concerns for the public and for the constraints in urban management and planning by the local government [12].

Since the public are the primary beneficiary of water supplies and the first to experience the consequences of water quality and quantity deterioration, reliable and relevant water-related information is crucial and critical for decision-making concerning water-use. And young people play an important role in development decisions as they are identified as one of the major stakeholders in this area, with the right and responsibility to participate in decision-making for sustainable development.

This study aims to understand young people's perceptions and concerns about changes in water-use resources that would support the sustainable development of water policies, including synergies and trade-offs, taking into account public concerns about urban planning and potential climate change impacts. The specific objective of the study is to assess two dimensions of their concerns about recent water quality and quantity changes in urban and peri-urban areas: perceived climate risks and experienced urbanization impacts.

2 THE LOCAL CONTEXT

HCMC is the main metropolitan area in Vietnam. It is located in the south of Vietnam and is part of the large Mekong River Delta. It is the most attractive cities of the country, with the greatest number of migrants from rural areas in Vietnam [13]. In the last 20 years, HCMC has experienced rapid population growth and urbanization. In 2010, the city's official population was 7.1 million people (General Statistics Office of Vietnam), but the actual population in 2010 was 9.6 million people [14] due to the high level of unregistered rural–urban migration and the spread of settlement, housing and industry beyond official statistical boundaries (Fig. 1). The built-up area of HCMC has increased at a rate of 4.8%,

and 66% of urban expansion and 50% of population growth occurred in peri-urban communities between 1990 and 2012 [15]. HCMC and the surrounding provinces are the region that host nearly half (45%) of the overall manufacturing production of the country.

Furthermore, because of its large population, HCMC will be negatively affected by climate change. The observed data show that annual rainfall and precipitation extremes in HCMC have a generally insignificant increasing trend in the 1980–2013 period, concurrent with heavy rainfall and flooding [17]. And according to the future projection, in 2050, millions of people in HCMC will be at increased risk from regular and extreme climatic events such as floods, droughts and tropical storms according to the projection [18]. Table 1 reports the numbers of people that were directly affected by flooding in 2007 according to the observed data, and those that are expected to be affected by flooding by 2050 according to projections with the high-emission scenario.

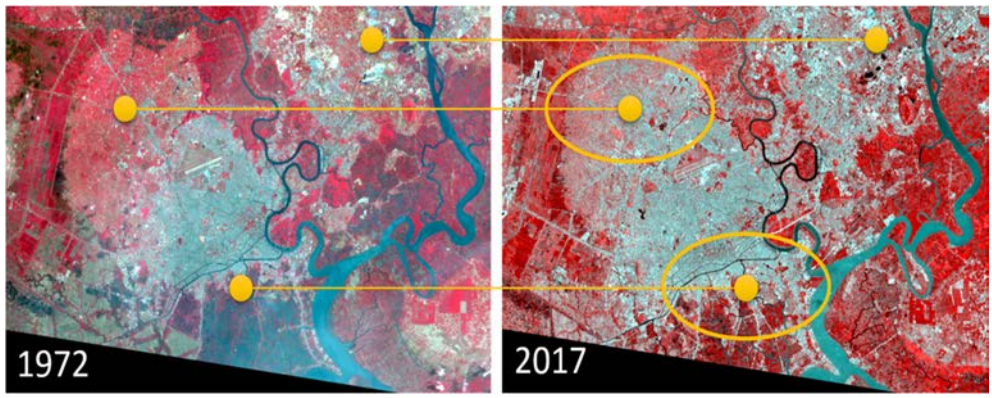

Figure 1: HCMC urban development from October 1972 to February 2017. Within the circles two urban zone which experienced major development within the time span. On the left, the satellite image acquired by Landsat MSS the 22nd October 1972, FCC-RGB 321. On the right, Landsat 8 acquired the 14th February 2017, FCC-RGB 543.

Table 1: Population directly affected by flooding in 2007 and projected numbers for 2050 (high emissions scenario). *(Source: Asian Development Bank, 2010.)*

2007 (observations)				**2050 (projections)**			
Regular flood		Extreme flood		Regular flood		Extreme flood	
N	%	*N*	%	*N*	%	*N*	%
958	15	690	26	10,246	49	128,861	62

3 RESEARCH METHODS

The study was designed through an online survey using Qualtrics online surveying tools. The survey targeted young people living and studying in the District 7 of HCMC to understand two dimensions of youth concerns about recent water quality and quantity changes in urban and peri-urban areas: perceived climate risks and experienced urbanization impacts. District 7 is a rural–urban transition area and it was established in 1997 from rural communes of Nha Be district. Agriculture was the main economic sector in the area, but today it is a place of important converging industrial zones, international universities, schools, shopping malls, etc. The survey link was mainly sent to Ton Duc Thang University, the largest university located in the centre of district. The survey was administered completely online. It was conducted over two months in 2017, with three emails sent to participants (an invitation email to the survey and two reminders). Most of the questions used a Likert scale from which the participants chose their answer; the Likert scale is a popular method used to measure attitudes and behaviours from one extreme to another (e.g. strongly disbelieve to strongly believe).

Descriptive statistics were used for data analysis to understand youth's beliefs about climate change, their perceptions of urbanization impact, as well as their concerns about water-use resources in both quality and quantity. Chi-Square analysis was used to explore the differences in young people's beliefs concerning climate change, their perceptions of urbanization impacts, and concerns among different youth groups (e.g. gender, fields of study, and original hometowns).

4 RESULTS

4.1 Demographics

The respondent demographics are summarized in Table 2. An almost equal percentage of male (41%) and female (42.2%) respondents voluntarily participated in the online survey. Although the survey targeted young people, the survey link was sent to everyone that was working and studying at the selected universities, and, surprisingly, nearly 83% of students were aged between 18 and 30. This implies that young people, especially people come from the fields of social sciences, public health and environmental sciences and technology, have a high level of concern about environmental issues.

4.2 Young people's beliefs about climate change and perceptions of urbanization impacts

Respondents highly believed in the occurrence of climate change and its effects on fresh water resources in HCMC, as well as the risks to human lives. They also strongly agreed that urbanization created negative impacts on the environment (Table 3). Most of the respondents homogenously believed that the climate is changing and that climate risks affect water resources in HCM. However, there were significantly different perceptions of the urbanization impacts among groups of genders, original home towns and fields of studies. More male than female respondents were likely to perceive the issues associated with loss of buffer zones, forests/rice fields, increased flood peaks, storm water run-off and degradation of aquatic habitat structure. This can be explained by the fact that the majority of male respondents study or work in environmental technical fields; therefore, they have more practical knowledge and observational experience of the environmental changes. In contrast, more female than male respondents perceive that many vegetated areas have been replaced with residential or industrial areas. There are also significant differences among respondents from different fields of study in some statements. In particular, the majority of

respondents who studied in the field of water supply and drainage techniques perceived that many vegetated areas have been replaced with residential or industrial areas, loss of buffer zones, forests and rice fields, and increased flood peaks and storm water run-off because they have more observational and practical experience with the issues.

Table 2: Baseline demographic characteristics of the respondents to an online survey on public perceptions of water-use resources in Ho Chi Minh City (n = 1073).

	N (%)
Gender	
Male	440 (41.0%)
Female	453 (42.2%)
Did not respond	180 (16.8%)
Age group	
18–30	888 (82.8%)
31–40	3 (0.03%)
Did not respond	182 (17.0%)
Professional job	
Student	889 (82.9%)
Lecturer/researcher	2 (0.02%)
Administrative staff	1 (0.01%)
Other	1 (0.01%)
Did not respond	180 (16.8%)
Respondents' home town	
Ho Chi Minh City	380 (35.4%)
Surrounding and nearby provinces	172 (16.0%)
Other parts of Vietnam	340 (31.7%)
Did not respond	181 (16.9%)
Fields of study/work	
Social Science and Public Health	253 (23.6%)
Water Supply and Drainage	98 (9.1%)
Environmental Sciences and Technology	411 (38.3%)
Other sectors	37 (3.4%)
Did not respond	274(25.5%)

Table 3: Young people's beliefs about climate change and their perceptions of urbanization impacts (5 Likert-scale answers: strongly disagree, disagree, uncertain, agree and strongly agree).

			Chi-Square					
	Mean	SD	Gender		Different original home towns		Different fields of study	
			X^2 (p-value)	df	X^2 (p-value)	df	X^2 (p-value)	df
Climate change beliefs								
Climate is changing globally	4.85	1.64	10.57 (0.060)	5	11.37 (0.329)	10	22.6 (0.093)	15
Sea level is rising in HCMC	4.25	1.51	4.79 (0.442)	5	7.74 (0.654)	10	24.78 (0.053)	15
Climate change now affects fresh water resources in HCMC	4.65	1.59	4.22 (0.517)	5	13.44 (0.200)	10	18.89 (0.219)	15
Climate change now poses risks to human lives in HCMC	4.90	1.66	9.31 (0.970)	5	12.35 (0.262)	10	15.86 (0.391)	15
Urbanization impacts								
Many vegetated areas have been replaced with resident or industrial areas	4.60	1.66	**12.71* (0.026)**	5	4.26 (0.935)	10	**29.20* (0.015)**	15
Loss of buffer zones, forests and rice fields	4.48	1.61	**12.45* (0.029)**	5	9.14 (0.518)	10	**36.19** (0.002)**	15
Increased flood peaks and storm water run-off	4.34	1.60	**19.04** (0.002)**	5	11.06 (0.353)	10	**31.08** (0.009)**	15
Less water in the stream, stream erosion and widening	4.30	1.58	9.62 (0.087)	5	10.51 (0.397)	10	19.20 (0.205)	15
Increased pollutants and water contamination	4.80	1.73	9.85 (0.079)	5	11.06 (0.353)	10	15.72 (0.400)	15
Degradation of aquatic habitat structure	4.65	1.69	**13.03* (0.023)**	5	12.68 (0.242)	10	14.43 (0.493)	15

*95% significance ($p < 0.05$).
** 99% significance ($p < 0.01$).

4.3 Young people's concerns about water use quality and quantity

Respondents had a high level of concern about both water quality and quantity. However, they were concerned more about water quality and the water-related health risks associated with rapid urbanization (e.g. organic and inorganic substances and microbiological and biological organisms). Although they were concerned about how water quality issues could create more conflicts and inequities in water access and illegal unregulated groundwater withdrawal, they were more concerned with increased water prices and the costs of treatment, and female respondents were more concerned than males (Table 4).

Table 4: Young people's concerns about water-use resource quality and quantity in Ho Chi Minh City (4 Likert-scale questions: 1 = not concerned; 2 = somewhat concerned; 3 = concerned; 4 = very concerned).

			Chi-Square					
			Gender		Different original home towns		Different fields of study	
	Mean	SD	X^2 (p-value)	df	X^2 (p-value)	df	X^2 (p-value)	df
Water quality								
Increased organic and inorganic substances	3.427	0.758	4.15 (0.246)	3	7.24 (0.299)	6	7.92 (0.541)	9
Increased microbiological and biological organisms	3.329	0.816	3.28 (0.350)	3	7.49 (0.278)	6	4.83 (0.848)	9
More health risks for households (water-related diseases)	3.717	0.566	6.53 (0.088)	3	5.55 (0.474)	6	8.27 (0.506)	9
Water quantity								
More conflicts and inequities in water access	3.199	0.866	1.51 (0.678)	3	2.24 (0.896)	6	16.04 (0.066)	9
Illegal unregulated groundwater withdrawal	3.113	0.857	2.88 (0.410)	3	5.35 (0.499)	6	5.74 (0.765)	9
Increased water prices and costs of treatment	3.6	0.691	**19.04* (0.000)**	3	8.48 (0.205)	6	7.88 (0.545)	9

*99% significance ($p < 0.01$).

5 DISCUSSION AND CONCLUSION

The study was designed to explore whether the beliefs and perceptions of the younger generation in the main metropolitan area of Vietnam shaped their concerns about water quantity and quality, and whether their experience affects their beliefs and perceptions. The results showed that most young people believe in climate change and perceived the urbanization impacts on water resource quality and quantity. Although they strongly believe in climate change, they tend to be concerned more about water quality deterioration caused by rapid urbanization without sustainable water waste management planning. Their concerns are associated with their daily experience. Those who work/study in the fields of environment, health and social sciences tend to report more concern for water issues, because their knowledge background/past and present studies influence their interests. Similarly, those who have more technical knowledge tend to report better perceptions for urbanization impacts. The findings are linked with a number of previous studies which have argued that experience and knowledge are important factor-shaping perceptions and concerns regarding environmental quality [19]–[21]. This implies that there is a need to enhance environmental knowledge in young people, and boost their concerns and interests in environmental protection and sustainable water use and management, because water is a crucial issue for the whole society, not only for those who study and work in the field. There is also a need to call for more interests in interdisciplinary studies on water-related issues, especially from young people, and to disseminate the scientific results to the public.

Among the concerns about problems related to water quality and quantity, the younger generation in HCMC are most concerned with the associated health risks and the rising price of water and costs of treatment caused by water pollution and shortage, as result of unsustainable urban development. Although they are concerned about climate impacts that could induce uncertainty in water planning and management, they are more concerned about inadequate water management policies and unsustainable urban environment planning and management. Many studies (e.g. [22], [23]) have confirmed the same – that urban planning without the sustainable consideration of urban services (e.g. sewage disposal) can negatively influence water quality and increased water pollution, resulting in ecosystem and human health risks.

Although our survey targeted young people, the survey link was emailed to all people studying and working in the selected university for the survey. Surprisingly, nearly 83% of the respondents were students aged 18–30. The survey helped us understand the link between young people's beliefs and perceptions and the levels of their concerns about water quantity and quality, thus supporting public policies to address water quality problems in this city. The result showed that young people perceived clearly the urbanization impacts on water resources, and that they have high levels of concern about urbanization-related water problems. This implies that governmental institutions need to be more aware of water quality issues and develop appropriate policies for water-use resource management within the context of climate change and rapid urbanization. In addition, youth participation in public development policy should be enhanced in order to promote active citizenship and the empowerment of future generations to engage them in sustainable development governance.

Although the online survey covered a large sample of 1074 respondents, several limitations to this study must be acknowledged. Firstly, there is likely some bias in respondents' answers because they may not have been fully truthful with their answers, and/or they may have not really thought the question through carefully before answering. Secondly, the survey didn't reach young people who have lower education levels and/or worked in the manufacturing industry, agriculture, fisheries, and other sectors. It could be

helpful to replicate the study with a wider coverage of youth population in the future in order to ensure that the results are robust, reliable and generalizable.

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