

The Flint Water Crisis:
A Case Study on Flint, Causes of the City's Downfall,
and the Need for New American Infrastructure

by

Samir Qattea

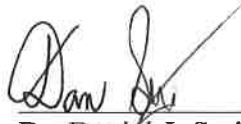
A thesis presented to the Honors College of Middle Tennessee State University in partial
fulfillment of the requirements for graduation from the University Honors College

Fall 2019

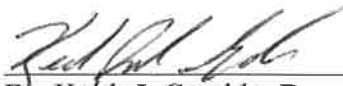
The Flint Water Crisis:
A Case Study on Flint, Causes of the City's Downfall,
and the Need for New American Infrastructure

Samir Qattee

APPROVED:



Dr. Daniel J. Smith, Project Advisor
Economics and Finance



Dr. Keith J. Gamble, Department Chair
Economics and Finance



Dr. Mary A. Evins
University Honors College

To the people of the world, who changed my mind.

To my friends, who filled my life.

To my family, who provided everything along the way.

ACKNOWLEDGEMENTS

This thesis is primarily the result of the collective efforts Dr. Daniel Smith, who was my thesis advisor for the entirety of this research, and myself. For his generous guidance, critical scrutiny, and analytical advice, I must extend my most sincere gratitude to him. He has consistently provided me with the resources necessary to bolster the strength of the research herein, while simultaneously pointing out where improvements should be made. His contributions to this project have served as a cornerstone for refining many components of it. And for that, I am immensely grateful.

Also, I would like to thank my family for providing me with the support and confidence to complete this project. I would not be the same person without all of you. Lastly, but certainly not least, I would like to thank the many fellow members of the Honors College, both staff members and students, for collaborating with me in reading and revising this project. The level of support allocated by this phenomenal collection of individuals has been unparalleled in my academic experience. Thank you all so much.

ABSTRACT

This research project is an investigation of the central causes that led to the condition of the city of Flint, Michigan, as of 2019. Based on the central causes, it is imperative to stress the need for an improved infrastructure in the United States of America. Provided in the research is an analysis of the primary events, such as the important governmental decisions, environmental conditions, and socio-political dynamism, that led to the collapse of Flint's systems. The methodology used is that of a case study, specifically an analytic narrative. The primary cause of the Flint Water Crisis is the water source switch from the Detroit Water and Sewage Department to the Flint River, which was done to save the city money. The research herein can be applied to find solutions, as well as develop preventative measures for similar situations in the future. The research for this paper is imperative as a contribution to the relatively recent incident. Given the significance of the event, the included information is relevant to the general public as it raises awareness of the circumstances that made possible the rapid undoing of an organized system. If a reader becomes informed of the Flint downfall and therefore takes steps toward avoiding a similar tragedy in the future, this project will have accomplished a necessary duty to the public.

LIST OF ILLUSTRATIONS

Section I: A Background and History of Flint

Figure 1.1. Environmental Kuznets curve	7
Figure 1.2. Map of water resources	13
Figure 1.3. Analysis of constituents of the Flint River water	14

Section II: The Economic Deprivation

Table 2.1. Flint's crime statistics	17
Figure 2.1. Flint's labor force and employment data	19

Section III: The Pivotal Moment

Figure 3.1. Lead levels in other Michigan cities	25
Table 3.1. Principal symptoms found from lead poisoning	28

TABLE OF CONTENTS

Dedication	i
Acknowledgements	ii
Abstract	iii
List of Illustrations	iv
Methodology	1
Introduction	2
Section I: A Background and History of Flint	6
The Industrial Revolutions	
Environmental Abuse	
History of Business	
Section II: The Economic Deprivation	16
The Slippery Slope	
Internal Tension	
The Natural Monopoly	
Section III: The Pivotal Moment	22
Departments and Authorities	
A Set Stage	
Crumbling	
The Ongoing Lead Crisis in America	
Conclusion	30
Bibliography	32

METHODOLOGY

The procedure for analyzing material is similar to that of a case study, specifically called an analytic narrative. An analytic narrative will suit this project most appropriately as compared to other methods due to the strictly objective structure of information alongside illustrative models. This approach combines rigorous analytical theory with historical research methodology. In the book *Analytic Narratives*, this methodology is outlined clearly. The approach is defined as one that “pays close attention to stories, accounts, and context. It is analytic in that it extracts explicit and formal lines of reasoning, which facilitate both exposition and explanation” (Bates et al. 1998, 10). Simply put, data are accumulated and then reasoned with.

To incorporate this methodology, I will first determine the appropriate information to include with respect to the concerns of the public. This will be done by ensuring quality sources, identifying the pivotal issues, and researching in order to answer the key questions from multiple angles and with a variety of perspectives. Data will be gathered according to the relevant studies that are published. The gathered information will serve to answer the implied questions a reader may consider throughout the thesis. Then, argumentation will be presented to fairly determine an objective and consistent account of the events in Flint.

Lastly, outlying opinions of researchers may be provided to allow the reader to determine which narrative is appropriate for answering concerns. To draw all the main ideas together, a brief conclusion will be implemented at the end. If a graph, diagram, or statistical information of another form is necessary, it will be inserted either above the item as a table or below the item as a figure.

INTRODUCTION

Flint is a city that is situated to the east of central Michigan. Its history is engaging and as such, there is much to be known about its past. One of the engaging facets of Flint's history involves the industries that contributed to its early success. Accounts of the events will begin with its inception and shift to the modern water crisis. Genesee County, the county that encompasses Flint, was organized in 1835 and then Flint was integrated as a city twenty years later in 1855. In early 2013, the city of Flint was preparing to alter its main source of water. Later, in the April of 2014, the city went through with the change: an event that marks the start of a mass lead-poisoning disaster that came to be known as the Flint Water Crisis (Dingle 2016).

Lead isn't an issue exclusive to Flint, however. There are "nearly 3,000 areas with ... recorded lead poisoning rates at least double those in Flint during the peak of that city's contamination crisis" (Pell and Schneyer 2016). This fact illustrates an urgent need for attention on this subject. Understanding the story behind the Flint water crisis is valuable in and of itself, and although the crisis is despairing in many respects, learning from the past and working toward an understanding of the phenomenon will enable educated decision-making to help avoid a similar tragedy in the future. As a whole, the crisis can be primarily attributed to the consequences of economic stress, environmental factors, and poor decisions from authorities.

The downfall may be traced back to the water source switch. To elaborate, the city switched its primary water source from Lake Huron and the Detroit River to the Flint River for the purpose of establishing self-sufficiency and negotiating leverage on water prices (Clark 2018, 11-15). This idea, which initially seemed beneficial, ended up further

plummeting the city into a trying economic regress, as well as deteriorating the water system to the point of dysfunction. Flint's economy had already been on the decline since 1980, when General Motors was abated (CNN 2019).

There were several separate regulatory and governmental agencies involved in the crisis. The Michigan Department of Environmental Quality (MDEQ) is the state agency that oversees environmental quality of air, land, and water in Michigan. This agency highlights an important relationship between state and federal authorities, which played a principal role in the downfall of the city. The Detroit Water and Sewage Department (DWSD), now overtaken by the Great Lakes Water Authority (GLWA), was the primary piping provider for Flint prior to the water source switch. The Karegnondi Water Authority (KWA) is another important association because it was proposed as a way to provide water to Flint. It carries a treatment plant that cost \$72 million (Acosta 2017). Also, the Environmental Protection Agency (EPA) is an independent agency of the United States Federal Government for environmental protection. Each of these organizations has played a fundamental role in the Flint Water Crisis. The relationships between each of these associations is an integral part of the story behind the crisis.

Viewing Flint's situation in terms of economic vulnerability, in 2013, Flint was susceptible to economic regression. Prices of water were some of the highest prices in America. To add to the issue, Flint itself charged "for a separate connection fee to be on the water system" (Wisely 2016). Naturally, the frustrations of residents grew as prices increased. In the end, Flint became desperate for some kind of change (Clark 2018, 9). From this perspective, the crisis begins to emerge as a lurking danger. There are two

main reasons why the prices were so high. Firstly, the Detroit Water and Sewage Department was able to maintain a natural monopoly on water flow to Flint, Michigan. Secondly, Flint was motivated to generate its own revenue on water systems. Flint “had wanted its own water source since at least 1962” (Walsh 2014). As a response to these two incentives, the Karegnondi Water Authority was proposed as a solution to be put in place in 2010 as a new supplier of water from Lake Huron to Flint. The construction of the KWA was to start in 2013 and it was estimated to save the city about \$3 million in costs soon after establishment (Byron 2013).

Prior to the water source alteration, the city of Flint was paying the DWSD high prices for a regular water supply. Thereafter, Flint switched from the DWSD, which drew from the Detroit River and Lake Huron, to Flint’s emergency water supply, which is the Flint River. This switch was done as a way to save money until the construction of the KWA pipeline was completed. From considering the event, one can see that the crisis is partially a byproduct of the city’s efforts to produce a stable economy and become self-sufficient. During the transition from the DWSD to the Flint River, a delicate financial balance was shifting. At this vital time, any unexpected costs would be catastrophic for the city as a whole.

To make a bad situation worse, the water in the Flint River is corrosive, meaning it slowly deteriorates materials in pipes (Conway 2018, 63). The corrosive qualities of the Flint River have been caused by industries and people “dumping sewage, chemicals, and road salt in the Flint River for more than a century” (Carmody 2016). In order to mitigate ongoing corrosion, treatment plants are supposed to use an ester of phosphoric acid, called phosphates, and mix it into water to treat it (Goodnough et al. 2016). The

Dort Highway Plant is the treatment plant that was elected to clean the water for Flint. This plant, however, wasn't adequately prepared to handle the water with the necessary phosphates (Clark 2018, 17-23). Subsequently, corrosive water destroyed the pipes in the city, from the inside. The water distribution system crashed after this event. The details behind the historical events that dictated this outcome are important.

The delivery of lead to the homes of every resident in Flint became an immediate issue. Though it may seem that there are simple ways to reverse this effect, there is no easy solution. Even by switching the water source from the Flint River back to the DWSD water supply source, the problem still would not be fully removed. Even with a clean water supply, the water delivered to the households would still be contaminated since it is fed through corroded and damaged pipes.

In retrospect, the decisions that lead up to the crisis were practically preventable. To fully acknowledge the depth of the catastrophe, this project provides a history and background of Flint, it explains the economic deprivation of the city, investigates the pivotal moments leading to the crisis, and identifies the authorities involved as well as the repercussions of their collective actions. Additionally, this case study evaluates each of these institutions and in order to provide an accurate account of the circumstances that have led to Flint as it is today, in 2019.

SECTION I: A BACKGROUND AND HISTORY OF FLINT

The Industrial Revolutions

To properly conceptualize the modern crisis in Flint, an understanding of the historical events that have led up to the determining moments is required. Much of the environmental abuse within the Flint area, such as the water pollution, can be rightly attributed to the time following the American Industrial Revolution. This particular revolution was a byproduct of the Industrial Revolution in Europe. As a consequence, the influence of the European Revolution leaked into America afterward. The consensus for the starting date of the first revolution is generally agreed to be around the middle of the 18th century. The setup leading to Britain's revolution is thought to have been from 1760 to 1880, as a consequence of global contexts (Stearns 2018, 18). The events from this time outline some key components to the modern events in Flint.

The industrial revolutions maintain their names because of the nature of the advancements at that time. The mid-18th century was an exciting time, full of new ideas that eventually became inventions or even entire industries. However, by around 1860 or so, the new inventions had slowed down, which brought a halt, and eventually an end, to the Industrial Revolution. Progress was slow for a while but then, again in 1870, more new revolutionary ideas manifested, which brought life to a second wave of influence in the United States (Engelman 2015). This chain of causal inspiration seemingly had a ripple effect. The influence of the United States was then felt once again in Europe, causing what is colloquially known as the Second Industrial Revolution, but more formally known as the Technological Revolution. This second revolution came to an end by the start of World War 1 in 1914 (Engelman 2015).

It's important to recognize that these industrial revolutions occurred in tandem with the birth of Flint. For the sake of simplicity, the time frame that is relevant to the city of Flint and its pollution has to do with the half-century time period after the Second Industrial Revolution, when it wasn't uncommon for environmental abuse to occur. This kind of situation can be made sense of when considering a model such as the Environmental Kuznets Curve. This model loosely states that various indicators of environmental degradation tend to get worse as modern economic growth occurs until the average income reaches a sufficient point over the course of development. Simply put, this model suggests that people will naturally become more concerned for the environment as their income increases and they can afford to invest their care into the environment.

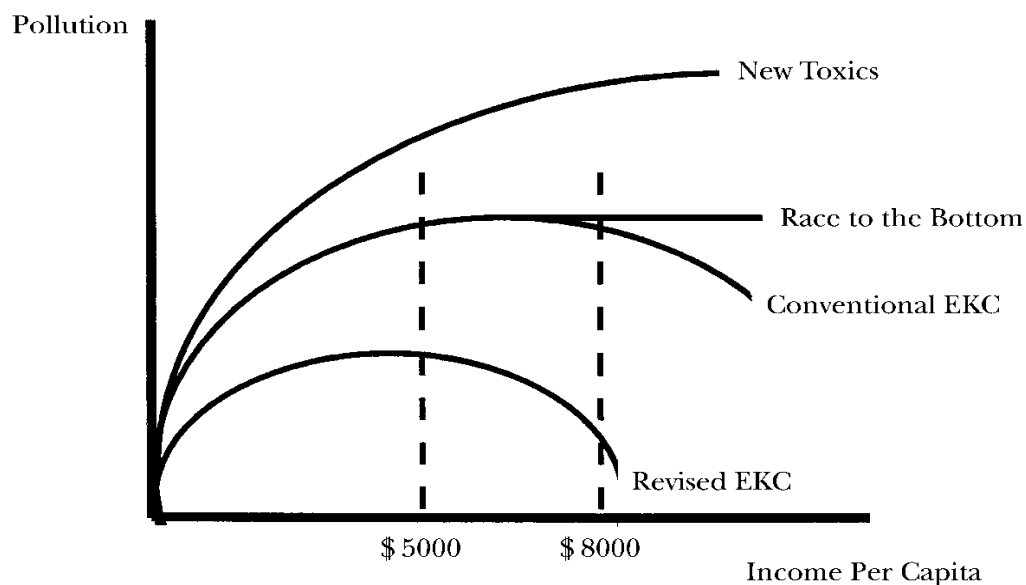


Figure 1.1 The data provide a general illustration of the environmental Kuznets curve given a variety of situations (Dasgupta et al. 2002, 148).

The implications of the curve may be despairing, but some evidence implies an, “optimistic view by suggesting that the curve is actually flattening and shifting to the left.” Translated, this means that less income is required for people to invest interest in

the environment. The primary motivator appears to be economic liberalization (Dasgupta et al. 2002, 153). Nevertheless, unmonitored usage of the environment, primarily for monetary gain, continued in Flint. As will be made plain, these revolutions are related to the Flint water crisis in many ways. Firstly, they provided the catalyst for new industries, which grew tremendously. The revolutions also ensured that some new technological advances and practices would become popular, without necessarily being ethical.

The industrial revolutions are pertinent to the world for many reasons, one of which is how beneficial they were for the health of people in the long term. For example, the American Industrial Revolution helped in reducing infant mortality rates in the following decades. Although at first, the revolution may have made some health issues worse, infant mortality rates dramatically reduced in the decades following the start of the revolution. This is likely due to the ideas from the time since the revolution “contained the seeds of a complete reversal of the infant mortality rate” (Infant Mortality and Life Expectancy 1999). To further support this notion, there is evidence that people “lived in housing that is today thought squalid, but was in fact an improvement on the pitiful country hovels they had lived in previously” (Pirie 2015). To substantiate the view that other benefits persisted, the “food was better and life expectancy began to rise” (Pirie 2015). In total, there were several benefits to the Industrial Revolutions. That said, there were also many costs associated with them. The environmental burdens, however, may have turned out to be too great.

Environmental Abuse of the Flint River

A calculation was published within a survey made in July 1959 by the Michigan Water Resources Commission that estimated that, “Assuming water pumpage in summer

at the Flint waterworks as 45 [million gallons daily], sewage-treatment plant operation at rated capacity, and no consumption or loss of water, about 20 [million gallons daily] of used water is discharged directly into the [Flint] river and its tributaries above the sewage-treatment plant” (Wiitala et al. 1963, E13). In addition to this comparably trivial waste disposal, there were other environmental abuses, which further proved to be detrimental.

In the time just before 1964, the Flint River was a recipient of pollution by means of industrial plants. For industrial plants, the byproducts of the manufacturing were generating chemical waste, alongside other environmentally disagreeable side effects. Typically, environmental abuse ranged from sewage effluvium to chemical effluent. Of these two, the chemical waste appears to have led to a greater detriment than the biological waste. The environmental issues accelerated until, “by the 1930s, Flint and the area around it had become an industrially polluted landscape probably as bad as anywhere in the world” (Rosner 2016).

The toxicity of the river culminated until even the fish couldn’t be eaten and were cast back into the river after being caught. The river bore such abuse that locals did not dare to approach it. People soon learned that, “It was too dangerous to eat anything from the water” (Clark 2018, 21). As a reaction to the toxicity of the water, in synergy with local flooding, many barriers were erected in the river in order to direct the river sections in downtown Flint. Though the intentions were to provide safety to locals while remaining navigable, the project actually ended up restricting the local people from the water entirely (Clark 2018, 21). Thereafter, a series of small dams that were erected in the river made routes highly limited.

The waste consisted primarily of sewage effluvia (human waste) and chemical effluent, both of which are substances of deleterious nature when paired with natural river water, particularly because several chemicals contribute to corrosive water. When in contact with lead piping, corrosive water will break down the inside of the pipes and deliver the water alongside the corroded material. One would think it is unnatural to intuit that the primary piping material should be lead when it is a known toxin to people but this discrepancy is easily understood when a presentation of timeline is clear for consideration. Lead was a growing concern as a dangerous element for biological agents during the Industrial Revolution, around the time when much of the foundations of American infrastructure were established. What is particularly interesting is, “While the acute effects of metal ingestion were well known, a full awareness of the chronic damages related to lead poisoning was ensured only in the 19th century” (Cesansa 2012). The ignorance of such effects during the Industrial Revolution, “increased the number of workers afflicted by chronic metal poisoning” (Cesansa 2012). It may be common knowledge for the modern person to be aware of the undesirable qualities of lead but this wasn’t commonly understood during the building of such piping structures and thus the blame falls entirely upon the collective incredulity and ignorance of earlier people, and not on their caution.

History of Business

Clearly, an issue of profound magnitude was set into motion by the industries surrounding the Flint area. The primary catalysts for the discrepancy were automobile industries. Another industry of recognizable influence was the timber industry, which was primarily based in urban areas (Wiitala et al. 1963, E5). Before the automobile

industry was in full gear, Flint industries were already using lumber for transportation. In 1900, Flint was the kingpin of a carriage-building industry, being able to produce some 150,000 vehicles every year (Crow 1945, 36). In the 1930s, 40s, and 50s, the automobile industry was booming, having demonstrated a significant hold on the consuming audience for transportation.

The automotive industry was highly prosperous near the beginning of the twentieth century. In the 1950s, this success was capitalized upon within the Flint area. Flint was the largest manufacturing complex of General Motors. The only city that Flint was beaten by was Detroit, at least in terms of the production of automobiles, auto parts, and auto supplies (Augustyn 2016). To elaborate on the new businesses in Flint, insight into the supply and demand of the products is helpful. The demand for the automobile industry rested primarily on the shoulders of the everyday customer. In a free market, there is a profit incentive for product or service suppliers to satisfy the demands of their consuming market.

The claim that manufacturing automobile products was one of the greatest contributing factors to the detriment of the Flint water is justified. The automobile businesses, as major money makers and one of the primary sources for jobs, allowed lead to become a widespread pollutant. Part of the reason why the abused was so terrible and prolonged was that the community of Flint benefited from ignoring the pollution problem. They were receiving high quality jobs, pensions, and health care benefits from the respective available careers in the area. The businesses used lead so often that, “By 1936, the car industry had become very dependent on lead. It went into their batteries and welding, paints, lacquers, enamels and other finishes, as well as the gasoline GM cars

depended on” (Rosner 2016). To further elaborate, “lead and other toxins were pumped into the air, water, streams, and ground in and around the mammoth car factories in Flint and other Michigan cities. It is unlikely that anyone living in or near Flint then—or today—could escape the impact of unrestrained pollution” (Rosner 2016). This insight into the demand for lead helps to paint a crystal-clear image of the expectations that were needing to be met in order for the automobile businesses to function properly and thrive.

Back in 1959 and before the Flint water crisis was ever an idea, much less a reality, an investigation was conducted, and a report was prepared on the types of assessments conducted by various organizations. Most of the data that are used in this report were collected over a period of many years for other investigations by the Geological Survey in cooperation with the Michigan Water Resources Commission, Michigan Department of Conservation, Michigan State Highway Department, and the U.S. Corps of Engineers. The following figures are compilations of information regarding records obtained at locations where data about chemical discharge, among other concerning factors, were collected. These tests were done in the general Flint area around the year 1963, more than half a century before the water crisis occurred.

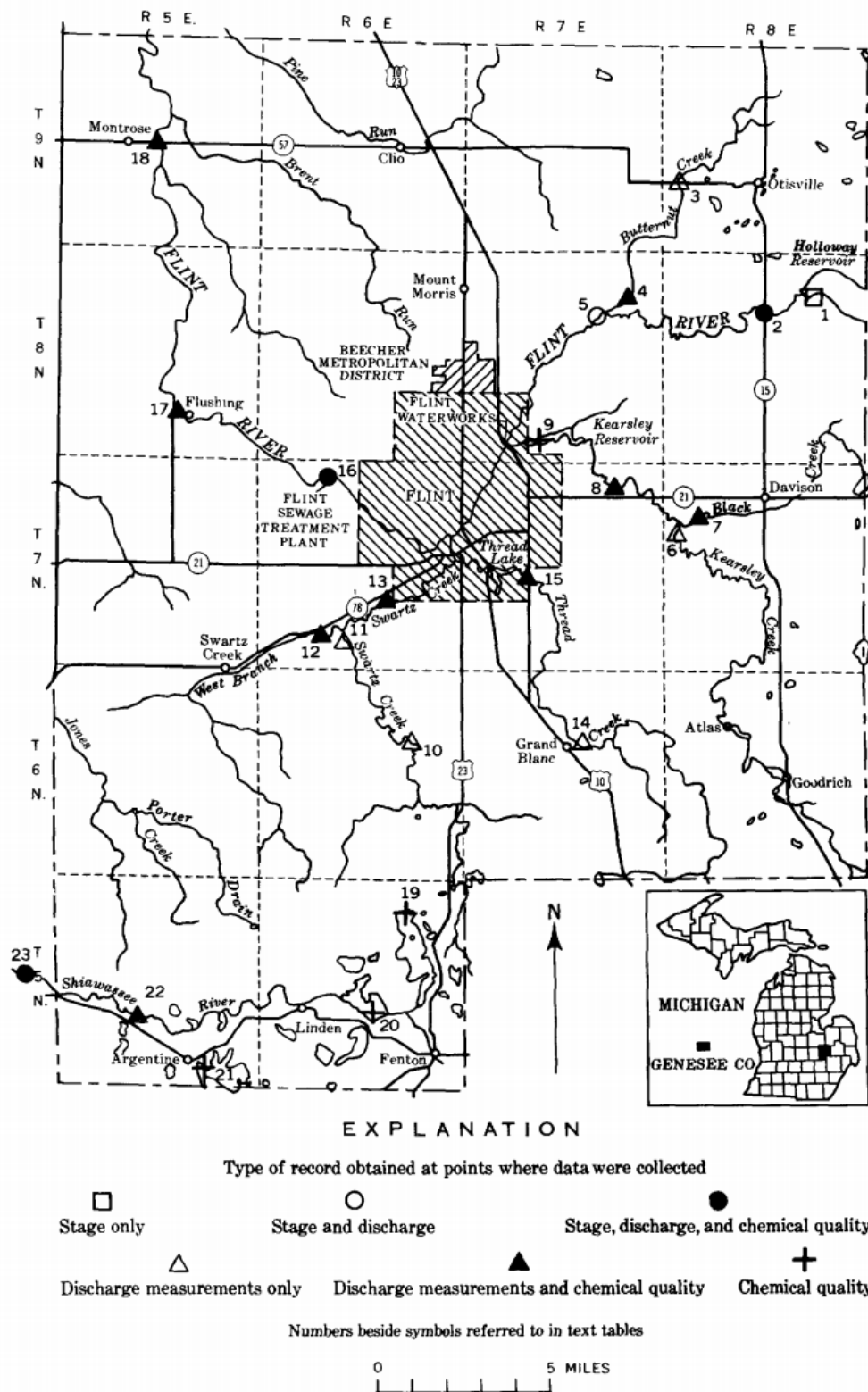


Figure 1.2 The data reflect the types of assessments done at their respective locations. Further detailing and explanation on the numbered locations is provided in Figure 1.3 (Wiitala et al. 1963, E4).

Chemical constituent or physical property	Concentrations or values in ppm or conventional units equaled or exceeded for percent of time indicated						
	5	10	25	50	75	90	95
Calcium.....	88	84	78	73	71	69	67
Magnesium.....	31	30	28	25	23	21	20
Total alkalinity (as CaCO ₃).....	265	258	244	229	213	199	190
Total hardness (as CaCO ₃).....	331	321	306	289	275	264	257
Noncarbonate hardness (as CaCO ₃).....	93	81	72	63	53	48	47
pH.....	8.6	8.5	8.4	8.3	8.2	8.1	8.0
Color.....	67	59	44	39	35	32	32
Turbidity.....	68	44	30	23	18	14	12

Figure 1.3 The collected information within this figure is representative of daily analyses made by the Flint Water Department from January of 1957 to December of 1958, providing a comprehensive look at the primary contributing constituents of the water from the Flint River (Wiitala et al. 1963, E24).

These two figures demonstrate some indispensable facts about the whole of the crisis story. Figure 1.1 displays a map of the Genesee County area as well as the testing that was performed on the river prior to the Flint Water Crisis. As the bottom key of the figure explains, there were several reports of chemical quality, discharge, and several other factors. The second figure, Figure 1.2, also displays information relevant to this topic. The information within this figure makes any set of chemical constituents that were in the Flint River during the sampling plain to see. By using both figures, the reader can come to understand what the discharge of differing regions may have been like prior to the crisis. It is important to note that there is no recorded lead in these samples. This is critical because these figures provide a level of explanatory scope as to what happened to the water quality as the pollution increased after the Industrial Revolutions. The lack of lead sampling implies that there is a general level of ignorance regarding just how dangerous the water quality was.

As stated earlier, Genesee County was organized in 1835. Flint was integrated as a city in Genesee County in 1855. From its inception, the population of Flint steadily

increased and it maintained a population of around 200,000 people in 1960. The contrast in the population sizes from then to now, in 2019, is stunning. Thirty years after 1960, the population decreased substantially, and the city contained only about 140,000 people. As of 2019, the population in Flint is now at a staggering 96,000 people, less than half of its previous population from 1960. Considering fairness in this information is important, and so it is fair to note that some of the Flint population has simply moved to surrounding areas. Though difficult to determine causal relations, there was a significant dip in population from 2009 to 2010. It may have been linked to a sudden spike in unemployment rates at the time.

During the population size decrease in 2009 and 2010, employment decreased about 5.9 percent while the population decreased 8.5 percent. As stated earlier, this is correlated data, which means one isn't necessarily the cause of the other. Each one of the causes of this population decline needs to be independently assessed as they are widespread and not necessarily represented in this sample. After the crisis began in 2014, there does not seem to be any positive evidence to indicate that the decrease in population is directly caused by, and therefore attributable to, the Flint Water Crisis. That said, the population in Flint continued to decrease from after 2014 until present day, in 2019.

SECTION II: THE ECONOMIC DEPRIVATION

The Slippery Slope

An economic deprivation is defined as a lack of the material benefits that are primarily considered to be basic necessities in a society (Socio-Economic Deprivation 2013). This term encapsulates the true horrors of the water crisis and also describes Flint's situation accurately. To elaborate, Flint is in an awful state of dependence for water. Throughout the years since the crisis began, there have been countless water bottles delivered to the locals' houses due to the poor supply of deliverable clean water. A district judge, named David Lawson, said in a preliminary injunction that officials must deliver at least four cases of bottled water per resident per week to any "Flint households that don't have properly installed taps" (Felton 2016). The ruling was estimated to cost about nine million dollars by state officials.

Clearly, the consequences of economic deprivation can be immense, as such a stress "reduces social trust and facilitates social disorganization, which in turn leads to youth violence and crime" (Seepersad 2016). This disorder may be evidenced by the fact that Flint continues to be one of the most violent cities in America (Engel et al. 2016). To be clear, these suggestions do not demonstrate that economic disparity in general leads to violence. Rather, some opinions regarding economic deprivation can provide a set of data that strongly implies a correlation between crime and financial desperation. Various statistics regarding the crime in Flint are outlined in Table 2.1.

Table 2.1 These statistics are largely based on the reports released by the Federal Bureau of Investigation (FBI). It is important to note that “In the event that crime data for this area are not available from the FBI, estimates are used. The estimates are based on demographic data including, but not limited to: home prices, income per capita and population density” (Flint, MI Crime 2017).

Statistic	Reported incidents	Flint /100k people	Michigan /100k people	National /100k people
Total crime	4,511	4,670	2,250	2,745
Statistic	Reported incidents	Flint /100k people	Michigan /100k people	National /100k people
Murder	37	38.3	5.7	5.3
Rape	104	107.7	70.6	41.7
Robbery	272	281.6	65.1	98.0
Assault	1,466	1,517.5	308.5	248.9
Violent crime	1,879	1,945	450	383
Burglary	961	994.8	357.8	430.4
Theft	1,397	1,446.1	1,245.7	1,694.4
Vehicle theft	274	283.6	196.5	237.4
Property crime	2,632	2,725	1,800	2,362

The relationship between economic depravity and crime should not be overlooked, nor overestimated. Understanding the association between these two phenomena underlines one of the most essential aspects of the social affect that the crisis has had on the city of Flint. The claim that a bad economy will necessarily increase crime is not justified, but there does seem to be a link between the two. Although a reasonable intuition may lead one to think there is a causal connection between the economy and crime, Lehrer denies this by saying, “there's little evidence to suggest that good economic times have much effect on crime” (Lehrer 2000). He further argues, “a bad economy doesn't always bring more crime” (Lehrer 2000). These ideas provide some level of contrast to Seepersad’s proposal. A fair compromise of these propositions can be accepted when a distinction between depravity and bad economy is made. Depravity addresses the necessary components to society, whereas a bad economy can address the

unmet wants and needs for a set of civilians within a society. In direct terms, there is no irreconcilable difference in these two views.

Internal Tension

The economic status of Flint has been inconsistent with many of the statistics regarding other areas in the United States. Consider that according to the United States Census Bureau, the median household income in Flint is \$26,330 as compared to the median household income of \$60,336 across the entire United States (U.S. Census Bureau 2019). This demonstrates a stark contrast between the provisions of the crisis-affected area and the remaining population of the United States. The Bureau of Labor Statistics maintains that the labor force in Flint, Michigan, was at a relative high between 2009 and 2010 and has oscillated steadily downward since then, whereas the employment rate has received the opposite effect since around 2010. Considering that the water crisis began when governmental decisions actualized in 2014, these statistics mean that although the employment rate has increased, the actual income of the jobs has been poor compared to the median income across the United States.

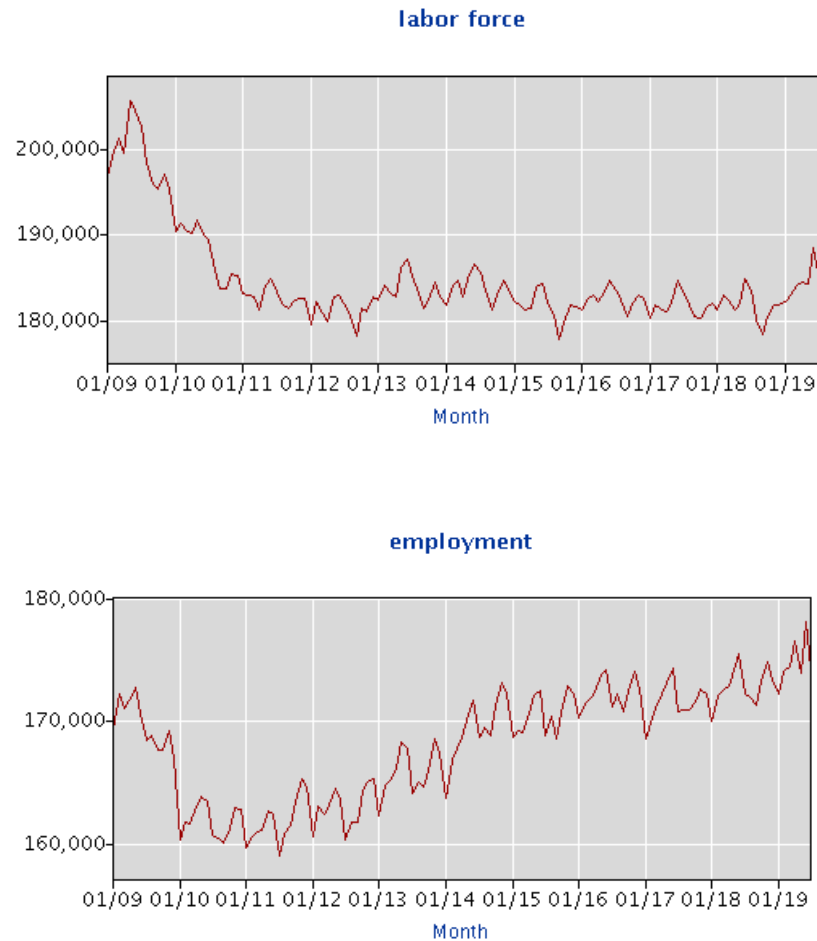


Figure 2.1 Although the water crisis began in April of 2014, it didn’t affect the labor force statistics nor the employment rates in any significant way, although it should be noted that there has been a noticeable increase in employment since then (United States Bureau of Labor Statistics 2019).

The United States Bureau of Labor Statistics is the principle agency responsible for information regarding labor in the United States. It serves a fundamental role in the U.S. Federal Statistical System, which is a network of federal agencies that produce data about the people, economy, natural resources, and infrastructure of the United States. Due to the nature of these organizations, it is reasonable to conclude that the information provided by the sources relating to them is reliable, even if the reliability of the data collection methods can be disputed. The decrease in population is important to note since Michigan officials, “continue to report reductions in state aid” (Ivacko 2013, 5), which

suggests that as a population size decreases, taxes tend to increase to compensate for financial shortcomings. These cost increases cause stress on the residents who become involved in the taxation.

The Natural Monopoly

A monopoly is typically defined as the exclusive possession or control of the supply of or trade in a commodity or service. These are illegal in the United States due to antitrust laws. In Flint, Michigan, there was an implicit form of a monopoly that was still technically legal. This was possible because, “Not all monopolies are illegal...businesses might legally corner their market if they produce a superior product or are well managed” (Illegal Monopolies 2019). In the case of Flint, the DWSD maintained what is known as a natural monopoly on water. A natural monopoly is defined as a “distinct type of monopoly that may arise when there are extremely high fixed costs of distribution, such as exist when large-scale infrastructure is required to ensure supply” (Economics Online). This description perfectly suits the situation that has arisen in Flint. The Detroit Water and Sewage Department was the primary distributor of water to Flint prior to the crisis. This department provided water from Lake Huron as well as the Detroit River. In Flint, the water treatment plants were not capable of treating the water from local sources properly and so the Flint government had to rely on the DWSD for water. Thus, a natural monopoly had been made.

Prices of water in Flint were some of the highest prices in America. To provide details on this, “Monthly rates in Flint were among the most expensive in the country, and yet 42 percent of residents lived below the federal poverty level” (Clark 2018, 15). Naturally, one would expect that Flint’s government officials became desperate for

change, and they did. Since the DWSD was able to maintain a natural monopoly on water flow to Flint, a solution was proposed. The Karegnondi Water Authority was suggested in response to the outrageous prices, mostly as a power move at first to try to negotiate prices down. The proposal was immediately approved by the Michigan Department of Environmental Quality, authorizing the KWA to pull 85 million gallons of water per day out of the Great Lakes (Clark 2018, 15). It was to be put in place as a new supplier of water from Lake Huron to Flint. And so the KWA began construction in 2013 (Byron 2013).

SECTION III: THE PIVOTAL MOMENT

Departments and Authorities

Each of the following organizations plays a fundamental role in the Flint Water Crisis. The relationships between each of these associations provide details to an integral part of the story, which contribute to understanding why the city ultimately collapsed. The Michigan Department of Environmental Quality (MDEQ), as the state agency that oversees environmental quality of air, land, and water in Michigan, was involved in the approval of the KWA as an alternate source of water for Flint. The responsibility for the downfall of Flint can be justifiably attributed to the statements and actions of this association. The MDEQ highlights an important relationship between state and federal authorities, which plays a major role in the downfall of the city.

Another fundamental organization is the Detroit Water and Sewage Department (DWSD). This department was the primary water provider for Flint prior to the water source switch. The water source switch was from the DWSD water source directly to the Flint River. Since January of 2016, the responsibilities of this department have been greatly transferred to the Great Lakes Water Authority (GLWA). The Great Lakes Water Authority has also assumed \$4 billion of DWSD's debt since formally overtaking it (Kampe 2016).

The Karegnondi Water Authority (KWA), as the proposed replacement for providing water to Flint, began construction in 2013 and was intended to be used as a way for Flint to become more self-sustained. Aside from establishing independence, the KWA was also proposed as a way to save money, since the prices of water from the

DWSD were outrageous. Before this authority finished its construction, the switch to the Flint River had already been made.

A Set Stage

The information leading up to this point has been concerning many different facets of the events leading up to Flint's collapse. In Section I, discussions were provided regarding how the Industrial Revolutions have benefitted the world both in their own time and now, as well as how they facilitated negative environmental habits. This was done as a way to provide background details for the pollution issues that made the Flint River corrosive. Later, information was given about how the subsequent environmental abuse became widespread. This information was integrally related to the business methods that were employed during Flint's years of heavy influence from the automobile industry. Further, we discussed how the history of businesses has shaped the economic landscape in Flint. This background was crucial because it provided a transition into the next section's information about the economy.

Thereafter, in Section II, an economic deprivation was defined and outlined to show that Flint is experiencing one. Common ideas regarding these deprivations were then discussed with details concerning how crime and economy have been related. The idea of a slippery slope was introduced in order to illustrate how the city began reacting to its unclean water supply and how the reaction was not a solution but rather a postponing of the inevitable. This discrepancy opened the crisis up, which allowed for an exploration into the internal tensions over the history of Flint and in modern times. All of these events generated an unresolved issue. By the April of 2014, the city was on the verge of collapsing and a critical judgement call error became the city's undoing.

Crumbling

Of the many relevant sources on the topic of the collapse of Flint, all of them agree that the turning point of the water crisis was due to a decision by the local Michigan government in 2013. The actual repercussions of the decision were experienced by the locals of Flint around the April of 2014. The cause of the city's water source collapse can easily be traced back to the initially celebrated water source switch. This occurred primarily because of the faulty statements made by the Michigan Department of Environmental Quality. Approximately thirty days after the switch from the DWSD to the emergency water supply pipeline in the Flint River, the MDEQ announced that the drinking water in Flint had "residual chlorine and bacteria in it, but not so much that it violated the legal standards" (Clark 2018, 32). Although complaints were consistently rolling in, this was expected from the outset since new water sources tend to provide a different taste anyway. In the meantime, the KWA pipeline was in construction and was projected to be finished in two years' time following the switch in 2014.

A famous complaint was made by a man named Lathan Jefferson who was a Flint resident. He contacted one of the offices of the Department of Environmental Quality for Michigan about rashes that he was developing from the tap water. This brought to light an important miscalculation, since it was said that the lab analyses showed "the drinking water...[met] all health-based standards" (Clark 2018, 33). The sheer magnitude of the issue was just beginning to surface.

The Dort Highway Plant is a treatment plant for water. The plant is located in Flint and was intended to be used for corrosion control. This highlights the pivot of the entire crisis: the MDEQ had told the staff at the plant that corrosion control was unnecessary, which was breaking federal law. To add to the issue, the Dort Highway Plant wasn't nearly sufficient to handle the water treatment as it needed important upgrades to perform such a task (Clark 2018, 33). For residents, living with the repercussions of the switch was not optional. The conditions in Flint were awful. To make the situation even worse, the residents of Flint were paying ridiculously expensive water bills to pay for this dangerous lead water. The rates they experienced were the highest water payments in all of Genesee County, coming in at \$140 per month for water and sewer bills.

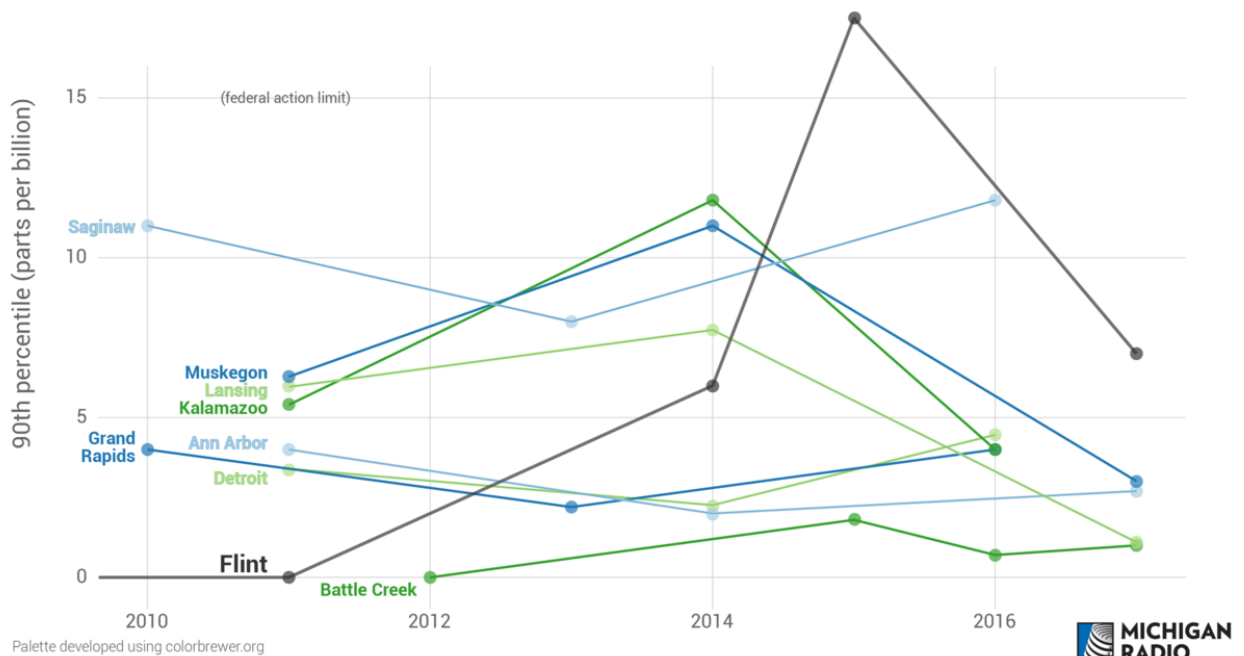


Figure 3.1 Note that the 90th percentile is the value 90 percent of lead tests that fall below 15 ppb for a given testing cycle. The EPA action level for 90th percentile is 15 ppb (Winowiecki 2019).

The crisis seemed like it couldn't possibly get any worse, and yet it did. In the August of 2014, E. coli was detected in the water. The presence of such a bacterium

suggests that the water is further contaminated by either human and/or animal feces, which shouldn't be surprising considering the variety of waste dumping that had been made in the Flint River (Clark 2018, 40). Boiling water for at least one minute was recommended and bottled water became a much-sought option. The city was left to ruin. The irresponsibility of the MDEQ's actions was paired with a great deal of ignorance on the issue. Mike Prysby, a speaker for the MDEQ, when addressing the coliform issue simply admitted, "We don't know yet what caused this" (Fonger 2014). One can only imagine the level of frustration that the residents experienced during the unraveling of all of this commotion and confusion.

The Ongoing Lead Crisis in America

Beyond the crisis in Flint, there is a widespread issue for America in dealing with lead pipes. Excessive lead levels have been discovered and unveiled in "almost 2,000 water systems across all 50 states" (Young 2016). If all fifty states in the United States of America have this issue, then incidents like the Flint Water Crisis could occur all over again in countless cities. American citizens should take this information seriously and act accordingly. It is much easier to prevent another water crisis than it is to reverse one that has already started, as the Flint Water Crisis clearly demonstrates.

To date, recognition of the Flint crisis has affected virtually all aspects of social discourse. Even the presidential candidates in the election of 2016 campaigned with the Flint crisis in mind (Henderson and Merica 2016). Working toward an in-depth understanding of this crisis in modernity will help with discerning the tribulations within Flint and any preventative measures that have been needed. The widespread issue of excessive lead levels in water needs to continue to be addressed politically.

The widespread problem is further evident upon investigating areas in cities like St. Joseph, Missouri, where “at least 120 small children have been poisoned since 2010, making the neighborhood among the most toxic in Missouri” (Pell 2016). Such conditions are indeed startling, especially when considering that even the children of medical professionals are affected. For example, the lead issue has penetrated this city to the point where a “local pediatrician's children were poisoned” (Pell 2016). When recalling the disastrous events in Flint, it is important to realize that the city “doesn’t even rank among the most dangerous lead hotspots in America” (Pell 2016).

While the events in Flint have been catastrophic, it is crucial to have a broader perspective on lead-related issues. Flint has become a victim of lead as a byproduct of the environmental abuse in the surrounding area. This is a common trend among lead-affected areas. The areas where lead poisoning is a central concern are “plagued by legacy lead: crumbling paint, plumbing, or industrial waste left behind” (Pell 2016). Put simply, infrastructure and sustainability are the main factors for the problems that led to the Flint water crisis in the first place.

The problem has permeated not only into private affairs but also to public domains. To illustrate an example, “in Lamesa, Texas...tests...showed lead contamination more than seven times the EPA limit at Klondike Independent School District, which serves 260 students in a single K-12 building” (Young 2016). The EPA is the Environmental Protection Agency, which is an independent agency of the United States federal government for environmental protection. While recent events may come as a shock, as they should, this problem is not exclusive to the 21st century.

Lead poisoning is not a new phenomenon. Information from before the mid-20th century shows that people suffered from lead poisoning or “water plumbism.” Water plumbism is a technical term referring to poisoning from lead. Cases of symptoms in Massachusetts were studied further concerning lead poisoning, and it was determined that “39 percent of the population used lead water pipes, suggesting that between 10 and 12 percent of the state’s population suffered from water plumbism” (Troesken 2006, 115). The symptoms of the reported conditions are listed in Table 3.1.

Table 3.1 The incidence of lead water poisoning in Massachusetts is illustrated below. The following outline displays the several effects of lead poisoning and of “principal symptoms found among the 253 persons examined” (Troesken 2006, 116).

Finding	Total cases		Poisoning cases	
	Number	%	Number	%
Total cases	253	100.0	63	100.0
Pallor	157	62.1	47	47.6
Low hemoglobin	82	32.4	25	39.7
Constipation	78	30.8	25	39.7
Eructations	77	30.4	26	41.3
Stippling	76	30.0	56	88.9
Headache	73	28.9	33	52.4
Joint pain	57	22.5	14	22.2
Abdominal pain	53	20.9	22	34.9
Vertigo	36	14.2	9	14.3
Lead line	26	10.3	24	38.1
Weakness in forearm	26	10.3	14	22.2
Loss of appetite	21	08.3	9	14.2
Weight loss	15	05.9	8	12.7

Troesken argues that two main conclusions can be drawn from this information. Firstly, these symptoms certainly suggest lead poisoning and yet many physicians may have overlooked these conditions or misdiagnosed their patients since they may have been “unattuned to the dangers of lead” (Troesken 2006, 116). The second position that Troesken defends is that the number of cases was likely underrepresented, meaning there were even more cases of water-related lead poisoning that have not been accounted for. The collected data suggest that the lead epidemic has been overlooked for much longer than what is popularly known.

It is important to realize that while Flint is experiencing terrible difficulties, which should have been avoided, America is at risk as a whole for more incidents like the Flint Water Crisis to occur. To combat this issue, America needs to invest in a more sustainable infrastructure. The usage of lead piping is not practical for future long-term solutions. For the future, American people need to elect politicians who will consider new solutions with long-term sustainability.

CONCLUSION

The Flint Water Crisis is a terrible event that probably could have been prevented with more cautious decision-making. The vast majority of the issue can be reduced to a few causes. This event was due to human fallibility, irresponsible decisions, inadequate preparation, old infrastructure, economic shifts, environmental abuse, and high prices on water. In hindsight, it is easy to see what should have been done as well as what should have been avoided, but these events are difficult to apprehend while experiencing each contributing factor one moment at a time, as the Flint residents did.

One of the fundamental errors that was made was the environmental abuse to the Flint River following the Industrial Revolutions. Although a thriving source of income for the city, the automobile industry proved to be detrimental to the Flint River. In turn, this proved to be a primary reason for the collapse in the final analysis. The economic shift after the automobile industry had slowed created an unhealthy monetary relationship between the city of Flint and its water supplier, the DWSD. In response, the city opted to establish itself as being more independent by proposing the KWA. Once approved by the MDEQ, the city of Flint switched its water source from the DWSD directly to the Flint River to save money.

The old infrastructure of Flint's water piping system gave out when it was set against the corrosive water from the Flint River. The corrosion caused the piping in the city to deteriorate from the inside out, delivering lead to the homes of Flint's residents. Sickness broke out in the form of rashes and numerous complaints were made about the quality of the new water. Initially, the complaints were underestimated and brushed off. As time went on, however, the issues were taken much more seriously. As a preventive

measure, several recommendations about water were made, from boiling it for a minimum amount of time to avoiding it altogether and instead purchasing bottled water.

Altogether, the Flint Water Crisis continues to be an issue today, in 2019, but solutions are on the horizon. Though costly and uncomfortable, the burden of the crisis may soon be relieved. The crisis has brought attention to a foundational issue: American infrastructure. A new system for infrastructure in America needs to be advanced and actualized. If there will be a solution to the Flint Water Crisis, then there needs to also be preventative action for similar events in the future and, indeed, in the present.

BIBLIOGRAPHY

- Acosta, Roberto. "New Genesee County treatment plant to begin delivering water Monday." *MLive*, 2017,
www.mlive.com/news/flint/index.ssf/2017/11/new_genesee_county_treatment_p.html. Accessed 14 February 2019.
- Augustyn, Adam et al. "Flint, Michigan, United States." *Encyclopaedia Britannica*, 1 Sept. 2016, <https://www.britannica.com/place/Flint-Michigan>. Accessed 5 Oct. 2019.
- Bates, Robert H. et al. *Analytic Narratives*. Princeton University Press, 1998.
- Byron, Shaun. "KWA construction starts soon, pipeline may not reach Genesee County until 2015." *MLive*, 2013,
www.mlive.com/news/flint/index.ssf/2013/06/kwa_1.html. Accessed 14 February 2019.
- Carmody, Tim. "How the Flint River Got so Toxic." *The Verge*, The Verge, 26 Feb. 2016, www.theverge.com/2016/2/26/11117022/flint-michigan-water-crisis-lead-pollution-history.
- Cesansa, Giancarlo et al. "Lead Poisoning: Historical Aspects of a Paradigmatic 'Occupational and Environmental Disease'." *The National Center for Biotechnology Information*, 8 Mar. 2012,
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3430923/>. Accessed 5 Oct. 2019.
- Clark, Anna. *The Poisoned City: Flint's Water and the American Urban Tragedy*. Metropolitan Books, 2018.

- CNN. "Flint Water Crisis Fast Facts." *CNN*, Cable News Network, 2 July 2019,
<https://www.cnn.com/2016/03/04/us/flint-water-crisis-fast-facts/index.html>
- Conway, Kyle J. "There's Something in the Water: How Apathetic State Officials Let the People of Flint, Michigan Down." *Villanova Environmental Law Journal*, no. 1, 2018.
- Crow, Carl. *The City of Flint Grows Up: the Success Story of an American Community*. Harper Bros., 1945.
- Dasgupta, Susmita et al. "Confronting the Environmental Kuznets Curve." *Journal of Economic Perspectives*, vol.16, no.1, 2002, pp. 147-168.
- Dalmia, Shikha. "Flint's Water Crisis Isn't a Failure of Austerity. It's a Failure of Government." *The Week - All You Need to Know about Everything That Matters*, The Week, 2016, theweek.com/articles/600101/flints-water-crisis-isnt-failure-austerity-failure-government.
- Dingle, Adrian. "The Flint Water Crisis: What's Really Going On?" *American Chemical Society*, 2016,
www.acs.org/content/acs/en/education/resources/highschool/chemmatters/past-issues/2016-2017/december-2016/flint-water-crisis.html. Accessed 14 February 2019.
- Economics Online. "Natural Monopolies." *Natural Monopolies / Economics Online*, Economics Online,
www.economicsonline.co.uk/Business_economics/Natural_monopolies.html.
- Engel, Pamella et al. "How Flint, Michigan, Became One of the Most Dangerous Cities in America." *Business Insider*, Business Insider, 17 Jan. 2016,

- www.businessinsider.com/why-is-flint-michigan-dangerous-2016-1. Accessed 6 Oct. 2019.
- Engelman, Ryan. "The Second Industrial Revolution, 1870-1914." *U.S. History Scene*, 10 Apr. 2015, <http://ushistoryscene.com/article/second-industrial-revolution/>. Accessed 5 Oct. 2019.
- Felton, Ryan. "Bottled Water Must Be Delivered to Flint Residents in Lead Crisis, Judge Rules." *The Guardian*, Guardian News and Media, 12 Nov. 2016, www.theguardian.com/us-news/2016/nov/12/flint-michigan-lead-bottled-water-delivery. Accessed 6 Oct. 2019.
- "Flint, MI." *Data USA*, datausa.io/profile/geo/flint-mi/.
- "Flint, MI Crime." *Flint, MI Crime Rates & Crime Map*, AreaVibes Inc., 2017, www.areavibes.com/flint-mi/crime/.
- "Flint Water Crisis Fast Facts." *CNN*, Cable News Network, 2 July 2019, www.cnn.com/2016/03/04/us/flint-water-crisis-fast-facts/index.html.
- Fonger, Ron. "Second Positive Coliform Bacteria Test Means Flint's West Side Water Boil Notice Still in Effect." *MLive*, MLive, 19 Aug. 2014, www.mlive.com/news/flint/2014/08/second_postivie_ecoli_test_mea.html.
- Goodnough, Abby et al. "When the Water Turned Brown." *New York Times*, 23 Jan. 2016, <https://www.nytimes.com/2016/01/24/us/when-the-water-turned-brown.html>. Accessed 18 November 2018.
- Gomez, Hernán et al. "Blood Lead Levels of Children in Flint, Michigan: 2006-2016." *The Journal of Pediatrics*, 2018.

Grossman, Daniel and David Slusky. “The Effect of an Increase in Lead in the Water System on Fertility and Birth Outcomes: The Case of Flint, Michigan.”

EconPapers, no. 201703, 2017.

Henderson, Nia-Malika and Dan Merica. “Hillary Clinton pledges to stand with Flint through water crisis.” *CNN*, 2016, www.cnn.com/2016/02/07/politics/hillary-clinton-flint-michigan-water-2016-election/index.html. Accessed 6 February 2019.

“Illegal Monopolies: What Is a Legal vs. Illegal Monopoly.” Gibbs Law Group, Gibbs Law Group, 2019, www.classlawgroup.com/antitrust/unlawful-practices/monopoly/#targetText=A%20monopoly%20is%20when%20a,Not%20a%20monopolies%20are%20illegal.&targetText=But%20monopolies%20are%20illegal%20if,is%20known%20as%20anticompetitive%20monopolization. Accessed 6 Oct. 2019.

“Infant Mortality and Life Expectancy.” *PBS*, Public Broadcasting Service, 1999, www.pbs.org/fmc/timeline/dmortality.htm.

Kampe, Paul. “Great Lakes Water Authority Takes over Regional Operations.” *The Oakland Press*, 4 Jan. 2016, www.theoaklandpress.com/news/nation-world-news/great-lakes-water-authority-takes-over-regional-operations/article_d08f66a5-6aa0-5a20-aa2d-f84af24af3c5.html.

Leeson, Peter T. “An-arrgh-chy: The Law and Economics of Pirate Organization” *Journal of Political Economy*, 2007.

- Lehrer, Eli. "Crime and Economy: What Connection?" *Heritage*, The Heritage Foundation, 15 Nov. 2000, www.heritage.org/crime-and-justice/commentary/crime-and-economy-what-connection. Accessed 6 Oct. 2019.
- Mackinac Center. *Michigan's Pension Underfunding Problem*. Mackinac Center for Public Policy, www.mackinac.org/pension. Accessed 14 February 2019.
- Ostrom, Elinor. *Governing the Commons: The Evolution of Institutions for Collective Action (Political Economy of Institutions and Decisions)*. Cambridge University Press, 1990.
- Pell, M.B. and Joshua Schneyer. "Thousands of U.S. Areas Afflicted with Lead Poisoning beyond Flint's." *Scientific American*, 19 Dec. 2016, www.scientificamerican.com/article/thousands-of-u-s-areas-afflicted-with-lead-poisoning-beyond-flints/.
- Pirie, Madsen. "Economic Nonsense: 17. The Industrial Revolution Brought Squalor and Impoverished the Poor." *Adam Smith Institute*, Adam Smith Institute, 3 Mar. 2015, www.adamsmith.org/blog/economics/economic-nonsense-17-the-industrial-revolution-brought-squalor-and-impoverished-the-poor.
- Rosner, David. "Flint, Michigan: A Century of Environmental Injustice." *American Journal of Public Health*, 1 Feb. 2016, <https://ajph.aphapublications.org/doi/abs/10.2105/AJPH.2015.303011>. Accessed 5 Oct. 2019.

- Seepersad, Randy. "Economic Deprivation." *Ministry of Children, Community and Social Services*, 2016,
www.children.gov.on.ca/htdocs/English/professionals/oyap/roots/volume5/chapter05_deprivation.aspx. Accessed 6 Oct. 2019.
- Skarbek, David. *The Social Order of the Underworld: How Prison Gangs Govern the American Penal System*. Oxford University Press, 2014.
- Soave, Robby. "Attorney General Wants to Send 3 Bureaucrats to Jail for Role in Flint Water Crisis" *Reason*, 2016.
- "Socio-Economic Deprivation." *Devon Health and Wellbeing*, Devon County Council, 2013, www.devonhealthandwellbeing.org.uk/jsna/overview/archive/socio-economic-deprivation/#targetText=The%20term%20socio%2Deconomic%20deprivation,basic%20necessities%20in%20a%20society. Accessed 6 Oct. 2019.
- Stearns, Peter N. *The Industrial Revolution in World History*. Routledge, 2018.
- "The Water Crisis in Flint, Michigan has had Terrible Consequences for Residents' Health." *The Economist*, 2017, www.economist.com/graphic-detail/2017/09/27/the-water-crisis-in-flint-michigan-has-had-terrible-consequences-for-residents-health. Accessed 14 February 2019.
- Troesken, Werner. *The Great Lead Water Pipe Disaster*. MIT Press, 2006.
- United States Bureau of Labor Statistics. "Labor Force Data." *Economy at a Glance*, U.S. Dept. of Labor, 10 Sept. 2019, https://www.bls.gov/eag/eag.mi_flint_msa.htm. Accessed 10 Sept. 2019.

- U.S. Census Bureau. "U.S. Census Bureau QuickFacts: Flint City, Michigan." *Census Bureau QuickFacts*, United States Census Bureau, 2019,
www.census.gov/quickfacts/flintcitymichigan.
- Walsh, Mary Williams. "Detroit Plan to Profit on Water Looks Half Empty." *The New York Times*, The New York Times, 26 May 2014,
www.nytimes.com/2014/05/26/business/detroit-plan-to-profit-on-water-looks-half-empty.html.
- Winowiecki, Emma. "Does Flint Have Clean Water? Yes, but It's Complicated." *Michigan Radio*, Michigan Radio, 21 Aug. 2019,
www.michiganradio.org/post/does-flint-have-clean-water-yes-it-s-complicated.
- Wisely, John. "Flint Residents Paid America's Highest Water Rates." *Detroit Free Press*, Detroit Free Press, 17 Feb. 2016,
www.freep.com/story/news/local/michigan/flint-water-crisis/2016/02/16/study-flint-paid-highest-rate-us-water/80461288/.
- Wiitala, S.W. et al. "Water Resources of the Flint Area Michigan." *Geological Survey Water-Supply Paper* 1499-E. Washington DC: Government Printing Office, Jan. 1963, <https://pubs.usgs.gov/wsp/1499e/report.pdf>. Accessed 20 Sept. 2019.
- Young, Alison and Mark Nichols. "Beyond Flint: Excessive Lead Levels Found in Almost 2,000 Water Systems across All 50 States." *USA Today*, Gannett Satellite Information Network, 2016, www.usatoday.com/story/news/2016/03/11/nearly-2000-water-systems-fail-lead-tests/81220466/.