EVOLUTION OF SUSTAINABILITY AND RESILIENCE IN MILITARY MASTER PLANNING: EXAMINING PLANNERS' PERCEPTIONS

by

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ABSTRACT

An increasingly globalized world and mounting threats to our economy, environment, and social structures have brought the concepts of sustainability and resilience into sharp focus. These threats include climate change, rapid urbanization, and loss of biodiversity in an increasing volatile, uncertain, ambiguous, and complex world. Sustainability and resilience have emerged as key concepts in understanding and addressing urban dynamics toward a livable urban future. These concepts are important because resilience typically deals with the short-term issues surrounding predicting and responding to immediate threats, while sustainability looks at the long-term, steady state of the built and natural environment. Focusing on resilience without considering sustainability runs the risk of meeting short-term goals at the expense of desired long-term outcomes, especially on military installations. Military installations, like cities, suffer the consequences of these planning decisions. Current literature documents the interdependent relationship between sustainability and resilience, yet military master planning tools do not reflect this relationship. Rather, sustainability and resilience are compartmentalized.

This dissertation uses a case study approach to examine sustainability and resilience evolution in military master planning, using the Installation Energy and Water Plan (IEWP) as it is being developed and implemented for two major military bases, Joint Base San Antonio, Texas (JBSA) and Joint Base Elmendorf-Richardson, Alaska (JBER). The study seeks to understand the role of planners as they navigate changing mandates, definitions, and executive orders that shift from a focus on sustainability to a focus on resilience in military master planning.

The study finds military master planning experienced a paradigm shift with the 2012 Unified Facilities Criteria and continues to evolve, with the current IEWP leaning toward

resilience and away from sustainability. Additionally, social equity as a key component in sustainability, is only considered peripherally. Other findings include that, in order to achieve the desired long-term outcomes of development on military installations, sustainability and resilience must be integrated into the overall master plan, with federal government policy in place to ensure it happens. This research also suggests planners play an instrumental role in determining if these concepts and strategies are included in military master plans.

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DEDICATION

I dedicate this dissertation to my family who have borne the brunt of an absentee wife, mother, sister, daughter, and grandmother. Through the years of graduate school, you all have stood by me, provided me with balance, and given me a reason to complete this work. I am eternally grateful to all of you in more ways than I can ever express. Your continued inspiration, laughter, and love allow me to reach heights I never dreamed possible. I would also like to thank my coworkers at the Corps of Engineers. You have allowed me the time, information, and support needed to complete this project. Your professionalism, compassion, and support are an inspiration to those around you.

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ABBREVIATIONS

Abbreviation	Explanation
ADP	Area Development Plan
AFB	Air Force Base
AFCEC	Air Force Civil Engineering Center
AICP	American Institute of Certified Planners
APA	American Planning Association
ASCE	American Society for Civil Engineering
BRAC	Base Realignment and Closure Act
CASI	Center for the Advancement of Sustainability Innovations
CE	Civil Engineering
CERL	Construction Engineering and Research Lab
DOD	Department of Defense
DODMPI	Department of Defense Military Planning Institute
EO	Executive Order
ERDC	Engineering Research and Development Center
HQ	Headquarters
IDP	Installation Development Plan
IEP	Installation Energy Plans
IEWP	Installation Energy and Water Plan

Abbreviation	Explanation
INRMP	2015 Integrated Natural Resources Management Plan
JBSA	Joint Base San Antonio
JBER	Joint Base Elmendorf-Richardson
Memo	Memorandum
NEPA	National Environmental Policy Act
OSD	Office of the Secretary of Defense
RPEC	Regional Planning and Environmental Center
SCP	Sustainability Component Plan
SecArmy	Secretary of the Army
SecDef	Secretary of Defense
SOW	Scope of Work
UFC	Unified Facilities Criteria
USACE	U.S. Army Corps of Engineers
USGB	United States Green Building Council
VUCA	Vulnerability, uncertainty, complexity, and ambiguity
WBDG	Whole Building Design Guidelines
WRDA	Water Resource Development Act

CHAPTER ONE

INTRODUCTION

A hurricane destroyed Tyndall Air Force Base (AFB) in Florida, while in California, Travis AFB was evacuated due to wildfires. In Nebraska, Offutt AFB suffered major damage due to seven feet of floodwaters, and across the world, military bases were locked down due to a global pandemic. These are acute stresses facing military bases today. Meanwhile, the vast majority of military bases are experiencing the acute and chronic stresses of social, environmental, and economic damages caused by sprawl. Like communities worldwide, these issues on our military installations are compounded by the effects of climate change, mobilization of people, and inefficient use of human and natural resources.

This dissertation uses a case study approach to examine the evolution of the concepts of sustainability and resilience in military master planning. Archival documents pertaining to the development and implementation of the Installation Energy and Water Plan (IEWP) at two major military bases, Joint Base San Antonio (JBSA) and Joint Base Elmendorf-Richardson (JBER), Alaska, as well as documents within the different levels of the Department of Defense (DOD), were analyzed to understand how the concepts are defined and framed within the organizations. Interviews were then conducted with planners from private firms involved in military master planning. The study seeks to understand the role of planners as they navigate changing mandates and definitions as federal policy shifts from a focus on sustainability to a focus on resilience in military master planning. Planners' perceptions at private firms and different levels of the DOD are important as they are responsible for implementing planning policies as dictated by policymakers. Military planners' perceptions help us understand the shift from sustainability to

resilience as well as the perceived outcomes of this shift. The overarching research question for this project is, "What are the planning implications of a shift in focus from sustainability to resilience as perceived by planners within the military complex?"

The apparent shift from sustainability to resilience by the Department of Defense (DOD) within military installation master planning began in 2008 with the advent of new executive orders to address sustainability and rising energy costs. The DOD developed the Sustainability Component Plan (SCP) and the NetZero Planner (Net 0) to assist military installations in reducing energy, water, and waste use intensity. Ten years later, in response to new federal regulations and growing world challenges, the DOD released a new planning tool. The Installation Energy and Water Plans (IEWP)/Installation Energy Plan (IEP) introduced the concept of installation resilience and aided military bases in setting mission-readiness goals. Pilot programs at nine installations across the U.S. suggest the IEWP archival data has been interpreted differently within installations with some bases focusing exclusively on resiliency goals to the exclusion of sustainability goals and others apparently combining the goals of both sustainability and resilience.

An increasingly globalized world and mounting threats to our economy, environment, and social structures from megatrends such as climate change, rapid urbanization, and loss of biodiversity in an increasing vulnerability, uncertainty, complexity, and ambiguity (VUCA) (Rose 2016) world have brought the concepts of sustainability and resilience into sharp focus. Thus, sustainability and resilience have emerged as key concepts in understanding and addressing urban dynamics toward a livable urban future (Romero-Lankao et al., 2016; Maddox, 2013), While current literature documents the interdependent relationship between sustainability and resilience, military master planning tools do not reflect this relationship. Instead,

sustainability and resilience are compartmentalized with one assessment tool addressing sustainability and the other resilience.

Determining whether resilience and sustainability are complementary or opposing concepts is significant because resilience typically deals with the short-term issues surrounding predicting and responding to immediate threats, while sustainability looks at the long-term, steady-state of the built and natural environment (Stromberg, 2017; Fiksel 2006, Marchese et al. 2019). Thus, only considering the short-term response to threats may be counter to strategies of sustainability (Marchese et al. 2019). If we consider military installations as cities, containing all of the elements of an urban organism, these concepts apply. To achieve the city (or in this case military base) we want in our future, we must balance and operationalize sustainability, resilience, and livability (Maddox, 2013). Thus, a systems approach is needed to address these long-term resource issues, linking it to the concept of resilience (Fiksel, 2006).

However, resilience and sustainability have historically been conceptualized as two separate notions with sustainability emerging from the environmental movement (Maddox, 2013; Portney, 2003; Wheeler, 2013), and resilience, while theoretically adopted from biology (Arefi, 2011, Folke et al., 2010), is most often conceptualized and operationalized through civil defense and emergency management (Coaffee, 2013; Goldstein, 2012).

Research on these concepts suggests a presumption of the causality for the change in focus (Jabareen, 2008; Marchese et al 2018; Rose, 2016), but in military master planning, the examination of causality is not addressed. Outside of the military complex, factors affecting the way urban development is addressed include administration changes, megatrends (e.g., globalization, terrorism, biodiversity loss, and threats from climate change), and the associated

growing VUCA[1] era (i.e., changes in the nature, extent, occurrence, and impact of events – especially climate change).

The stresses of a VUCA world affect the military complex and, while the literature supports the notion that both sustainability and resilience are interrelated and co-dependent, the perceptions of, causality for, or impacts of the relationship between sustainability and resilience planning on military installations have not been examined (Jun & Conroy 2014; Jabareen, 2008; Marchese et al 2018; Wilkinson, Porter, & Colding, 2010).

This research project focuses on the implications of the apparent shift in focus from sustainability to resilience in military master planning. It examines the planner's role in master planning within military installations with a focus on determining (1) how planners define sustainability and resilience, (2) if planners perceive a shift from sustainability to resilience, and (3) their perceived outcomes of the shift. Two study areas were selected for the research: Joint Base San Antonio (JBSA), which is a conglomerate of five bases: Fort Sam Houston, Lackland Air Force Base (AFB), Randolph AFB, Port San Antonio, and Kelly AFB; and Joint Base Elmendorf-Richardson (JBER) which is a combination of Elmendorf AFB and Fort Richardson in Alaska (Table 1). Each installation is comprised of different, individual bases and has manifested a symbiotic relationship with their respective cities over the decades. Poor planning and development practices on either of the military installation could have direct, adverse impacts on the greater San Antonio and Anchorage regions, especially in terms of traffic

[1] The U.S. Army War College first used the acronym VUCA in response to the collapse of the USSR circa 1990, as they recognized leadership would require building capacity to respond to a swiftly-changing unknown. VUCA is used by Rose (2016) in his book "The Well-Tempered City" to describe both urban and biological systems.

congestion, waste disposal, stormwater runoff, ecosystem degradation, as well as air and water quality.

Table 1: Military Installations Included in this Study

Joint Base Installation	Acronym	Installations Included
Joint Base San Antonio San Antonio, Texas Population: 1.53M military personnel, civilian, retirees Regional Area 465 mi^2	JBSA	Fort Sam Houston
		Lackland AFB
		Randolph AFB
		Port San Antonio
		Kelly AFB
Joint Base Elmendorf-Richardson Anchorage, Alaska Population: 401,108 military personnel, civilians, retirees Regional Area 26,420 mi^2	JBER	Elmendorf AFB
		Fort Richardson

The potential planning implications go beyond military installations, as military master planners may focus on a single set of issues rather than considering sustainability and resiliency systematically. Decisions inside the fence (i.e., on the military installation) have ramifications both inside and outside the fence as planners, stakeholders, and decision makers consider environmental impacts, air and water pollution, traffic, housing, and resource degradation.

Research Questions and Significance

To better understand the role and perception of planners in the shift in focus from sustainability to resilience in military master planning, a case study methodology was used, with a focus on the two large military installations. The overarching research question for this project is, "What are the planning implications of the shift in focus from sustainability to resilience as perceived by planners within the military complex?" Questions that created the theoretical framework for this research consist of the following:

1. How do military master planners at private firms and different levels of the Department of Defense (local, regional, enterprise, and federal) define sustainability and resilience?
2. Have military complex planners perceived a shift from sustainability to resilience, and if so, what is the perceived cause of this shift?
3. What role do military complex planners play in the shift from sustainability to resilience?
4. What is the perceived outcome of the shift?

To answer these questions, archival documents were analyzed at different levels of the military complex and in-depth interviews were conducted with select military master planners. As military master planners work within the context of growing VUCA threats and changing federal policy, this research project examines the perceptions and roles of planners who are at the forefront of these changes.

This study is significant for two reasons: First, millions of dollars are spent every year on providing energy, water, waste disposal, and environmental and cultural resources protection by the Department of Defense. Second, the management of these resources and internal and external encroachments have an impact on not just the military base (internal encroachments), but also on the adjacent communities outside the fence line. These external encroachments often provide

many of the needed installation resources and suffer the consequences of poor management of resources and waste on the installations (Young, 2008). The United States Department of Defense (DOD) is the largest developer in the world with over $1.05 billion in real property and 27.2 million acres of land as of fiscal year 2016 (DOD, 2017), a landmass comparable to the state of Virginia. Prior to the implementation of the Base Realignment and Closure Act (BRAC), military installations faced critical budget constraints, lack of available land for growth and expansion, and struggled with improving the quality of life for installation residents and employees (Wheeler et al., 1988). As military installations expand and contract around the world, military master planning is the primary tool for facilitating growth and shrinkage. Military master plans integrate multi-sector stakeholder collaboration to aid in reducing the impact to surrounding communities while maintaining security and other vital functions unique to the military.

With the implementation of base closures (BRAC), military master planners were tasked with assisting installations around the world in planning for the vast reduction of personnel and missions at some bases and the corresponding expansion of missions and personnel at other bases. From 1988 to 2005, five base closure (BRAC) rounds resulted in the selling off of 315,026 acres of land as bases reduced their footprint. Base realignments and closures in 2005 led to the relocation of approximately 70,000 service members[2] impacting communities across the U.S. (Congressional Research Service, 2019). Since this time, new guidance has emerged for real property development on military bases, making it mandatory that each base has master plans in place in order to get congressional funding for projects. New mandates for improving

[2] This round of BRAC resulted in a $14.1 billion cost increase over the expected $21 billion due to increased construction costs associated with implementing the BRAC plan.

land-use planning and development include a focus on improving cost and land-use efficiencies. Policies such as the Unified Facilities Code (UFC) and other guidance have been updated to reflect a new era of military real property planning and design. The implementation of sustainability and resilience on the military installations was not looked at as part of this study because planner's perceptions do not affect the actual implementation of the plans.

According to the DOD Planning Institute (DODMPI, 2019), effective and thoughtful long-term development and management of resources requires master planning to be implemented for present and future physical development of an installation. To accomplish this, an evaluation process is implemented to form the basis for determining development objectives and planning goals. The framework for military planning processes includes stakeholder input to determine (1) issues to be addressed; (2) the vision and goals of the area; (3) the creation of land use and real property planning alternatives; (4) selection and leadership buy-in of the preferred alternative, and (5) development of the regulating (zoning) and phasing plans. For military installations, planning is accomplished primarily at the local level often through private firms contracted by the Army Corps of Engineers. Military master planners interpret the policies created at the national level and use the tools developed at the research and enterprise level by local experts to achieve national goals.

Military installations have been deemed ecological "islands of diversity" and are harmed by outside growth pressures as well as the implementation of planning efforts inside the base (Van Antwerp, 2001). For instance, Joint Base San Antonio is a conglomerate of five bases, which are threaded throughout San Antonio, Texas, creating a decades-long symbiotic relationship. For comparison, the Joint Base Elmendorf-Richardson is a conglomerate of two bases in Anchorage Alaska, combining an Amy post and an Air Force base. Poor planning and

development practices on the installations could have direct adverse impacts on the greater San Antonio and Anchorage regions, especially in terms of traffic congestion, waste disposal, air and water quality, and increased demands for schools, housing, and jobs for military families. Thus, military installation master planning has significant and ongoing impacts on the regional environmental and cultural resources.

Sustainability impacts master planning as it proposes strategies that address the long-term use of lands and resources. This includes how the use of those resources affect cost, pollution and waste, as well as the environment, and provides for social equity. Resilience impacts master planning as it proposes strategies that decrease the fragility of supporting systems, helps systems adapt and change, and provides for a safer, more secure place for people and the environment (Marchese et. al, 2019). The Corps of Engineers Headquarters 2016 *Strategic Sustainability Performance Plan* defines resilience in terms of (1) preparing for the impacts of climate change, and (2) the ability of the installation to resist disturbance, recover quickly, adapt as needed, and improve the system so it is stronger moving forward. Marchese et al. (2019) state that sustainability and resilience must work together to achieve the quality of life we want now and into the future. Chapter 2 is a review and analysis of the pertinent literature and archival documents covering resilience and sustainability.

The Role of Military Planners

Six participants for this research were selected from private architecture and engineering firms with direct involvement in military master planning. These firms were contracted through the U.S. Army Corps of Engineers (USACE) to develop master plans for the military installations over the past five years. Driven by federal policy, master planners in the Corps of

Engineers and in architectural and engineering firms are the vehicle through which planning policies flow for implementation. These policies aim to reduce costs, make the military installations more sustainable, and build resiliency while maintaining mission objectives. Planning for an installation (essentially a whole city) with people of diverse interests and often competing goals and leadership is fraught with its own challenges. In addition, the military's historical focus on "programmatic" approaches to problems rather than a "systems" approach can create a new set of issues once the original issue is addressed (McQuade & Hunter, 2019).

Planners' perceptions are significant as they implement planning policy at different levels of the organizations. For this research project, each level of the military organization involved in planning is examined through archival review, and military master planners at private firms are interviewed, as their actions impact the implementation of policies downstream. Table 2 illustrates the organizational levels examined for this study. At the national level, the USACE Headquarters (HQ) sets policy; the Engineering Research and Development Center (ERDC)/Construction Engineering Research Lab (CERL) researches and develops planning tools that impact the approach to planning; the regional level consists of USACE Southwestern Division-Regional Planning and Environmental Center (RPEC) and the Air Force Civil Engineering Center (AFCEC) which contract and create base master plans; and the local level, in this case, the Joint Bases in San Antonio and Alaska Civil Engineering section where the local planners sit, co-create, and execute the master plan.

Table 2: Organizational Chart

Organizational Level	Responsibility	Organization	Acronym
National	Create Policy	USACE Headquarters	USACE HQ
Research and Development	Develop and test tools for implementation	Engineering, Research, and Development Center	ERDC
		Construction, Engineering, Research Lab	CERL
Regional/Enterprise	Develop and deliver plans	USACE Southwestern Division-Regional Planning and Environmental Center	RPEC
		Air Force Civil Engineering Center	AFCEC
Local	Co-develop and implement plans	JBSA Civil Engineering	JBSA CE
		JBER Civil Engineering	JBER CE

The installation study sites were selected for several reasons. First, the Joint Bases at San Antonio and Anchorage are two of the nine IEWP pilot program sites. Second, since the Base Realignment and Closure Act (BRAC) initiative, both bases contain multiple branches of the military, including the Army and Air Force within one installation, adding to the complexity of multiple commands under one organization. Third, activities within the installations have significant environmental, economic, and social implications for the greater San Antonio, Texas and Anchorage, Alaska regions.

Master planners at the installation level and contracted military planners in private firms are the front-line implementers of policies. Thus, these planners are what Lipsky (1980) coined as "street-level bureaucrats." This group is characterized as having regular and direct interaction with citizens, or the recipients of government services, in this case the tenants, leadership, and other stakeholders on the installation. It is important to note that planners can interpret policy and have the power to exercise a degree of discretion over the services, benefits, and sanctions received by those recipients, which corresponds with installation planner's ability to influence how master plans are understood and implemented (Lipsky, 1980). Contracted planners help

create the master plans by engaging closely with leadership, stakeholders, base planners, residents, and tenants. Master planners at an installation generally determine which projects are presented, promoted, and moved into programming, which is where they are further designed and constructed. The creation and implementation of master planning products can vary widely at the various installations. Thus, understanding how policies, such as those that promote sustainability and resilience, are perceived makes understanding the perspectives of planners at each level of the military complex vital to understanding how planning policies are framed and implemented. In all cases, leadership must ultimately be in agreement with the master plan. However, leadership changes frequently and new priorities emerge and mission change, making it necessary for plans to be more flexible than those found in the civilian planning arena.

Defining Sustainability and Resilience

To implement planning for sustainability and resilience, it is important to define what is meant by these terms. Wheeler & Beatly (2009), along with others, state that essentially sustainability focuses on the long-range use of resources so current generations fulfill their needs without compromising the needs of future generations (Basett & Shandas, 2010, Davidson et al., 2019). Sustainability typically includes three pillars: economic, environmental, and social (UN World Commission on Environment and Development, 1983).

Resilience, on the other hand, focuses on ensuring systems, including energy and water, continue operating under any circumstances so they can resist shocks, rebuild quickly, and adapt and learn from disruptive events to help make the system stronger (Hollings, 1996; Coaffee, 2008).

A growing issue within military master planning is whether planning goals should be focused on sustainability or resilience. Sustainability, as it applies to the built environment, is defined as previously stated, "meeting the needs of the present without compromising the ability of future generations to meet their own needs" and has three pillars that must be kept in balance: environment, social equity, and economy (WCED, 1987):

> Sustainable development is a process of change in which the exploitation of resources, the direction of investment, the orientation of technological development, and the institutional change are all in harmony and enhance both current and future potential to meet human needs and aspirations (Wheeler & Beatley, 2009, p. 63).

Sustainability looks at long-term resource use and the impacts of those uses on current and future generations. Conversely, urban resilience is defined as "the capacity of individuals, communities, institutions, businesses and systems within a city to survive, adapt and grow no matter what kinds of chronic stresses and acute shocks they experience" (Stromberg, 2017, para. 3). Resilience considers the current ability of a system, such as an energy or water system, to resist shocks, rebuild itself, and improve the system's response to future shocks. These two concepts, sustainability and resilience, and how they are defined, have important implications on the physical development of cities and the encapsulated nature of a military installation. The "business as usual" model, which wastes resources, pollutes the environment, marginalizes segments of society, and creates fragility in economic sectors, is in opposition to these two concepts (Wheeler, 2013; Portney, 2003). Literature for sustainability illustrates that a sustainable system creates a continuous resource stream that ensures future resources, while a resilient system ensures the system can resist outside pressures, bounce back when disaster strikes, and adapt or create a new normal (Coaffee, 2013; Walker & Salt, 2006: Folk 2016;

Holling, 1996; Davidson et al., 2019). However, the military complex is facing struggles with funding and the growing acute and chronic threats and stressors, such as climate change, terrorism, and now, a global pandemic. The growing tension between the focus on long-term goals of sustainability or short-term goals of resilience is the basis for this research project.

For planning purposes on military bases, both sustainability and resilience planning focus on energy conservation, with water a somewhat secondary consideration when using resilience planning. Archival documents examined as part of the literature review reveal neither approaches give full consideration to the broader definitions of the concepts, leaving out direct responses to social equity and quality of life aspects on the installations.

The megatrends of globalization, increased cyber-connectivity, urbanization, population growth, income inequality, natural resource depletion, loss of biodiversity, a rise in migration of displaced peoples, and increased terrorism challenge how we think about and react to sustainability and resilience (Rose, 2016). For those engaged in military master planning, this means addressing what the military describes as volatility, uncertainty, complexity, and ambiguity (VUCA) (Rose, 2016). The impacts of these megatrends are exacerbated by the growing threat of climate change, creating a "threat multiplier," culminating into what Rittle and Webber (1973) coined "wicked problems;" problems that are difficult or impossible to solve. Natural and human-made catastrophes around the world bring environmental and economic calamity to many physical, social, and psychological systems and structures. Adding to the turmoil, the discourse and growing controversy over the existence of climate change and humans' contribution to its magnitude make even defining the issues problematic, and thus attempting solutions appear almost impossible (Hulme, 2009; Mark Pelling, 2011).

As these megatrends and rising VUCA continue to dominate the news and thus the minds of planners, leaders, and everyday citizens, a shift in focus has occurred in planning research and discourse from sustainability to resilience (Lew et al., 2016). This shift is confirmed through a brief survey in planning research journals and planner's discourse over the past 10 years (Jun & Conroy, 2014; Jabareen, 2008). The shift has several probable causes. First, the construct of sustainability essentially rose out of the 1970's environmental movement, with the term "sustainable development" first used in the 1972 book *Limits to Growth* (Meadows et al., 1972). It was recognized that human development negatively impacted populations and was destroying the environment. Sustainability sought a balance between humans and nature and has only been widely applied to the fields of planning and architecture since the 1990s (Wheeler & Beatley, 2009). However, with the increasing pressures of rapid urbanizations, economic globalization, the rising concerns over climate change, the terrorist attacks of September 11, 2001, and the financial crisis in 2007, the focus has moved away from sustainability to resilience planning in preparing for, mitigating, and adapting to these threats (Wheeler, Randolph, & London, 2009).

Over the past decades, the federal government administration has changed from one political party to another, and policies and direction concerning environmental and social issues have likewise shifted. The U.S. military has not been immune to these changes and the growing controversy over climate change, sustainability, and resilience. In response, new policies and mandates with various foci have occurred with each change in administration. In 2018, after rescinding the Obama era executive orders for climate change and sustainability, the Trump administration issued a new executive order, which strictly focused on cutting costs and building resilience. In response to the new mandate, the Army Corps of Engineers developed the

Installation Energy Plan (IEP)/Installation Energy and Water Plan (IEWP), which is currently being piloted at eight installations across the United States.

Approaches to Military Master Planning

Military installations function as self-contained cities, and planning for housing, services, facilities, and infrastructure is more akin to master-planned communities, meaning the property is centrally planned and implemented. Military master planning has followed the rational planning methods used in non-military planning for the past 70 years (Young, 2008). Military land-use planning is different from civilian land-use planning in that, besides being driven by political decisions and funding, the primary drivers for master planning on military installations are the current mission needs of an installation, which includes war, peace-keeping, state-of-emergency, and activities such as troop training, munitions testing, flight training, firing ranges, and maneuver training (Young, 2008). Sustainability and resilience have elements of both the rational planning paradigm and some aspects of "muddling through" (Lindbloom, 1959) with regards to developing plans at the installation level. Military land-use planning is unique in that operational and institutional missions are inseparable

Military planning is rational in nature and, reflecting its hierarchical context, has typically a top-down approach with limited stakeholder participation until it reaches the installation level (Young, 2008). Efforts have been made in more recent regulations, however, to ensure stakeholder input. While the rational planning theory paradigm attempts to establish a general public interest that is impartial and representative of the interest of an entire community, within the military complex, goals and tools are set at the top, and stakeholders and leadership on

the installation are only involved during the actual installation planning phase. Rational planning thus offers a framework for understanding the decision-making process and has three phases: (1) goal-setting, (2) establishment of policy or planning alternatives, and (3) implementation of a preferred or accepted alternative (Banfield, 1973). In rational planning, "an end is an image of a future state of affairs towards which actions are oriented … formulation of the end may be extremely vague and diffuse" (Banfield, 1973, 2). Using the rational planning paradigm, military installations developed consistently with civilian urban growth which included car-centric physical development, large, inefficient buildings with little natural lighting, reliance on inefficient equipment for heating and cooling, and little consideration for environmental concerns.

In 1988, under pressure to reduce the growing military budget, maintain mission readiness, increase efficiency and effectiveness of training, house troops and their families, and more easily mobilize troops, the Base Realignment and Closure Act (BRAC) legislation was authorized by Congress. Since the BRAC process began in 1988, there have been four additional series of closures and realignments (1991, 1993, 1995, and 2005). These five BRAC reorganizations stimulated both rapid growth for some installations and reductions for others (Young, 2008).

As missions began to consolidate, new planning challenges arose. Some installations were required to shrink their footprint while others saw drastically increased demand for facilities, housing, and infrastructure. As missions changed[3] to absorb the consolidation of BRAC and the increased demand began to exert pressure for appropriate types of plans,

[3] Both JBSA and JBER continue to adjust to changing missions due to BRAC. Recently, new missions were added at JBSA to include flight and medical training, which brought a demand for increased housing, new facilities for aircraft, as well as additional medical training facilities and administrative space.

improvements in planning tools and processes needed to be implemented. As Young (2008, p.10) stated, "Since the implementation of BRAC and DOD Transformation, there has been a shift away from traditional military rational planning approaches. Military installations and surrounding communities are beginning to understand the importance of collaborative planning initiatives."

In military master planning, two different rational planning approaches are used to make decisions in land-use planning and policy decisions; mission sustainment and capacity-based planning. Mission sustainment is need-driven, development decisions based on the primary mission of the installation, the mission being the reason for the military's existence. Within military master planning there exist both operational and institutional missions. "Operational missions are concerned with "numbered armies, corps, divisions, brigades, and battalions," whereas institutional missions are concerned with providing "the infrastructure necessary to raise, train, equip, deploy, and ensure the readiness of all Army forces" (Young, 2008, p. 9). These mission types are interlinked so that one cannot exist without the other. This makes land-use planning inseparable from these missions to ensure efficient and functional military planning.

Capacity-based planning is the second approach in military land-use planning and policy decision-making and is based on what the installation needs rather than what already exists. It attempts to move away from one narrow decision and to encourage the development of more innovative alternatives to address uncertainty, provide flexibility in development to face current and future challenges, and work within the budget and funding realities (Young, 2008; Joint Systems and Analysis Group, 2007, p. 4; Ward & Davis, 2002, p. 2). Capacity-based planning has four basic principles: "(1) broaden the range of missions for which forces are prepared, (2)

make joint service perspective prominent in all aspects of planning, (3) use risk as a strategic measure for effectiveness, and finally (4) shift requirements away from requirement generation to innovative concepts and approaches" (Young, 2008 p. 10; Joint Systems and Analysis Group, 2007, p. 4.) This planning approach forms the basis for new military master planning practices as it turned toward sustainability and later toward resiliency planning.

Sustainability and Resilience Executive Orders and Responses

Sustainability and resilience are two concepts on which the Army Corps of Engineers focuses as it seeks to fulfill its mission to support the Department of Defense in master planning (DOD Strategic Sustainability Performance Plan, 2016). Evidence is presented by the Strategic Sustainability Performance Plans developed in accordance with executive orders within the last five years (Planning for Federal Sustainability in the Next Decade, March 19, 2015). These orders created from Washington, D.C. executive policies provide a framework for evaluating long- and short-term climate change risks and demonstrate the organization's attempt to focus on identifying opportunities and challenges associated with environmental issues (USACE Recreational Strategic Plan, 2011).

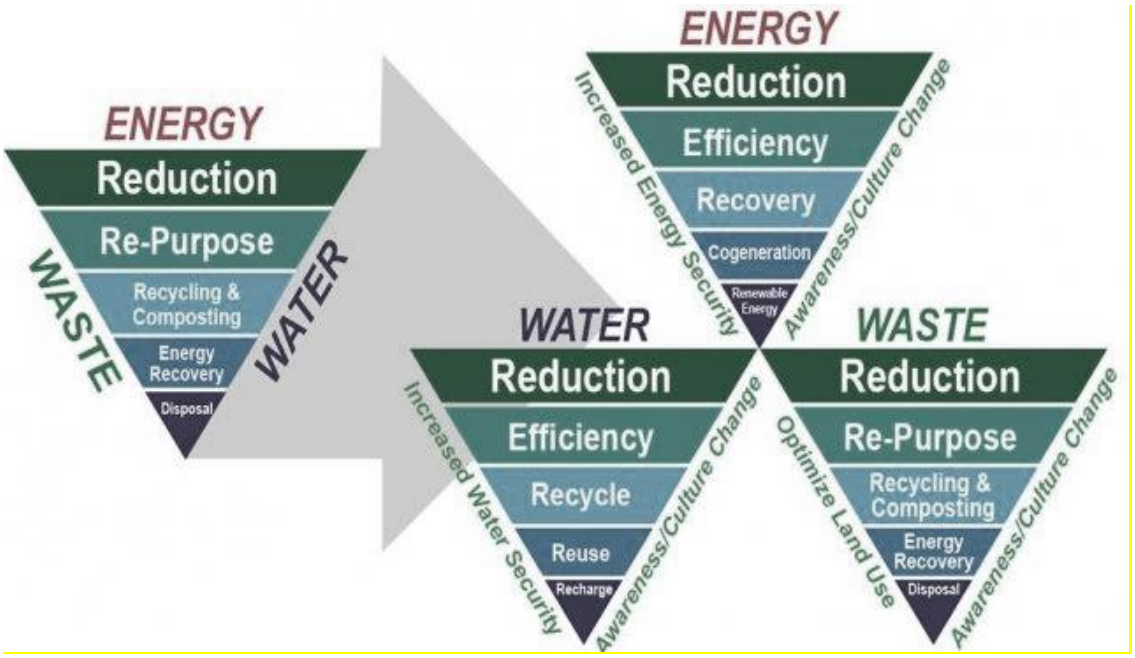
Sustainability is defined by the U.S. Army Corps of Engineers (USACE) as "an umbrella concept that encompasses energy, climate change, and the environment to ensure today's actions do not negatively impact tomorrow" (USACE, 2019). Resilience, as defined by the USACE, is closely related to climate change: "the concept to convey a holistic approach to addressing threats and uncertainty from acute hazards such as more frequent and/or stronger natural disasters, man-made threats, changing conditions from population shifts and climate change" (USACE EP, 2019). This approach is in response to expansive executive orders in 2013 for

building sustainability which addresses concerns about climate change. However, as previously stated, all the Obama administration executive orders were revoked by the Trump administration in 2017, replaced by orders that only considered the efficient use of energy.[4] These changing mandates and definitions, and the Army Corps of Engineers' response to them, are the focus of this research.

In response to these mandates, the DOD set forth a series of guidelines which state that all military installations must have a plan to reduce their energy intensity by 3% annually and 30% by the end of FY2015, relative to a baseline set in FY2005 (Andrews, 2009). In 2014, the Army directed all installations to work toward achieving NetZero objectives for energy, water, and waste. To help installations meet these goals and deadlines, the research arm of the Army Corps of Engineers, developed the Sustainability Component Plan (SCP) and the NetZero Planning (NZP) program (now called the System Master Planner (SMPL)).

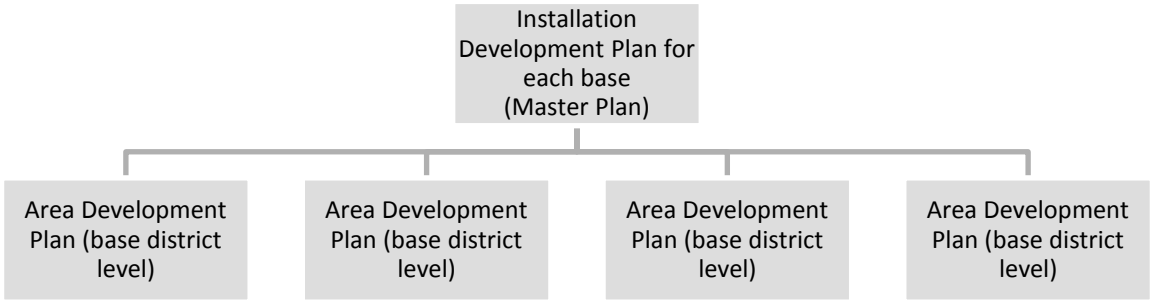
Figure 1. NetZero Hierarchy and Planning Goals (USACE 2013)

[4] EO 13653 "Preparing the United States for the Impacts of Climate Change," November 2013; EO 13783 "Promoting Energy Independence and Promoting Economic Growth," 2017 by the Trump administration. Only EO 13834 "Efficient Federal Operations" is currently in effect as all others have been revoked by subsequent orders in the Trump administration.



These plans and tools served as the planning vehicle and calculating mechanism for the impacts of different scenarios as an overlay to the Area Development Plans (ADP), which are the comprehensive planning products used at the installation district level. The Installation Development Plan (IDP) is the overall land-use plan for the installation and is divided into smaller planning districts. Each of these individual districts is then planned for using the finer-grained Area Development Plans. For example, Joint Base San Antonio has one Installation Development Plan, which is further broken down into 14 smaller planning districts for which Area Development Plans are developed.

Figure 2. Installation Master Planning Hierarchy



The main drivers for reducing energy consumption used by the federal government derives from the 1973 Federal Energy Management Program, (FEMP) which led to broad efforts to retrofit federal buildings[5]. A 2007 executive order by the Bush administration strengthened and updated goals, practices, and reporting requirements for environmental, energy, and transportation performance and accountability (13423 *Strengthening Federal Environmental, Energy, and Transportation Management*) (Andrews, 2009).

As mandates changed from one administration to the next, the DOD and Army Corps of Engineers focused on developing plans to help installations meet the changing requirements. First, the criteria for each facility (Unified Facilities Criteria (UFC) 2-100-01) was updated in 2013 so that new area development plans focused on sustainable development principles such as narrow buildings for natural light, compact, walkable infill development, and energy efficiency. The plans were based on setting high sustainability targets for each installation including NetZero goals for energy, water, waste, and stormwater. As these plans were developed at

[5] In 1992, the 1978 *National Energy Conservation Energy Policy Act* was amended by the FEMP (Andrews 2009).

various military installations around the world, it became apparent that executing the plans as designed was cost-prohibitive, and though they reduced greenhouse gas emissions and met energy goals, they were not always cost-effective. Additionally, as administrations changed, most of the focus for sustainability centered on cost reduction by impacting energy use, with lesser regard for water, and almost no regard for stormwater or waste reduction. Also missing was the third leg of the triple-bottom-line: social equity.

The start of the Trump administration saw a new focus for federal planning around sustainability and resilience. Many of the executive orders adopted during the Obama administration focusing on building sustainability and addressing issues of climate change were rescinded[6]. However, language still exists within these new orders to reduce costs and build resilience for specific endeavors and an apparent new focus on building resilience as opposed to sustainability, although no hard targets were made in which to measure outcomes. Additionally, no definition of resilience was given, only a mandate to become more efficient in their operations.

In response to mandates by the Trump administration, the Army Corps of Engineers developed the Installation Energy and Water Plan (IEWP) to help military bases ensure mission readiness by focusing energy and water resilience in mission-critical facilities and processes. However, the interpretation of the guidance across military installations is not consistent, with some installations strictly focused on building resilience and others focusing on a more holistic approach that includes sustainability measures. In 2019, the Air Force began implementing its version of the IEWP, the Installation Energy Plan, on seven military bases in the United States, while the Army is piloting its version, which includes water as a focus area, at three locations;

[6] Such as EO 13693 *Planning for Federal Sustainability in the Next Decade*

each includes San Antonio and Anchorage. These two large complex military installations are unique locations as each combine Army and Air Force bases within a single installation. Planning at these locations happens base-wide and cannot be separated by military branch. The conflict between decisions regarding what makes an installation both resilient and sustainable becomes more complex because planners must navigate different branches of the military along with local, regional, and federal mandates.

Overview of Dissertation

This dissertation is divided into five chapters. Chapter 1 gives an overview and introduction to the topic, importance, and research method undertaken and discusses federal mandates for the military involving sustainability and resilience and the planning tools developed by the U.S. Army Corps of Engineers, which has the primary responsibility for facilitating military master planning.

Chapter 2 is a review of the relevant literature. Specifically, it includes a look at current literature in sustainability and resilience planning and how they compare to one another. The chapter includes tables that illustrate the comparison as these terms were used from 1989 through 2018. A matrix presenting a comparison from the literature on these two concepts can be found in Appendix 1.

Chapter 3 details the case study methodology employed in this dissertation research, describing data sources, which consist of stakeholders in the military complex, archival data, and processes for gathering and analyzing the data. It contains an analysis of the archival data pertaining to the definitions and framing of sustainability and resilience within the different levels of the DOD to establish a beginning framework for analyzing interview data gathered.

Chapter 4 is the analysis of the open-ended interviews conducted. This resulted in four core themes that aligned with the research questions, 13 categories, and 35 subcategories.

Chapter 5 is the summary of findings, relevance, and recommendations for future research. The summary of findings includes the impacts of military master planner's definition and framing of sustainability and resilience, as well as the importance of policy and planners in the process of planning to guide leadership and stakeholders in developing plans that include these important concepts.

Because of their direct involvement in military master planning, planners engaged through the Army Corps of Engineers are uniquely qualified in helping us understand how sustainability and resilience planning is interpreted and implemented within the military complex. Perceptions of military planners have a direct impact on the application of resilience and sustainability. As federal mandates for planning military bases have turned to focus on reducing costs through reductions in energy and water use, as well as increasing the installation's resilience and ability to maintain mission readiness in a VUCA era, it becomes important to evaluate whether a shift from sustainability to resilience has occurred and its implications, if any. This research uses a case study research approach to examine (1) the evolution of sustainability and resilience, specifically within the military complex, and (2) the perceptions of military master planners in private firms concerning the evolution of sustainability and resilience in military master planning.

CHAPTER TWO

LITERATURE REVIEW

Introduction to Literature

This literature review seeks to construct the theoretical and empirical framework necessary to answer the research questions. To begin to develop a theoretical framework, an assessment of the research literature referencing sustainability and resilience as separate terms was performed to determine the growth in research intensity, (the number of published articles), of the two terms and different components of those terms. This assessment helped illustrate the intensity (frequency) of research from 1989 to 2019. Then, the research for the two terms together was examined. Following this analysis, current research concerning the relationship between the two concepts within the urban planning and public policy context was examined to determine the differences and similarities in the use of sustainability and resilience, the purpose for the research, how the concepts were being framed, and the stated outcome of the research. Against this backdrop, an analysis of the Energy Installation Plans as proposed by the various military installations in San Antonio and Anchorage was conducted which included archival information pertaining to the different levels of the military base organization in terms of sustainability and resilience. The literature used for this examination was cross-disciplinary and included research from urban planning, community development, and public policy; the environment, energy, water, infrastructure, and climate change.

The Installation Energy and Water Plan (IEWP)

In March 2016, the Office of the Secretary of Defense issued a memorandum requiring Installation Energy Plans to (1) assure future energy and water demands are met; (2) achieve requirements set forth by Congress, the White House, and the Department of Defense; (3) lower costs; and (4) facilitate stakeholder cooperation. This policy, in response to the current administration's executive orders, replaces the Obama administration's plans that focused more broadly on NetZero objectives and sustainable measures for water, energy, waste, and stormwater. Peter Potochney, the acting Assistant Secretary of Defense (Energy, Installations, and Environment) (SecDef) stated: "…a large coordination of effort is needed to gain synergy between current energy initiatives and future planned energy projects to maximize energy use and cost reduction. … we can drive a more integrated and systematic approach to energy management through informed energy planning" (Potochney, 2016).

The memo required that within three years of its signing installations must complete an energy plan that aligns with the Undersecretary of Defense's memo (*Installation Master Planning* of May 28, 2013). The energy plan's requirement will become part of the *Unified Facilities Criteria,* which guides master planning on all military installations (Office of the Assistant Secretary of Defense, 2016).

In December 2017, the research arm of the Air Force was called to develop a planning tool to support energy efforts at each military installation (Faldowski, 2019). In April 2018, the Army drafted guidance for the Installation Energy and Water Plan to focus and prepare more broadly for risks in both energy and water. The Air Force's and Army's energy plans serve as holistic roadmaps for military installations that integrate installation and higher-level strategic guidance, plans, and policies. The purpose is to enable each installation to achieve its goals in

energy efficiency and renewable energy through dual strategies: one that aims to reduce their carbon footprint and demand for energy in the protection of the environment (sustainability), as well as provide redundant and alternative energy sources (resilience). One of the chief considerations within the guidance is to address concerns that may be hindering stakeholder cooperation on energy and water management while aligning these energy plans with other installation master plans and the National Environmental Policy Act requirements (Potochney, 2016).

In response to this guidance, the U.S. Army pivoted toward security and resilience in energy and water and away from efficiency and conservation. The 2018 National Defense Authorization Act presented the rationale for this shift:

> It is now undeniable that the homeland is no longer a sanctuary. …attacks against our critical defense, government, and economic infrastructure must be anticipated. The IEWP emerged out of the need to establish requirements for energy and water security to enhance the resilience of installations. Secure and reliable energy and water are essential to military operations and the installation's mission (DOD, 2018a)….The Secretary of Defense shall ensure the readiness of the armed forces for their military missions by pursuing energy security and energy resilience (DOD, 2018b).

However, the guidance calls for compatibility with existing installation master plans which require military installations to follow strategies for sustainable development. These sustainability strategies include compact development, infill development, transit-oriented development, horizontal mixed-uses, vertical mixed-uses, connected transportation networks, sustainable landscape elements, low-impact development and stormwater management, multi-

story construction, and building orientation and configuration that optimizes building performance, conserves energy, and enhances indoor environmental quality such as thermal comfort, day-lighting, and viewsheds. Thus, resilience measures, as defined in the new energy and water plans (IEWP), must, by definition, be compatible with sustainability measures of the bases' new facilities criteria.

The new energy and water plan (IEWP) was a result of comparing the existing plans to determine if there were redundancies and gaps. The plans reviewed under this process included the Army Facilities Management Plan, Army Emergency Management Program, and the Unified Facilities Criteria (DOD Building Code). The goals of the new IEWP include:

- ensure the capability of installations to provide necessary energy and water for a minimum of 14 days in case of a crisis or attack;
- improve and restore degraded energy and water systems, and reduce risk of future disruptions;
- develop redundant and diverse sources of supply, including renewable energy and alternative water sources;
- create infrastructure capability of onsite energy and water storage with flexible and redundant distribution networks;
- train personnel who conduct required systems planning and operations activities for energy and water.

These elements require installations to assess and prioritize installation-critical energy and water requirements needed to support the mission(s) of an installation.

Sustainability and Resilience Component Plans

Prior to this policy, many military installations were developing plans in accordance with the Sustainability Component Plans (SCP). Unlike the current Energy and Water Plan that was developed in response to increased awareness of installation vulnerabilities (VUCA), the Sustainability Component Plan was developed in response to an era of constrained budgets as a way to reduce costs associated with energy, water, and waste, as well as the impacts of increased stormwater runoff due to sprawling development practices. These plans focused on ways to more efficiently move around the installation and identify ways at both the planning and building levels to facilitate more efficient use of the installations' limited fiscal and natural resources (Gillem, 2014). The Sustainability Component Plan is somewhat of a forerunner to the current Energy and Water Plan, as its purpose is to ensure that installations integrate sustainability strategies that help them achieve NetZero for energy, water, and waste intensity. The Sustainability Component Plans evaluates use intensity at the building level, as well as the efficiency of utility systems. This baseline information is used to help planners create scenarios to achieve the installation's goals for reducing energy, water, and waste intensities (Gillem, 2014). However, while energy reduction has been mandated through executive orders and DOD policies, the Obama era Sustainability Component Plans is an overlay to each base's more local Area Development Plan and has not been universally implemented across the military complex.

In September 2016, the Department of Defense (DOD) published its *Strategic Sustainability Performance Plan* to establish a path to ensure the longevity of critical resources, minimize long-term costs, address environmental and safety concerns, and advance technologies and practices that further the DOD's sustainability goals. This document recognizes the importance and vulnerability of the installations' current energy and water systems, as well as

the need to maintain readiness in the threat of climate change. In the plan, the different branches of the military are included in its strategic overview as they each have slightly different approaches to address what they refer to as sustainability. The Army references the 2015 "Energy Security and Sustainability Plan," which is built on the principles of resiliency. The Army's overarching, mission-focused sustainability efforts include policies, initiatives, projects, technologies, and collaboration. During FY 2015, the Army issued an overarching "Energy Security and Sustainability Strategy" build upon the principles of resiliency. The Navy sees sustained reduction in energy consumption and integrated affordable renewable energy sources as making the Navy more resilient. The Air Force stated, "In times of constrained budgetary resources, sustainability initiatives help the Air Force maintain efficiently operated, ready, and resilient installations…" (Energy and Water Plan, p. 15). Sustainability efforts across the Department of Defense were less about a holistic approach toward sustainability as it is defined in its greater context and more about energy reduction and associated cost reduction.

In 2017, the Secretary of the Army issued a directive titled *Installation Energy and Water Security Policy* that prioritizes water and energy security to ensure available, reliable, and quality power and water to secure critical missions for 14 days. To help planners achieve these two objectives, the plans call for the development of redundant and diverse sources of supply, including renewable energy and alternative water sources; develop infrastructure that is capable of onsite energy and water storage with flexible, redundant distribution networks; and ensure personnel are trained in energy and water security to conduct required system planning, operations, and sustainment activities.

The new Energy and Water Plan guidance requires that existing plans are reviewed to evaluate redundancies or gaps in current planning, establish the criteria for determining 75% of

consumption, develop the metrics for measuring energy and water use and capacity including the distribution system, develop standardized scopes of work criteria, and establish criteria for mission-critical operations that must maintain energy and water for 14 days during an emergency. Thus, these plans serve as important tools for implementing resilience projects on military installations.

These strategies correlate to strategies for sustainability. For example, one of the first steps in reducing the carbon footprint and protecting the environment is to reduce the demand for energy and water, which reduces the load and effectively reduces carbon emissions. Developing alternative energy can also be an economic driver, which is one of the pillars of sustainability.

Part of developing alternatives for renewable energy and water capacity is to reduce demands for these resources. Developing renewable energy sources not only creates a more resilient system, but it reduces carbon emissions and ensures continued resources into the future. Developing renewable energy sources is coupled with repairing and upgrading infrastructure which includes developing sustainable strategies that bring building footprints closer together, creates looped systems of energy and water supply, and includes strategies within the building that reduce energy and water demand, such as replacing lighting with LED lamps and installing low-flow toilets. The development of energy and clean water also includes using green infrastructure, finding alternative sources of water and ensuring water quality, which are strategies for building a sustainable system (Condon, 2010; Ewing et al., 2008; USGB, 2019). Additionally, ensuring renewable energy and clean water helps to protect the natural environment, reducing air and water pollution and stormwater runoff through systems designed to naturally slow and store water which are components of sustainability.

Resilience throughout the 2016 *Strategic Sustainability Performance Plan* is defined in terms of preparing for the impacts of climate change, and the ability of the installation to resist disturbance, recover quickly, adapt as needed, and improve the system so it is stronger moving forward. This language indicates the Department of Defense sees resilience and sustainability as operational components of one another. Additional evidence is presented by the Air Force Strategic Master Plan. "The plan incorporates sustainability as a key component of ensuring resilient Air Force installations that are 'right-sized' to meet the mission with sustainably-built and natural infrastructures." (p. 18). Thus, the new Energy and Water Plan (IEWP) evolved from a need to address sustainability in terms of resources, as well as ensure those resources are not vulnerable to disruption for critical missions, thus developing resilience in each base.

The scope of work for the new Energy and Water Plan at the Joint Base San Antonio, Texas as compared to the Installation Energy Plan at the Joint Base in Anchorage Alaska reveals a great deal about how the implemented plans may differ. Each site began with the same overarching guidance and planning process. However, the Joint San Antonio plan included language that requires training for personnel to operate the energy and water systems securely and sustainably, while language within the Anchorage plan only addressed aspects of resilience in terms of planning for threats with sustainability as incidental. Further, both plans are blind to the equity, quality of life, and economic aspects that make up long-term sustainability and resilience.

Past planning for these two bases in terms of sustainability includes the *2015 Integrated Natural Resources Management Plan* developed for the joint base in Anchorage which guides the management of military base installation land, water, air, and natural resources and guarantees continued access to these resources to sustain long-term ecological integrity. In the

San Antonio case, the new Energy and Water Plan (IEWP), does not examine the integrity of the resources, only the assurance that water and energy are available under all circumstances.

For Joint Base San Antonio, past sustainability planning was clear in the language included in the 2018 *Environmental Management System Policy Statement*. This policy called for, among other things, providing sound stewardship, conservation and preservation of the environment, efficient use of resources to maximize environmental program success, reduction of energy and water consumption, air emissions, and waste generation, and promote natural and cultural resource conservation whenever possible. However, neither this policy nor the Anchorage Base's 2015 Natural Resources Plan provided guidance for operationalizing the stated goals and objectives, and the inclusion and implementation of this guidance are left up to the individual planners. Also, though the new Energy and Water Plan Guidance states clearly that both sustainability and resilience must be addressed, unlike the previous plans set by policies in 2018 and 2015 used by San Antonio and Anchorage, they seem less concerned with the long-term environmental aspects (sustainability) of energy and water and more with the immediate aspects of energy and water security.

The Energy and Water Plan (IEWP) has operational objectives that include the implementation of projects to build resilience. Understanding whether the shift from sustainability to resilience has indeed happened, or if these plans include important elements of both sustainability and resilience, is critical to understanding the longer consequences to development and the environments for both the military installations and the surrounding communities.

Sustainability and Resilience in Urban Planning

As previously stated, sustainability and resilience have emerged as key concepts in understanding and addressing urban dynamics toward a livable urban future (Romero-Lankao et al 2016). Maddox (2013) posits that to achieve the city we want in our future we must balance and operationalize sustainability, resilience, and livability. Over the decades, industry, government, and the general public have become more aware of sustainability and the need for a systems approach to addressing it, linking sustainability to the concept of resilience (Fiksel 2006). However, resilience and sustainability have historically been conceptualized as two separate notions with sustainability emerging from the environmental movement (Maddox 2013; Portney 2003; Wheeler 2013), and resilience, while theoretically adopted from biology (Arefi 2011, Folke et al. 2010), is most often conceptualized and operationalize through civil defense and emergency management (Coaffee 2013; Goldstein 2012).

The terms sustainability and resilience have had many disparate uses in recent years, which have influenced how each is framed. Sustainability is often framed in terms of the "Triple Bottom Line – environmental, social, and economic," and resilience is framed in terms of "the ability of a system to prepare for threats, absorb impacts, and recover and adapt following persistent stress or a disruptive event" (Marchese et al. 2018, p. 1280). Additionally, the lack of consistency in defining the terms sustainability and resilience has contributed to some framing the concepts as the same, while others maintain they are entirely different (Redman 2014).

A significant component of resilience and sustainability theorizing involves both natural and human systems (Marchese et al. 2018; National Research Council 2012). While humans have always interacted with the environment, the scope, complexity, and intensity of the interaction have grown exponentially since the beginning of the Industrial Revolution (Diamond,

1997; Liu et al. 2007; Marsh 1864). Until recently, the human and natural systems, like resilience and sustainability, have been studied independently of one another, and the complexity of patterns and processes of their interactions have not been well characterized, and thus, understood (Lui et al. 2007 p 639). Ecologists have traditionally studied the environment and considered human interactions to be an outside influence, while social scientists have framed interactions around human interaction, holding environmental factors as constant (Lui et al., 2007).

Within the framework of urban resilience and sustainability, the current focus is on mitigation and adaptation planning. Much of the recent conversation concerning resilience and sustainability occurs around addressing these issues in land-use planning, making the topic appropriate for planning professionals. To date, much of the framing and studying of these notions has been in the field of science in which planners have a limited role (Wheeler, Randolph, & London 2009; 2009; Bassett & Shandas, 2010). Moving resilience from an organizing metaphor to an operationalized concept is important as the public gains greater awareness of the threat of climate change (Wheeler, Randolph, & London, 2009). Although the growing scientific evidence supports that the source of climate change is anthropogenic and linked to energy use, the impacts and ability to mitigate damage and adapt to changes are realized in land use. The 2019 special report from the Intergovernmental Panel on Climate Change and Land (IPCC) focuses on land use as a critical component in addressing the energy, industry, and transportation impacts on climate change (IPCC, 2019).

In a literature review of the terms resilience and sustainability, Marchese et al. (2018) found sustainability and resilience are framed in three different ways: (1) the institutional perspective in which resilience is an integral part of the larger concept of sustainability with

sustainability as the primary focus; (2) sustainability as a compound of resilience in which the three pillars of sustainability -- economic, social, and ecological -- make a system more resilient; and (3) resilience and sustainability as a separate objective informed by objective-oriented efforts such that short-term goals of resilience and long-term goals of sustainability compete (Marchese et al., 2018, 1276-1278).

Sustainability and Planning Theory

The story of sustainability has its roots in the environmental movement (Wheeler, 2013) as a result of chronic urban stresses including slow-moving disasters that weakened the fabric of a city, brought on by the industrialization era, and the advent of the automobile. While some literature points to the Garden City movement at the turn of the century and the "ecological" cities of the 1970s to be the roots of the sustainability movement (Basiago, 1996), as sustainability is conceived today, sustainability has its origins in more modern times.

In the 20th century, as the urban population began to grow, so too, did specialization in planning, which lead to the broader-based foci that we now embrace as sustainability. Wheeler (2013) illustrates the evolution of sustainability in planning in North America and Europe as beginning with public health and sanitation, parks and public spaces (the life work of Frederick Law Olmsted, the father of landscape architecture, as it is practiced today), housing regulations in the 1900s, land-use regulations (1910), transportation planning (1920), and regional economic development (1950), public participation and environmental planning (1970), followed closely by environmental justice (1980), new urbanism/Smart growth (1990), sustainable development (1995), climate change (2000), and food systems (2005) (Wheeler, 2013).

As more than 70% of the world's population shifted to urban environments, the theory of sustainability was applied to human development and planning as initially suggested by the publication of the October 1989 Brundtland Commission[7]. This publication first provided a more concrete definition of the otherwise nebulous term "sustainability," defining it as, "…development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (Wheeler, 2013; WCED, 1987). This was closely followed in 1991 by the United Nations Rio de Janeiro *Earth Summit* conference, which helped to bring the notion of sustainability to the international stage.

However, the first notion of "sustainability" as it relates to human development emerged out of the environmental movement with the 1972 book, *Limits to Growth* (Meadows et al., 1972). This book by three Massachusetts Institute of Technology (MIT) scientists recorded the findings of a computer model that examined resource consumption and production:

> If the present growth trends in world population, industrialization, pollution, food production, and resource depletion continue unchanged, the limits to growth on this planet will be reached sometime within the next 100 years. (Meadows, Randers, & Meadows, 2004)

The results of this model, which predicted a rapid depletion of resources, propelled the conversation toward addressing issues facing urban environments. This is a far cry from what Wheeler & Beatly (2009, p.8) said about sustainability: "Sustainable development is a process of change in which the exploitation of resources, the direction of investment, the orientation of technological development and the institutional change are all in harmony and enhance both current and future potential to meet human needs and aspirations." In planning, the theme of

[7]Formally the World Commission on Environment and Development (WCED) *Our Common Future*.

sustainability has emerged for over a century; there must be a balance between the city and nature.

Sustainability evolved from a theoretical notion to a solid concept with actionable goals and strategies for maintaining a way of life that does not negatively impact future generations. Since the 1987 Brundtland Report, sustainability has been a core framework for community development (Lew et al., 2016). Since that time, sustainability has been widely accepted to include the previously discussed "triple bottom line" and serves as the formula for balancing the needs of the present generation with those of the generations to come (Daly, 1995; Holland, 1997; Wu, 2013).

To assess the development of these concepts, an analysis of research literature was conducted. The graph below (Figure 3) illustrates the prevalence of sustainability research from 1989 through 2018 amongst peer-reviewed research in five-year increments. The graph illustrates a vast increase in interest in the subject of sustainability beginning in 2000 with an even steeper rise from 2013 to 2018. This rise in interest may be attributed to the growing concern over ongoing worldwide extremes in weather induced by climate change.

Figure 3. Prevalence of Sustainability Research in Peer-Reviewed Articles, 1989-2018

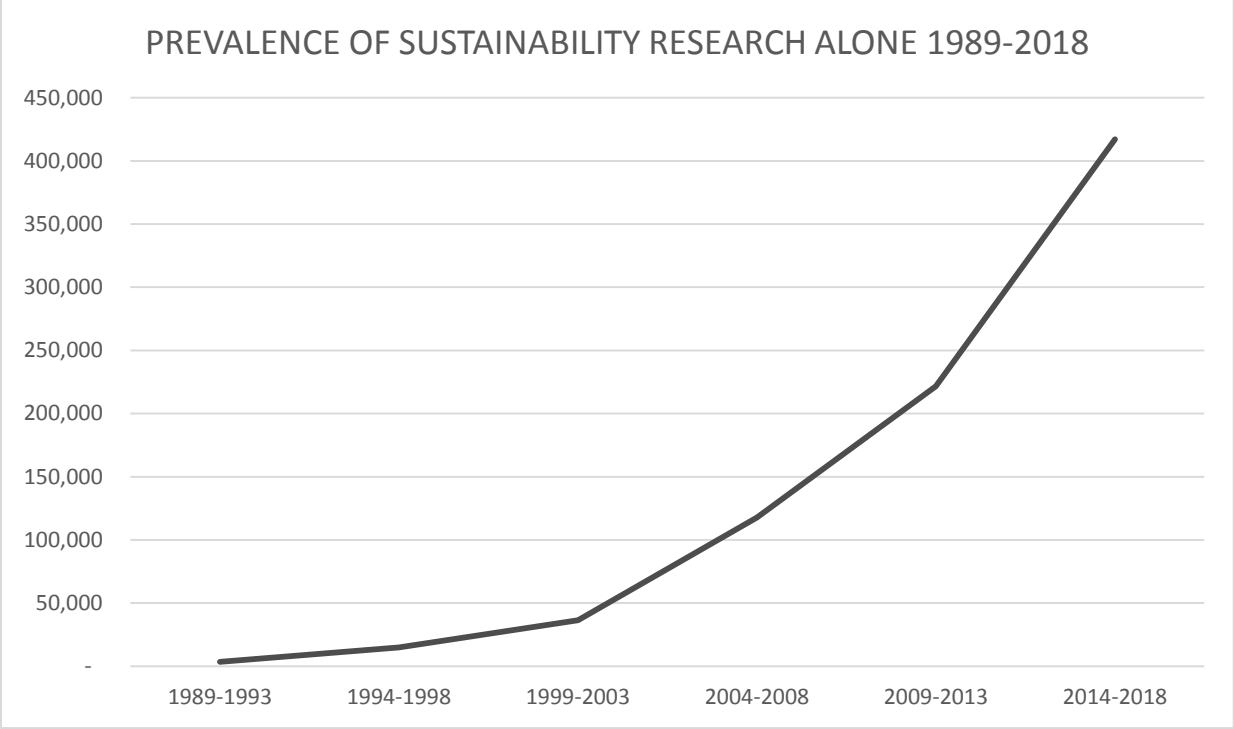
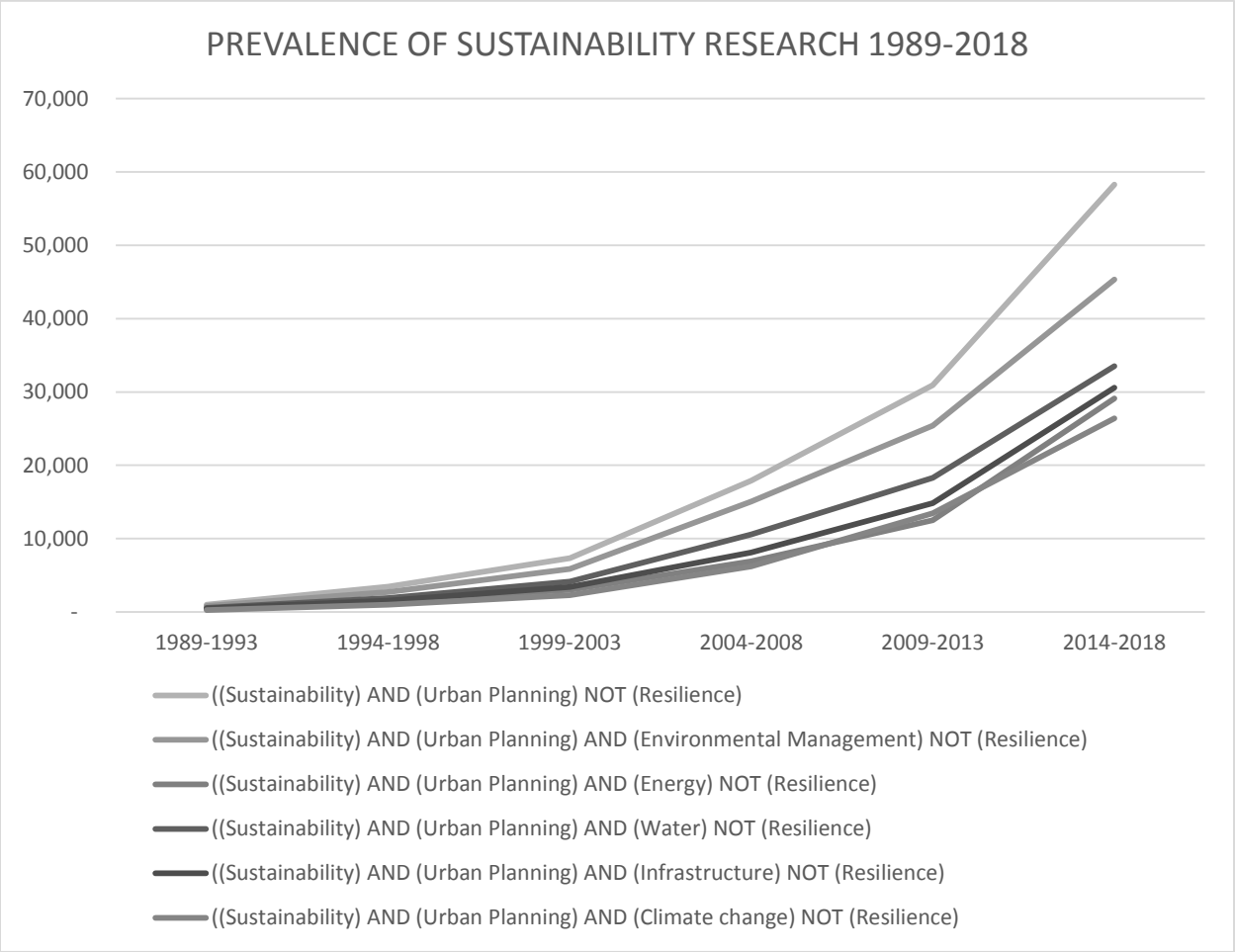


Figure 4 below illustrates how selected research topics in sustainability have changed over time. Research related to sustainability and urban planning experienced a rapid increase in 1999-2003 and again in 2009-2013 as did all other selected topics. The selected topics were chosen based on their prevalence in the U.S. Army Corps of Engineers documents, military base plans, executive orders from the last two administrations, and Department of Defense guidance. The terms most often used included environmental management, energy, water, infrastructure, and climate change. The spikes in occurrence correspond with hurricane Katrina in 2005, the great recession in 2008, and the terrorist attacks of September 11, 2001. However, the purpose of this comparison is not to form causality but only to show the evolution of the intensity of research.

Figure 4. Prevalence of Sustainability Subject Research in Peer-Reviewed Article 1989-2018



Resilience Planning Theory

"Adapt or perish, now as ever, is nature's inexorable imperative" (Wells, 1945, p. 19). These words by H.G. Wells could easily become resiliency's mantra. Resiliency is defined by Coaffee (2013) as a culmination of three dynamics: (1) resilience is the capacity to withstand and rebound from disruptive challenges (Coaffee, 2013), (2) resilience in people is their capacity to adapt physically, emotionally, and psychologically, and (3) resilience is the ability to overcome, correct, and to become better than before. These three elements have led to the development of

resilience thinking (Walker & Salt, 2006) and the expansion of the use of this concept in three areas: physical resilience, social resilience, and environmental resilience.

Where sustainability has its roots in chronic urban problems, resilience's story is that of acute issues. The term VUCA (vulnerability, uncertainty, complexity, and ambiguity) was coined to explain the series of events that set the tone for a growing interest in resilience. These events included severe and sudden onset of disruption and collapse first brought about through the stresses of climate change and natural disasters, then reinforced through megatrends of volatility in the markets, increased terrorism around the world, increased cyber activity, globalization, urbanization, increased consumption, natural resource depletion, rise in migration, and loss of biodiversity (Rose, 2017).

Urban resilience is defined as the "capacity of individuals, communities, institutions, businesses and systems within a city to survive, adapt and grow no matter what kinds of chronic stresses and acute shocks they experience" (Stromberg, 2017). The concept of resilience suggests a new paradigm in planning that may replace sustainability. (Cascio, 2009). De Vita et al., (2019, p. 535) reiterated the definition of resilience as, "The ability of a system to absorb, recover from, and successfully adapt to stressing circumstances." Since 2009, resilience has emerged in planning discourse and has found its way into a broad range of subjects and disciplines including energy, environmental security (Coaffee, 2008), climate change mitigation and adaptation (Wardekker, Jong, Knoop, & Sluijs, 2010), urban design (Pickett, Cadenasso, & Grove, 2004; Colding, 2007) urban water management (Blackmore & Plant 2008), and disaster management and recovery (Davidson et al., 2019).

The evolution of the definition of resilience has turned up in urban policy and practice as emerging models of security and emergency planning merged with environmental and social

issues. Furthermore, resilience has become the unifying metaphor expanding the institutional framework for national security, emergency preparedness (Rogers, 2001), and environmental nurturing and justice as illustrated in the growing body of climate action plans and sustainable community work (Bassett & Shandas, 2010; Bennett et al., 2014; Edwards 2010; Hornborg, 2009; Walker & Coope, 2011).

Resilience, as it relates to the urban environment, also led to the development of additional approaches that responded to specific disciplines including both engineering resilience and social-ecological resilience (Folk, 2016; Holling, 1996; Davidson et al., 2019). The engineering approach addresses the efficiency, constancy, and predictability of a system in a fail-safe design which contrasts with the evolutionary biologists' approach that celebrates a systems' persistence, change, and unpredictability (Gunderson et al., 2002, in Nelson et al., 2006; Marchese, 2018). "Engineering resilience refers to the ability of a system to resist change during a disturbance and/or efficiently return to equilibrium after a disturbance and is appropriate for physical infrastructure elements" (Davidson et al., 2019, p. 2). Conversely, social-ecological resilience refers to the amount of change a system can undergo and still retain the same functions and structure, the degree to which the system is capable of self-origination, the ability to build and increase the capacity of learning and adaption, and the capacity to transform part or all of the system into a different kind of system when the existing one is in an irreversible undesirable state (Walker & Salt, 2012; Davidson, 2019, p. 2). Thus, engineering resilience helps planners plan for more efficient systems that predict and prepare for sudden changes, and social-ecological resilience aids in learning systems to adapt in response to change. The emergence of the concept and theory of resilience in planning can be traced to post-September 11, 2001, with the attack on the World Trade Center by terrorists in New York (Nelson et al 2006). Vale and Campanella

(2005) borrowed the concept of resilience from ecology and linked resilience with disasters and urban development.

Resiliency has undergone a system of triage in planning and policy and responses to pressures have depended on the level of government affected (Bassett & Shandas, 2010). Coaffee (2013) stated that there have been four generations of resilience practice with security and emergency planning as the core of planning issues. In addition, the advent of environmental resilience occured in policy implementation during this same timeframe, precipitatedfirst by social pressure then by the increased economic cost of environmental issues and climate change (Zautra, Hall, and Murray, 2009).

Prior to 2000, resilience was defined in policy as defensible space with urban policy planners subjugating resilience in favor of security and emergency management agendas (Coaffee, 2013). Cities were seen in pathological terms; vulnerable places in need of protection, with physical design in the form of crime prevention through environmental design being the core of territorial control. Just as these policies addressed individual threats, the pre-2000 environmental policy was a time of federal policies that regulated the more lethal and widespread environmental pollutants. The individual component was perceived as being sick, and the system in which it existed was not addressed holistically in these policies. Additionally, the idea of social resilience was absent from both conversations (Coaffee, 2013).

From 2000-2005, the first generation of resilience addressed the ability of the nation to absorb a significant shock (Coaffee, 2013). The major catalysts for this change in thinking were the terrorist attacks throughout the Western world. These attacks revealed the vulnerability of urban environments as the physical and economic damage was exacerbated by the social disruption and widespread loss of life (Coaffee, 2013). At the same time, environmental issues

began to surface in the wake of rising energy prices and the need to reduce reliance on foreign oil gave weight to the renewable energy debate.

The second generation of resilience, 2005-2009 according to Coaffee (2013), moved from the realm of absorbing shock to managing and minimizing risk. While still focused on the pathology of urban resilience, policies began to interface with the planning system. The focus for policymakers was to address the preventative-action nature of resilience beyond absorbing shocks with a mere pathological interpretation of the system. To achieve greater outcomes, this also involved moving the responsibility for action to the lowest level of governance in business and government. Additionally, the social aspects of resilience were addressed for the first time as communities were left to prepare for shocks and manage a broader array of risks (Coaffee, 2013; Zautra, Hall, and Murray, 2009; Bassett & Shandas, 2010).

From –2009-2013, resilience policy had entered a third generation focused on resilience as an everyday practice. The designed-in security measures encompassed a larger pool of people able to plan, design, and implement measures that reduce vulnerabilities in the built environment (Coaffee, 2013). The increase in responsibility for creating resilient cities to a broader array of lower-level stakeholders opened opportunities to address other issues. These issues included energy efficiency, water management, crime reduction (Coaffee, 2013), and climate change initiatives. The advent of Climate Change Action Plans in this era is evidence of the growing holistic system thinking in planning, design, and implementation.

The fourth generation of resilience, 2013 and beyond, is evolving into a system that approaches resilience in terms of its wellness. While resilience was initially driven by the answer to the question, "What makes a city sick?" this new thinking asks, "What increases a city's quality of life?" (NIEHS 2013). New policy dynamics recognize the interconnected, holistic, and

comprehensive nature of places (Coaffee, 2013). Discussions now revolve around community and individuals rather than the ubiquitous, faceless public. Based on the evolution of its definition, resilience has evolved from a pathological approach, addressing issues of safety and security, to a more holistic approach, involving stakeholders and addressing issues of urban wellness, such as energy and water supply.

Urban resiliency has as many threads as those that hold the community together as a whole. From economic stability, social equity, environmental preservation, and adaptation, to energy, water, and food security, each component weaves its way through and around the other to create a web of security inside and outside human ecology. Policy making has historically looked at financial, urban, and environmental security separately. Yet, the discussion, procedures, and practices of resilience are being influenced and employed at smaller scales with broader scope. The increasing scope of urban resilience, however, cannot be managed wholly in isolation (Salat et al., 2012).

For planners, there is an increase in responsibility to remedy social and environmental issues but fewer resources to accomplish these challenges, particularly after the economic downturn of 2007. With greater pressure to meet centrally-derived performance targets, the decentralizing of responsibility, and the centralizing of power to shape the agenda, new relationships amongst the varied stakeholders and levels of governance are required (Coaffee, 2013). Integrating the moving pieces toward improved quality of life will likely be the challenge for the next generation of resiliency, so we can, indeed, bounce back and be better than before.

Similar to the sustainability graph (Figure 3), the graph below (Figure 5) illustrates the prevalence of resilience research from 1989 through 2018 amongst peer-reviewed research in

five-year increments. It shows a somewhat steadier incline through 2009 after which it increases significantly.

Figure 5. Prevalence of Resilience Research in Peer-Reviewed Article 1989-2018

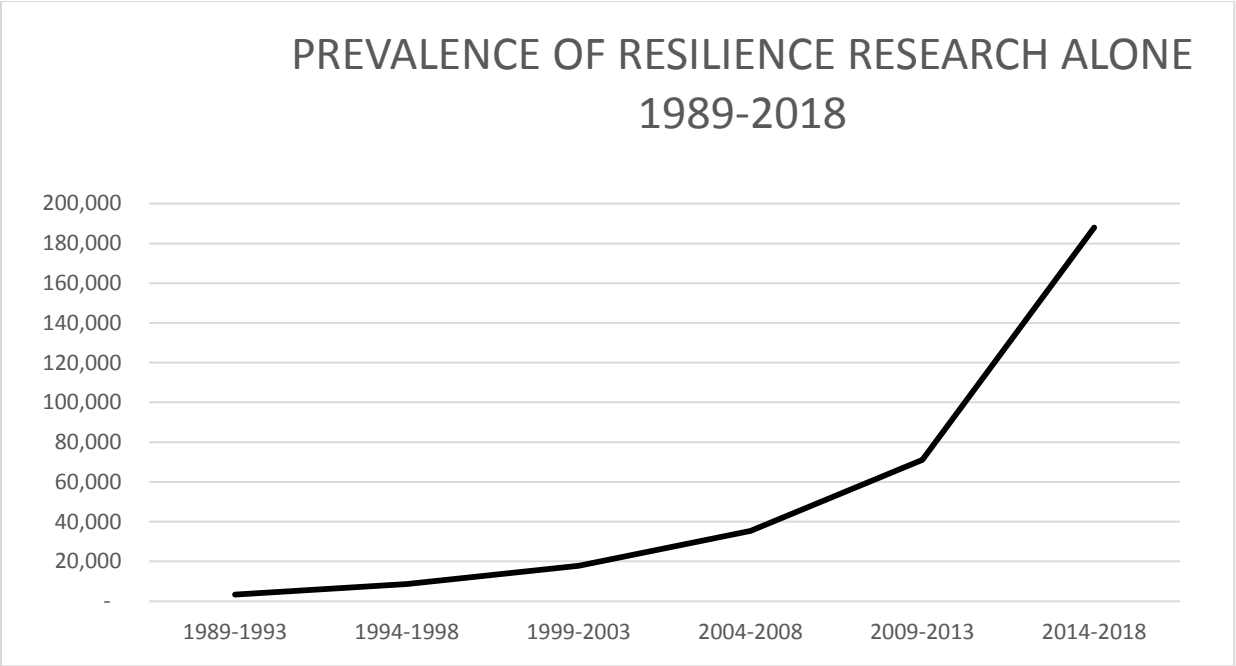
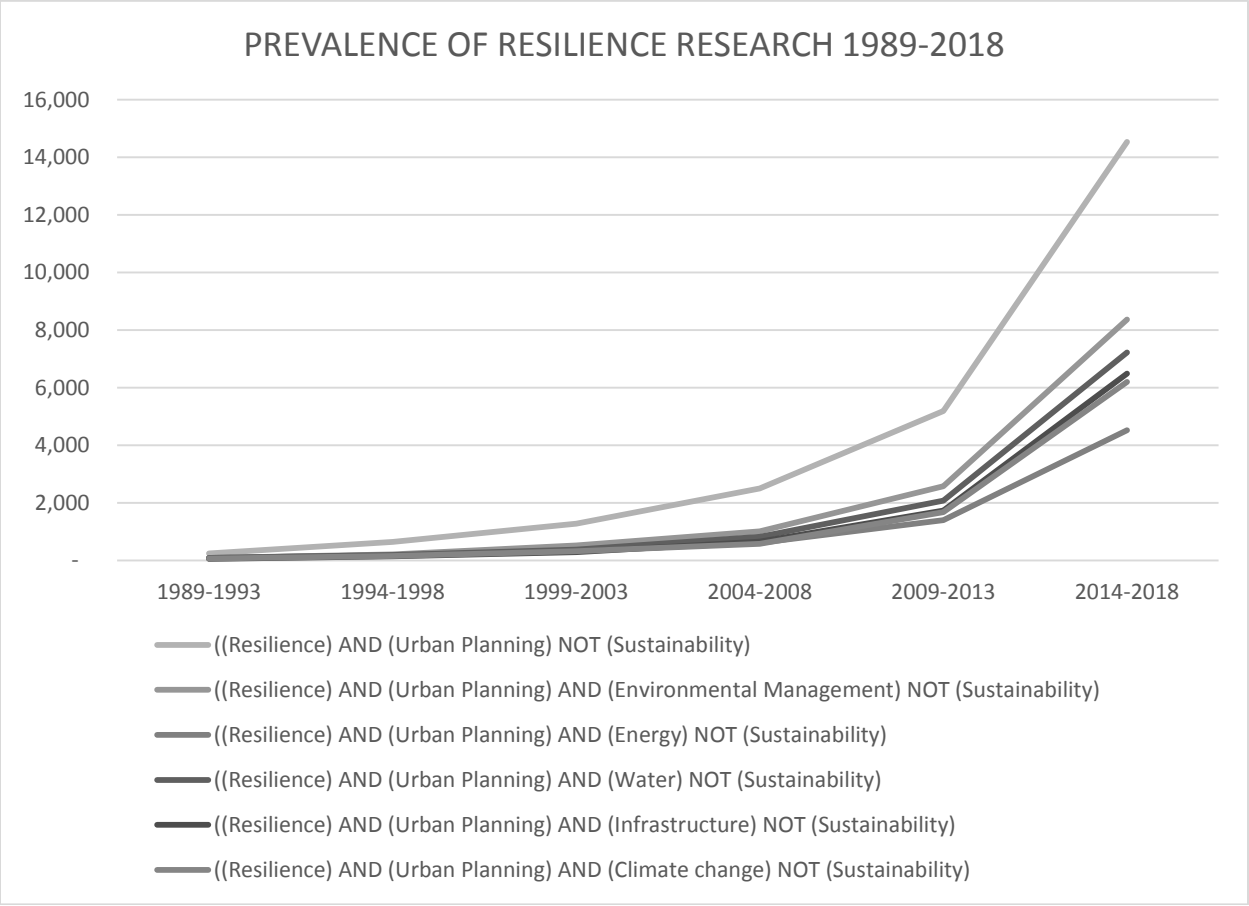


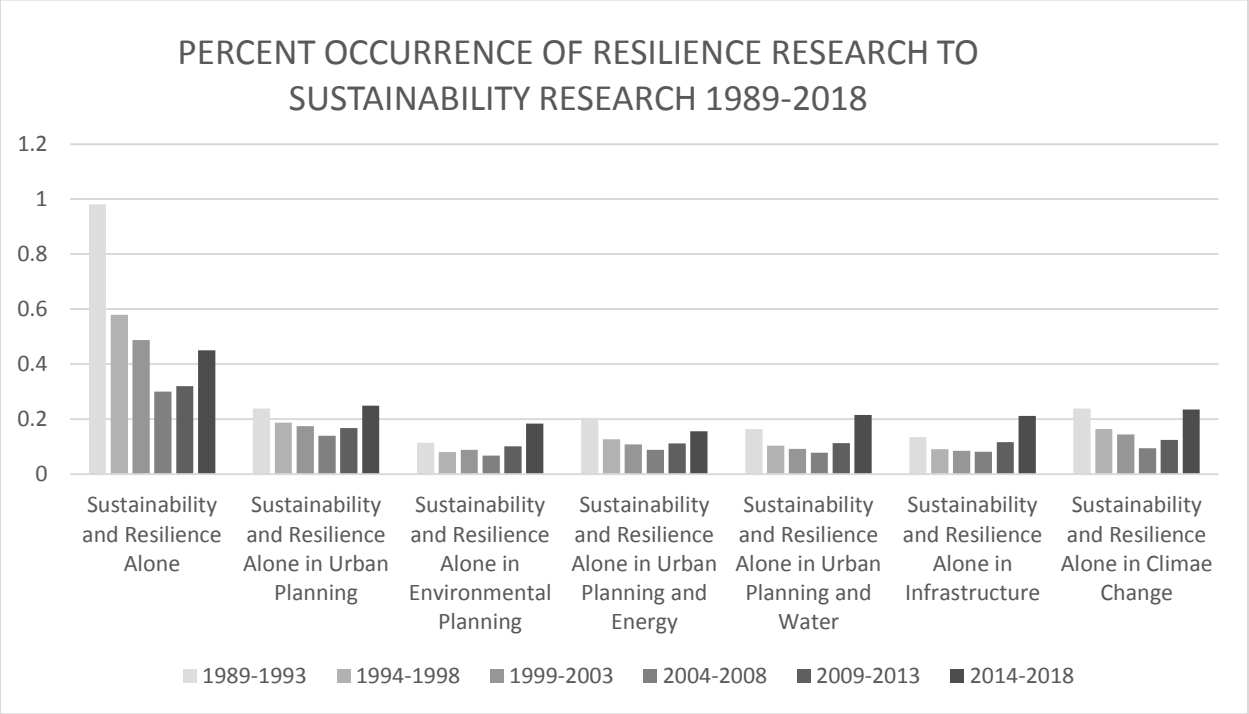
Figure 6 below illustrates how selected research topics in resilience have changed over time. Research related to resilience and urban planning experienced a slight increase in 1999-2003, and then a rapid increase in 2009-2013 to 2014-2018. This is true with all other selected topics, with environmental management seeing the greatest research intensity. Like sustainability, these increases correspond with hurricane Katrina in 2005, the great recession in 2008, and then a significant increase following the terrorist attacks of September 11, 2001. However, the purpose of this comparison is not to form causality but only to show the evolution of the intensity of research.

Figure 6. Prevalence of Resilience Research in Peer-Reviewed Articles, 1989-2018



The following graph (Figure 7) illustrates the percent occurrence of resilience research intensity to sustainability research intensity overall and in the selected subjects from 1989-2018. This graph shows sustainability was referenced almost twice as much as resilience, but resilience research had tripled in intensity from 2013-2018 compared to sustainability's doubling in the same timeframe. However, references to sustainability as a total number remain at almost twice that of resilience overall and in the selected topics from 1989-2018.

Figure 7. Percent Occurrence of Resilience Research to Sustainability Research 1989-2018 Overall and for Selected Topics



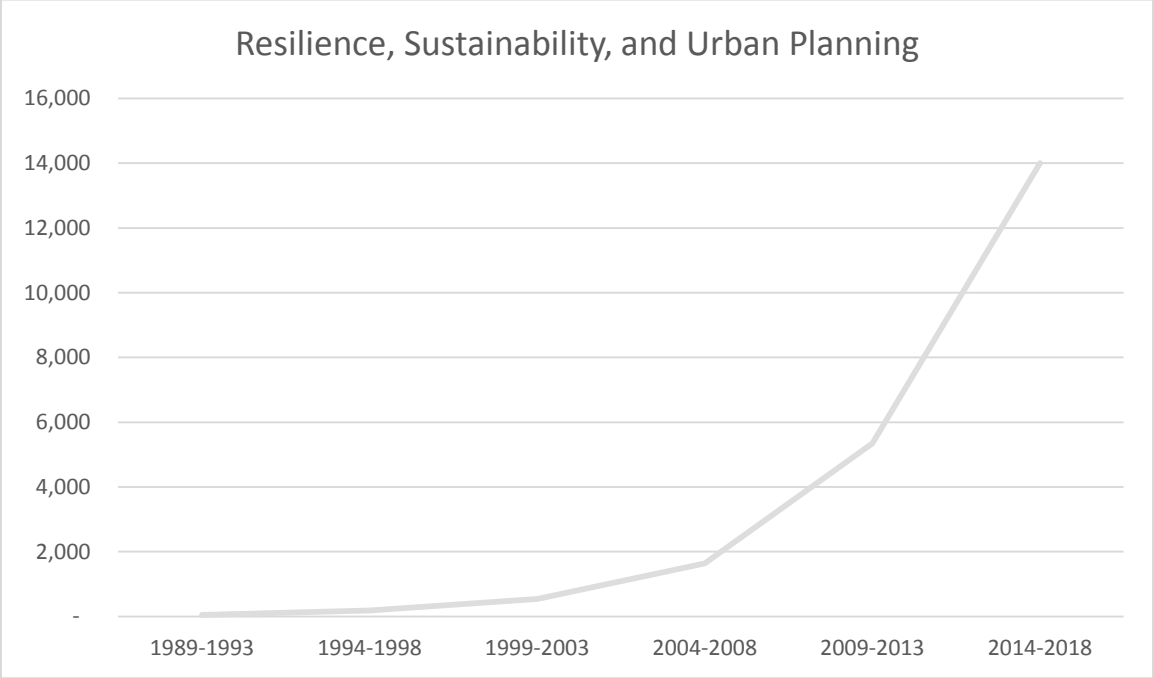
As figure 7 illustrates, both the concepts of sustainability and resilience have grown in the intensity of research since the publication of the Brundtland report in 1987 in response to environmental pressures and the associated human suffering around the world. Additionally, although we have no causality and only a rough correlation, steep increases in research in both subjects correspond with the devastation following Hurricane Katrina in 2005, especially in sustainability, and again in the aftermath of the 2001 terrorist attacks on U.S. soil, especially in resilience. The following section discusses the relationship between sustainability and resilience and develops a framework for combining the two concepts in an era of VUCA.

Linking Sustainability and Resilience Theory

Over the past 30 years, the notions of both sustainability and resilience have emerged in planning literature with resilience only recently emerging in planning discourse. Even newer is the exploration of the relationship between resilience and sustainability (Jun & Conroy, 2014; Jabareen, 2008; Marchese et al., 2018; Wilkinson, Porter, & Colding, 2010). Community development has focused on the core concept of sustainability since its rise in urban planning in the 1980s (Lew et al., 2016). However, as Maddox (2013) posits, to achieve the desired city, we must balance and operationalize sustainability, resilience, and livability. Industry, government, and the general public have become more aware of sustainability and the need for a systems approach to addressing it, linking sustainability to the concept of resilience (Fiksel, 2006). However, resilience and sustainability have historically been conceptualized as two separate notions with sustainability emerging from the environmental movement (Maddox, 2013; Portney, 2003; Wheeler, 2013), and resilience emerging out of civil defense and emergency management (Coaffee, 2013; Goldstein, 2012).

Figure 8 illustrates the growth in research that combines sustainability and resilience from 1989-2018. This illustrates that more and more the two concepts are examined together, especially since 2013, as the world becomes a more unpredictable place.

Figure 8. Occurrence of Resilience Research Articles to Sustainability Research Articles in Urban Planning, 1989-2018 Overall and for Selected Topics



Cascio (2009) stated, "Sustainability is a seemingly laudable goal – it tells us we need to live within our means, whether economic, ecological, or political - but it's insufficient for uncertain times. How can we live within our means when those very means can change, swiftly and unexpectedly, beneath us?" (Cascio, 2009). Fiksel (2006, p. 16) argues that "The sustainability of living systems – including humans – within the changing earth system will depend on their resilience." Basiago (1996) argues that "A new city has emerged in the 1990s, designed to achieve urban 'sustainability'" (Basiago, 1996, p. 135). However, by 2016 in the field of community development, resilience, which had emerged gradually out of ecology, has since been adopted as a means for responding to a VUCA world (Lew et al., 2016), overshadowing the conversation of sustainability.

Lew et al. (2016) point out that the confusion over the framing of sustainability and resilience is due to two factors. Both concepts are removed from their core definitions to fit

political agendas, and both share similar goals and approaches to developing solutions, especially in terms of climate change, in an attempt to balance development and the natural world (Lew et al. 2016). Lew et al. (2016) describe the difference in framing sustainability and resilience as being effectively the same phenomenon, or as the conservation goals of sustainability conflicting with the resilience goal of adaptation (Lew et al., 2016).

In their comparison of sustainability and resilience, Marchese et al. (2018) note the focus of sustainability is on current and future quality of life in relation to environmental, social, and economic systems while resilience tends to focus on the response of these systems to extreme disturbances (e.g. hurricanes, bombings, financial meltdown) (Marchese et al., 2018; National Research Council 2012; Coaffee & Lee, 2016), and persistent stresses brought on by those disturbances (e.g. loss of housing, potable water, electricity) (Marchese et al., 2018; Coaffee & Lee, 2016). Carpenter et al. (2001), too, describes sustainability and resilience as systems that have both a spatial and temporal component to them. Both concepts are linked to the persistence of a system over time and space, and both are linked to global trends (Folke et.al., 2002).

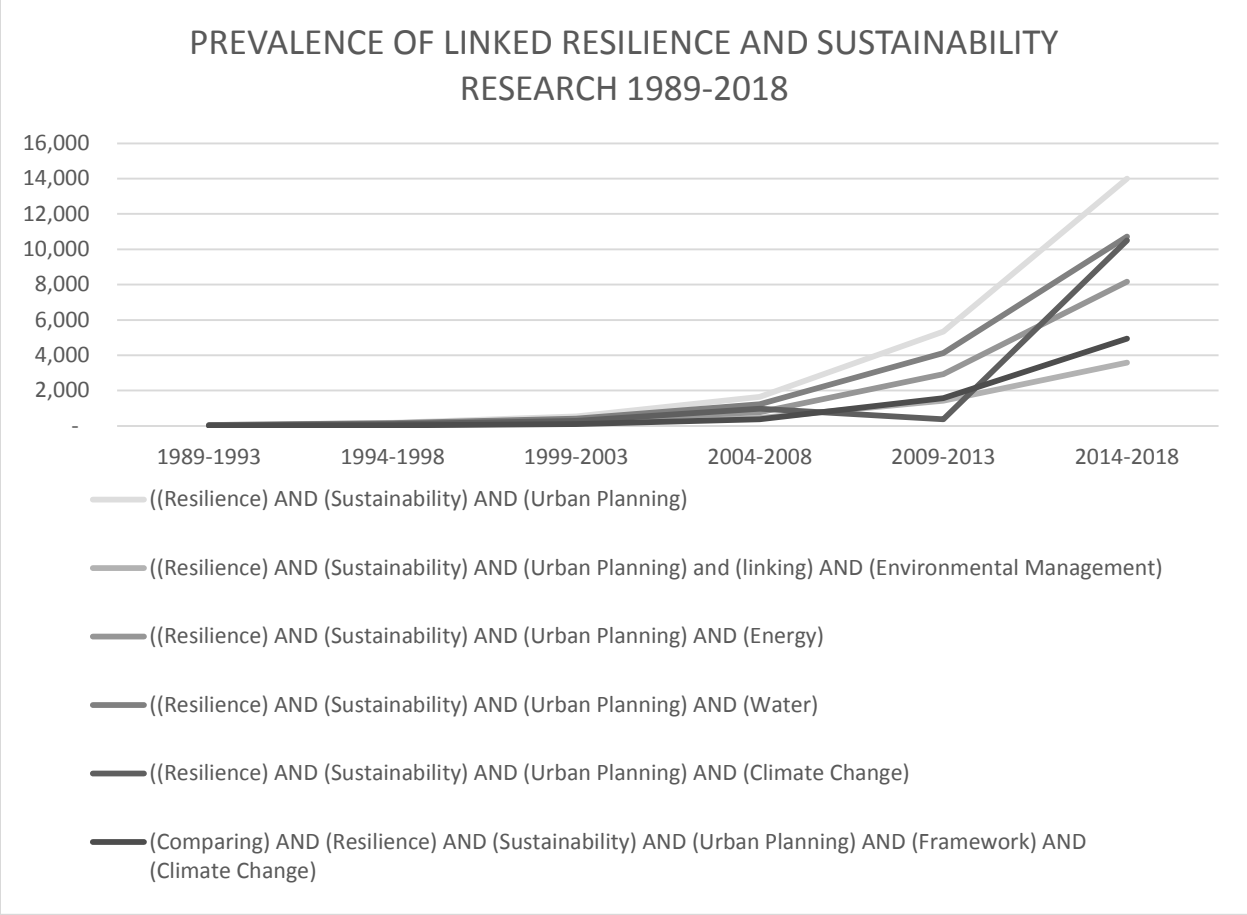
However, while both sustainability and resilience have temporal and spatial components as well as overlapping goals, these can be quite different and thus can conflict. Sustainability considers the long-term, efficient, and renewable use of resources. The goals of sustainability tend to manifest in larger, more regional spatial scales (e.g. water systems) (Redman, 2014: Marchese et al., 2018) and longer timeframes (i.e.. 50 or more) (Meacham, 2016; Marchese et al., 2018). Resilience tends to consider the potential calamities of the here-and-now, seemingly making it more palatable to the public and leadership (Mulligan et al. 2013; Marchese et al. 2018).

Davidson et al. (2019) see resilience as the dominant organizing framework. Davidson stated that modeling the future based on the past to achieve sustainability and building a systems adaptive capability to favorably respond to shocks results in resilience (Davidson et al., 2019). Redman (2014) posits that both sustainability and resilience should be continually applied to improve society and the environment.

Linking Resilience and Sustainability

To better illustrate the relationship between sustainability and resilience, a matrix was developed (see Appendix A) using a review of past and current literature. Focused exclusively on literature that compares the two concepts, this review revealed that combining the two concepts in urban planning literature has grown significantly over the past five years. While Schewenius, McPhearson, & Elmqvist (2014) caution against using resilience as a one-size-fits-all approach to achieving sustainability, it is well established through the literature that sustainability and resilience are separate, yet inseparable, concepts in achieving the goals and mandates of both.

Figure 9. Prevalence of Linked Resilience and Sustainability Research, 1989-2018



Installation Energy and Water Plan Scopes of Work

The Scopes of Works (SOW) developed for Joint Base San Antonio (JBSA) and Joint Base Elmendorf-Richardson (JBER) in Anchorage, Alaska were created separately by private firms that specialize in military master planning. The Corps of Engineers contracted the architecture and engineering firm AECOM to create the Installation Energy Plan (IEP) for the

Anchorage joint base[8] as part of the pilot program for the Air Force. This military installation impacts 401,108 people, encompassing an area as large as 26,420 square miles.

The Installation Energy and Water Plan (IEWP) for the San Antonio military installation was contracted to the architecture and engineering (AE) firm EJES, with an in-house portion completed by the Army Corps of Engineers' Construction Engineering and Research Lab (CERL) and the Regional Planning and Environmental Center (RPEC). The AE firm developed scopes of work for each base that makes up the San Antonio military installation which includes the Median Annex, Lackland AFB, Kelly Field Annex, Port San Antonio Annex, Randolph AFB, Canyon Lake, Seguin Auxiliary Field Fort Sam Houston, Medical Center Annex, Grayson Street Annex, and Camp Bullis. Together, this military installation impacts 1.53 million people, encompassing an area of 465 square miles.

The contracted portion of each of these plans included data collection, workshops, and draft production. The research arm of the Army Corps of Engineers (CERL and RPEC) is using the data gathered to create and test a software tool (SIMPL) to track and verify cost and energy savings based on the strategies developed for energy and water sustainability and resilience. The scope of work for the Anchorage installation was developed under the July 2018 Installation Energy Plan Guidance, and the scope of work for the San Antonio military complex was developed under the April 2018 Energy and Water Guidance.

[8] AECOM also developed scopes of work for additional military installations, including Beale Air Force Base, Edwards AFB, Vandenberg AFB, MacDill AFB, Selfridge Air National Guard Base, and Greeley Air National Base

Joint Bases Elmendorf-Richardson and San Antonio Scopes of Work

The purpose of the Energy and Water Plan for the San Antonio base is to address requirements for energy and water security and resilience, including energy and water efficiency and conservation, renewable energy, alternative water, and alternative fuels policy goals and compliment the energy and water needs as outlined in the installations holistic Master Plan, which was developed under the guidance of the Army Corps of Engineers Unified Facilities Criteria for master planning.

The San Antonio scope of work states all tasks should be completed for each of the five bases independently then combined into an overarching and holistic plan for all of Joint Base San Antonio. The SOW also requires data identification and collection as well as major stakeholder involvement. The scope of work has four steps in execution: (1) identify energy and water requirements; (2) assess risk and opportunities within the current operations; (3) generate solutions to address the risks and opportunities identified; and (4) develop an implementation plan that includes projects and strategies that increase the installations overall resilience. During the first workshops, stakeholders identified the scope, goals, and planning vision for the San Antonio Installation Energy and Water Plan.

Tasks to be completed following this initial goal and visioning session include establishing energy and water needs for critical missions which includes identifying those missions and operations and determining the required utilities and infrastructure needed to support them. A baseline was needed to determine the following:

(1) energy, water usage, and supply

(2) energy and water sources, availability, and access

(3) condition of energy and water infrastructure to support critical missions

(4) level of personnel trained in conducting required energy and water security systems

(5) sustainment activities.

After establishing a current baseline, future needs are captured for both the installation as a whole and separately for critical missions and facilities. The Installation Energy and Water Plan version was adopted over the alternate version Installation Energy Plan at Joint Base San Antonio due to the limited water availability in that region.

The U.S. Air Force Office of Energy Assurance, which initiated the Installation Energy Plan for the Joint Base Elmendorf-Richardson in Anchorage, is tasked with providing resilient and sustainable planning guidance for the execution of energy resilient projects. The Energy Plan scope of work for the Anchorage base addresses a comprehensive and holistic roadmap toward goals in energy efficiency, renewables, and energy resilience. Guidance for energy plans state that they must do the following:

(1) meet projected future energy and water demands to achieve mission assurance

(2) achieve goals set by Congress, Executive Order 13693, Department of Defense components on energy use intensity and other energy efficiencies, greenhouse gas renewable energy, energy resilience, water efficiency, and alternative fuel and

(3) address concerns that are hindering stakeholder's cooperation on energy and water management.

The Plan is required to be developed in coordination with the Installation Development Plan (IDP), which is the overarching master plan for the installation. Unlike the San Antonio Plan which is required to be integrated into the master planning documents, the Energy Plan at the Anchorage joint base is required to be a stand-alone component of the IDP. The Plan has five parts:

(1) energy assessments

(2) energy goals and priorities

(3) energy strategies

(4) gap analysis and alternative scenarios analysis, and five development and sequence planning actions and activities

There are critical issues of resilience and sustainability not addressed directly in either the San Antonio or Anchorage plans. These include but may not be limited to, issues of social equity and the strength and vigor of the workforce during pandemics. While the strategies in the energy plans are implementable, this narrow view of resilience and lack of sustainability measures is perhaps shortsighted and reactionary.

Engineering and Planning Disciplinary Perspectives

As seen within this literature review, sustainability and resilience are complex concepts with meanings that continue to evolve. Impacting this evolution is not just the world events themselves, but the interpretation and perspectives of those that are involved with planning and implementing solutions to the impacts of events (Marchese et al., 2018). To better understand this phenomenon, this section examines the disciplinary perspectives of planners and engineers through their documents and online presence as they define what is meant by the terms and develop solutions to address current and chronic stresses to improve both the environment and quality of life. An examination of these perspectives reveals that, in general, planners look at the complete context of sustainability as it relates to the physical, economic, and environmental aspects of urban development, while engineers are tasked with operationalizing these concepts. In fact, to create a sustainable and resilient urban environments in its broader definition as

defined by the American Planning Association (APA), the Brundtland Report (1987), the American Society of Civil Engineers (ASCE), and researches such as Holling (1996) & Meadows (2004), it is apparent that planners, designers, and engineers must work collaboratively and include diverse stakeholder input throughout the planning and implementation process.

Resilience in the ASCE refers to the capability to mitigate against significant risks and incidents and to quickly recover and reconstitute critical services with minimum damage to public safety and health, the economy, and national security, as stated in the *Policy Statement 518 – Unified Definitions for Critical Infrastructure Resilience* (ASCE, 2013). According to the ASCE, this definition was created post 9/11 to provide a unified definition of critical infrastructure (ASCE, 2013). Thus, critical infrastructure includes systems, facilities, and assets so vital that their destruction or incapacitation would have a debilitating impact on national security, the economy or public health, safety, and welfare.

The American Planning Association

Over the years, the APA has developed a framework for defining sustainability. The *Sustainability Policy Framework* document of 2016 (Framework hereafter) (APA, 2016) stated the reach of sustainability is both broad and deep, and the planning profession is well-suited to advance sustainability policies and practices to ensure the future viability of our planet and all its diverse communities. This is an interesting contrast to the ASCE's statement that they are well-suited to the process of implementing sustainability, as the concept of sustainability has significantly evolved over time. Currently, the APA defines sustainability in terms of improving the quality of people's lives while living within the capacities of supporting natural and human systems (APA, 2020).

The Framework addresses resilience in terms of strong social networks and community resilience to disasters under the umbrella of sustainability. One of the principles of the Framework is a resilient economy in which the community is prepared to deal with both positive and negative changes in its economic health and maintains the ability to initiate sustainable urban development strategies (APA, 2016). Resilience is also included as part of the core principles in terms of healthy and resilient practices. Evidence of how the APA addresses resilience more directly comes from guidance in the APA *Policy Guide on Hazard Mitigation* (APA, 2014).

The *Policy Guide on Hazard Mitigation* is designed to "support measures and policies to enhance awareness of risks and efforts to improve community preparedness, resilience, and sustainability in the face of both natural and human-caused hazards" (APA, 2014, p 1). This guide includes 26 high-level prescribed policy outcomes for addressing natural disasters such as drought, floods, hurricanes, and extremes in temperature to human-caused disasters such as biological, chemical, or radiological agents, dam failures, and terrorism. Included in these measures is a section on disease and pandemic (APA, 2014).

Moreover, embedded within the APA is the *100 Resilience Cities*, initiated by the Rockefeller Foundation (Stromerg, 2017) *Planning for Resilience* blog. The definition of resilience emerges from this initiative that includes the capacity of individuals, communities, institutions, businesses, and systems within a city to survive, adapt, and grow no matter what kinds of chronic stresses or acute shocks they experience.

The Civil Engineering and ASCE

The American Society for Civil Engineering (ASCE) defines sustainability as a set of economic, environmental, and social conditions, the "Triple Bottom Line," in which all of

society has the capacity and opportunity to maintain and improve its quality of life indefinitely without degrading the quantity, quality, or the availability of economic, environmental, and social resources (ASCE, 2020). They make a point to connect sustainability with infrastructure to improve the quality of life, enhance the environment, and support the economy.

As one of the Society's three strategic initiatives, ASCE's focus on sustainability is guided by a board-level committee and supported by a broad community of local committees and technical groups. Within the Society's *Sustainable Land Use* training course, however, they state there is a strong connection between how we plan for growth and development and the infrastructure needed to serve it. The program is designed to allow engineers to achieve a greater working knowledge of how to design infrastructure systems that encourage and support sustainable lifestyles; preserve and sustain native species, human heritage, and social opportunities; and enhance sustainable economic opportunities (Weinstein and Clifton, 2020). Because the ACE's *Sustainable Land Use* course is taught by planners, specifically Weinstein, P.E. ASLA, AICP, MASCE, ENV SP, and Clifton, AICP, it can be surmised that the ASCE and APA work collaboratively to bring about perhaps a more comprehensive understanding of sustainability to the engineering field and a more holistic understanding of both sustainability and resilience.

ASCE recognizes environmental operating conditions are changing radically, significantly different from what civil engineers have been taught to expect (ASCE, 2020). William Wallace, an instructor for the University of Florida's Electronic Delivery of Graduate Engineering program and chair of the Sustainable Development Committee of the International Federation of Consulting Engineers, reflects that a long-held premise for civil engineering projects is what scientists are calling stationarity. Stationarity means the statistical properties of

engineering design parameters (e.g. ambient temperature, sea level, storm intensity, the extent of droughts, heatwaves, and flooding) will be the same in the future as they have been in the past (ASCE, 2019). Unfortunately, multiple decades of unsustainable practices have made those assumptions unreliable (ASCE. 2020). Overconsumption of resources and excessive pollution, particularly greenhouse gas emissions, have significantly degraded the earth's natural resources and systems, resulting in vast changes in resource availability and the environmental conditions under which infrastructure systems are expected to operate (Wallace, 2020). Consequently, non-stationarity has become the "new normal" for the built environment. Resource availability and environmental operating conditions are changing and will continue to change substantially in ways that are not readily predictable. From now on, making a project "sustainable" is no longer a matter of adding "green" features to a conventional design. Today's civil engineer needs to know how to meet project owners' needs and contribute to sustainable performance while taking into account significantly changing operating conditions (Wallace 2020, para 2).

These viewpoints, and the fact that within their *Sustainable Infrastructure Certificate* program are instructors who are American Institute of Certified Planners (AICP) certified, suggest a broad view of the practical application of sustainability concepts. In fact, the ASCE notes that they are well-suited for the process of implementing sustainability. The course's module on access and mobility for the 21st century states "sustainable development entails maintaining and improving quality of life indefinitely without degrading the quantity, quality and availability of natural, economic, and social resources" (ASCE, 2019a). It is well established that access and mobility are key elements in connecting people to economic and social opportunities to improve their quality of life.

Table 3 demonstrates some of the differences and similarities in perspectives on sustainability and resilience from planners and engineers within the APA and the ASCE as evidenced by their respective documents and virtual presence. Much of the recent focus in both organizations has been in the field of resilience, and both recognize resilience is an important component of sustainability. Additionally, both recognize the importance of local stakeholder involvement to develop, test, and improve resilient and sustainable solutions. The APA focuses much of its resilience planning on the issue of climate change, mass migration, and pandemics, while the rhetoric within the ASCE focuses on creating infrastructure that is resilient to climate change and terrorist attacks. Both recognize that the world is no longer predictable and planning and engineering for these uncertainties presents both challenges and opportunities for the future.

In reviewing their online presence, it is noted that planners look to what is needed to create sustainable, resilient, livable places, and engineers are tasked with devising ways in which to make these places a reality. Table 3 below indicates engineers look at how their contribution to building resilient places decreases fragility in the physical systems that support the economic and social systems and contribute to sustainability (ASCE, 2016), while planners look at sustainability and determine how resilience against climate change and other uncertainties contribute to more sustainable systems (APA, 2016). While it is clear that there are many overlapping perspectives, it could be argued that perhaps engineers are more skilled at operationalizing resilience, while planners are more adept at guiding sustainability in its broader sense. However, within the bodies of research, it is evidenced that both concepts must be welded together to increase the quality of our lives, our economies, and our environment and ensure that all members of our society are given equal access and connection to that quality in a manner that resists disruption and evolves with changes. As is indicated by members of both the APA and the

ASCE, it is essential for planners and engineers to work collaboratively with designers, contractors, and stakeholders to achieve resilient, sustainable places, as it is at the local stakeholder level that solutions are tested and improved upon (ASCE, 2015, APA, 2016).

Table 3. Planning and Engineering Perspectives on Sustainability and Resilience

Planners - APA	Engineers - ASCE
Planners – APA	
Sustainability	
Advance **sustainability** policy and practices to **ensure future viability** of our planet and all its diverse communities (APA, 2016)	A set of **economic, environmental, and social conditions** in which all of society has the capacity and opportunity **to maintain and improve its quality of life indefinitely** without degrading the quantity, quality, or the availability of economic, environmental, and social resources. (ASCE, 2020)
"The time has come for to collectively **reexamine-and ultimately move past-the concept of sustainability** in **environmental** and **natural resources** law and management" (Benson and Craig, 2013)	A concept and a notion that is **broader than resilience**. Sustainability includes resilience. A non-resilient system is unsustainable. **Sustainability** includes actions you take to make things **last for the long-term**. (ASCE, 2015)
"The reach of **Sustainability** is both **broad and deep**. Considered in its true applicability, its principles **infiltrate all facets of planning** and are essential characteristics of good planning. It	"Knowledge of **sustainable** development should be a key requirement for engineers." (ASCE, 2018) ASCE and its members are dedicated to ensuring a

Planners - APA	Engineers - ASCE
is **overarching** and is best considered as an **umbrella** to many, if not almost all, planning topics, such as **transportation, water**, the **built environment, natural resources**, **health,** the **economy**, and many, many more." (APA, 2016)	**sustainable future** in which **human society** has the **capacity** and opportunity to **maintain** and **improve** its **quality of life indefinitely**, **without degrading** the quantity, quality, or the availability of **natural, economic, and social resources**. (ASCE, 2020, para 1)
Resilience	
"The capacity **of individuals, communities, institutions**, businesses, and systems within a city to **survive, adapt, and grow** no matter what kinds of **chronic stresses** and **acute shocks** they experience." (Stromberg, 2017)	The capability to **mitigate against** significant all-**hazards risks** and incidents and to expeditiously **recover** and reconstitute critical services with minimum damage to **public safety** and **health,** the **economy**, and **national security**. (ASCE, 2013)
Resilience, in all of its forms, is a key issue in planning (APA, 2018)	A **resilient** community is prepared to **prevent or minimize** the **loss or damage to life**, **property,** and the **environment** when faced with a **natural disaster**, such as a flood, hurricane, or tornado, or a man-made disaster, such as an electrical outage, **economic collapse,** or **health epidemic**. (Henze, 2015)
The past is not the best predictor of the future anymore. **Resilience** helps us look at how we might **deal with change**, and what degree we	A more **active response to threats** that may occur in the future, examining **worldwide issues** as one set of **resources we share**, and pay attention to

Planners - APA	Engineers - ASCE
want to deal with that change. (Bomar, 2015)	what happens and **how people respond**, in order to create **resilient** communities. (ASCE, 2015)
Resilience, as it pertains to urban development, is focused on infrastructure. "Planners stand at the intersection of long-term **climate resilience** and **infrastructure implementation**" (DeAngelis, Briel, and Lauer, 2019)	Civil Engineering concerned with **safety – reliability** based designed followed by **risk-informed** design, **resilience** looks at beyond failure to deal with **recovery**. (Ayyub, 2020)
Planner's role in **infrastructure resilience** includes robust **public outreach**, **inclusive community** visioning, and building links between plans that address local infrastructure. (DeAngelis, Briel, and Lauer, 2019, p. 110)	Recognize the implications of **environmental** disasters and **terrorist attacks** causing worldwide **recessions**, and how the **cost benefit analysis** should include the cost of the system's failure. (ASCE, 2015)
Resilience requires developing plans that consider future **climate conditions**, **local willingness** to actively use plans. (DeAngelis, Briel, and Lauer, 2019, p. 110)	**Resilience** is critical to **infrastructure,** as it looks at the long-range impacts of things such as **climate change** and operational changes, and how do those systems **adapt and bounce back**. (ASCE, 2015)
Planners harness **local planning tools** necessary to advance **resilience**. (DeAngelis, Briel, and Lauer, 2019, p. 128)	Engineers must **talk to a lot of different kinds of people.** This includes everyone in the community: the public, the leadership, designers, contractors, and local stakeholders, (ASCE, 2015)

Planners and Engineers in the Installation Energy and Water Plan Process

Within the Army and the Army Corps of Engineers, the guidance for the current energy plan was essentially developed by planners at the national, research, and enterprise levels of the military complex in response to vulnerability, uncertainty, complexity, and ambiguity (VUCA) of the effects of climate change, terrorist attacks, growing unrest around the world, rapid urbanization, pandemics, as well as poor and overtaxed infrastructure. Planners devised the elements that need evaluation to reduce the fragility of certain systems, particularly the energy and water systems, that are needed to ensure essential mission and personnel functions. The actual plan content to be implemented is developed by planners at the regional and installation levels of the military complex.

Finally, these infrastructure systems are then engineered at the regional or enterprise levels and implemented on the installation level based on installation and personnel needs using best practices to improve infrastructure systems, increase efficiency, create redundancy, and reduce cost. However, an analysis of the documents related to sustainability and resilience within installation master planning would indicate the sustainability concepts of social equity and economic resilience are only considered indirectly or consequently. Even though the guidance within the current energy plan requires master plans to be compatible with sustainability as defined within master plans created under the *Unified Facilitates Criteria*, which includes many sustainability strategies, there is no mention of strategies being economically or socially resilient. Current research indicates sustainability is the continuance of systems of environment, economics, and social equity (Wheeler & Beatley, 2009; Maddox,2013; Portney, 2003; Wheeler, 2013; Marchese et al., 2018; Daly, 1995; Holland, 1997; Wu, 2013), while resilience is the ability of each of these systems to withstand acute and chronic stressors, learn, adapt, and grow

(Stromberg, 2017; Coaffee, 2013; Goldstein, 2012; Marchese et al., 2018; De Vita et al., 2019, p 535). As Field and Conn (2006) indicate in their work in living systems theory, we are all living systems engaged within other living systems that make up an indivisible whole, relying on planning, design, and engineering of our physical world to create places that are livable, equitable, and economically viable. (Field, J. & E. Conn, 2006). Just as sustainability is vulnerable without the element of resilience, planning is impotent without the implementation of engineering. Thus, planning and engineering work together to make sustainable systems more resilient and resilient systems more implementable. As seen in Table 3, although planners and engineers come from separate professional perspectives and responsibilities, each strives to bring about sustainable communities with resilient infrastructure to withstand chronic and acute stressors.

Sustainability and Resilience at Different Levels of the Military Complex

For this research project, four levels of the military complex were examined as they relate to installation master planning. Because the military is inherently fraught with acronyms and it is impossible to omit them, Table 4 illustrates the organizational level, the level's responsibility to sustainability and resilience, and which agencies are associated with that particular level.

To understand and assess how each level defines sustainability and resilience, several documents and online information pertaining to sustainability and resilience were examined. The table in Appendix B was created to identify the organizational level, responsibilities, agencies within the level and their acronyms, and documents pertaining to that agency, discussed in sections below. Key terms were identified in each of the archived documents or online presence and then categorized to determine the agency's perspectives concerning the relationship between

sustainability and resilience using the framework developed by Marchese et al. (2018) in section 2.7.1 below.

Table 4. Organizational Level and Associated Agencies

Levels and Responsibilities	Agencies
National: Sets policy	Secretary of Defense (SecDef) Office of the Secretary of Defense (OSD) Secretary of the Army (SecArmy) Department of Defense (DOD) Headquarters (USACE-HQ)
Research: Develops tools for implementation	Engineering Research and Development Center (ERDC) Construction Engineering and Research Lab (CERL) Center for the Advancement of Sustainability Innovations (CASI)
Enterprise/ Regional: Interprets policy and develops plans	Air Force Civil Engineering Center (AFCEC) U.S. Army Corps of Engineers-Regional Planning and Environmental Center (USACE-RPEC)
Local: Co-develops and implements and manages plans	Joint Base San Antonio (JBSA) Civil Engineering (CE)[9] Joint Base Elmendorf-Richardson (JBER) Civil Engineering (CE)

National Level USACE

[9] The Installation Civil Engineering Division includes planning and programming sections, that are responsible for the master plan (planning) and the implementing of the master plan (programming).

At the national level, 14 documents from seven agencies were evaluated (Appendix B). USACE national headquarters' (USACE-HQ) policy and strategy stated "Sustainability is not only a natural part of the Corps' decision processes; it is part of the culture (USACE, 2020a). Corps of Engineers headquarters defines sustainability as "an umbrella concept that encompasses energy, climate change, and the environment to ensure today's actions do not negatively impact tomorrow" (USACE, 2020a, para. 1).

Corps of Engineers headquarters uses a scorecard with a list of goals to be assessed, the metrics for measuring those goals, and a rating system called the *OMB Scorecard for Efficient Federal Operations/Management* (USACE, 2019a) which was developed by the Office of Federal Sustainability's Council on Environmental Quality and passed down from the Department of Defense (DOD, 2020). Goals for this scorecard are guided by the *2019 Sustainability Report and Implementation Plan* (USACE, 2019b) whose goal is to carry out EO 13834 *Efficient Federal Operations* and its objective is to enhance the resilience of Federal infrastructure and operations and enable more effective accomplishment of its mission assurance, operational readiness, and cost-effective business practices. This implementation plan includes hard targets to be achieved within certain timeframes and is reported up the chain of command (USACE, 2019b).

However, for Corps' military responsibilities, the Army Corps of Engineers' policies come through guidance from the Department of Defense, including the guidance for the Energy and Water Plans. In October 2014, the Department of Defense released its *Strategic Sustainability Plan* (DOD, 2014). Within its pages, goals were set for taking "sensible and measured steps to mitigate the risk on operations posed by such climate changes effects as flooding, surging sea levels, severe weather, and extreme temperatures…" (DOD 2014, p. ES7).

Although the title states *sustainability*, the text is indicative of resilience, as proposed goals are designed to mitigate risk. However, the Corps stated in its *Facts Sheet* (USACE, 2019c) that sustainability has been a part of its culture since the adoption of the *Environmental Operating Principles* in March 2002 (USACE, 2019). In this overview, the Corps addressed the triple-bottom-line plus of sustainability; mission, environment, community, and economic benefit, and cites the *Sustainability Plan's Roadmap* to reduce waste, cut costs, enhance the resilience of Army Corps of Engineers infrastructure and operations, and enable more effective accomplishment of the Corps' mission (USACE, 2019c).

Aside from this, the 2016 *USACE Resilience Initiative Roadmap,* outlines the Corps approach to resilience (USACE, 2016). In this document, resilience is said to be "a concept to convey a holistic approach to addressing threats and uncertainty from threats, changing conditions from population shifts, and climate change. Resilience represents a comprehensive, systems-based, life-cycle approach to both acute hazards and changes over time" (USACE 2016, p. 1). It describes resilience as a broad-based, collaborative approach to finding creative solutions to challenges. In this document, the principles of resilience are described as prepare, absorb, recover, and adapt; focusing on projects, systems, and community resilience initiatives. As can be seen, the issues of resilience and sustainability are siloed and perhaps incomplete at the national level.

Research and Development Level - USACE ERDC/CERL

The Engineering, Research and Development Center (ERDC) and the Construction Engineering Research Lab (CERL) are the research and development arms of the Army Corps of Engineers. These organizations develop software platforms that gather and analyze data for sustainability and resilience as well as develop engineering solutions efforts across the Corps, the Department of Defense, and other agencies. These agencies developed the *NetZero Planner* (now the *SIMPL* software tool), as a tool used in conjunction with the Sustainability Component Plan for energy plan data collection and analysis. ERDC stated that it is "dedicated to helping solve our nation's most challenging problems in civil and military engineering, geospatial sciences, water resources, and environmental sciences of the Army, Department of Defense, civil agencies and our Nation's public good" (ERDC 2020a, p. 1). In a statement on sustainability, ERDC said "…the USACE is committed to ensuring that sustainability is not only a natural part of all our decision processes, but should also be part of our organizational culture We define sustainability as an umbrella concept that encompasses energy, climate change, and the environment to ensure that what we do today does not negatively impact tomorrow" (ERDC, 2020a, p.1). They illustrate that sustainability encompasses acquisitions, climate change adaptation, design and construction, environmental, installations support, and research and development.

Within the Engineering Research and Development Center is the Center for the Advancement of Sustainability Innovations (CASI), established in 2006, whose purpose is "to achieve more sustainable facilities and operations" (ERDC, 2020b para. 2). The sustainability focus areas for this center are approaches, measures, and knowledge management; regional planning; energy solutions; facilities and infrastructure; water and waste resources; natural infrastructure; forward military operations; climate change; and green remediation and reuse.

Under the Engineering Research and Development Center (ERDC) is the Construction Engineering Research Lab, whose mission statement is to "develop and infuse innovative technologies to provide excellent facilities and realistic training lands for the Department of Defense, the U.S. Army, and many other customers while also supporting ERDC's research and development mission in geospatial research and engineering, military engineering, and civil works" (CERL, 2020, para. 1). In its fact sheet, the Construction Engineering Center stated it ensures environmental quality at the lowest life-cycle cost to support the Army's training readiness, mobilization, and sustainability missions. This includes sustainable installations, resilient facilities and infrastructure, and smart sustainable materials. While this indicates that sustainability is part of its mission, there are no documents that specifically reference or define what is meant by sustainability or resilience.

Additionally, the Construction Engineering Lab published a paper in 2017; *Military Climate Resilience Planning and Contemporary Urban Systems Thinking* (Allen and Deal, 2017). This document discusses engineering resilience having existed for over three centuries but moves forward to address the newer issues of psychological and ecological resilience, framing the definitions and military considerations around the works of civil engineering at the University of Illinois (2017); the ecological works of Holling (1973), psychology of individual physical and mental health of Gattis (2017) and Masten (1990); and the social systems works of Adger (2000).

Enterprise/Regional Level – AFCEC and USACE/RPEC

The Air Force Civil Engineering Center (AFCEC) (Air Force) and the U.S. Army Corps of Engineers (USACE) (Army) have similar functions. However, much of the master planning is

done by the Corps of Engineers as the organization's planning and contracting capabilities are more robust. The Secretary of Defense created the mandate that initiated the creation of these plans, the Secretary of the Air Force created the guidance for the Installation Energy Plans (IEP), and the Secretary of the Army created the guidance for the Installation Energy and Water Plans (IEWP). These replaced the Sustainability Component Plans (SCP) when the administration changed, and the term *sustainability* was struck from federal documents in favor of *resilience.* The Regional Planning and Environmental Center (RPEC) is the regional/enterprise arm tasked with the enterprise deployment of the Air Forces' Energy Plan implemented at the Joint Base in Anchorage and the Army's Energy and Water Plan implemented at the Joint Base in San Antonio.

AFCEC

In terms of sustainability, the Air Force Civil Engineering Center (AFCEC) stated that it is responsible for managing the Air Force's compliance, restoration, sustainability, and National Environmental Policy Act (NEPA) programs. In this case, it seems sustainability is more closely aligned with environmental issues which leaves out the elements of social and economic sustainability. However, the Planning & Integration Directorate stated the Comprehensive Planning Division conducts and updates enterprise analysis for capacity and sustainability indicators, while the Regional Development Planning Branch evaluates the installation's complex suitability and sustainability for current and future missions (AFCEC, 2020a). This agency stated they "actively manage encroachment, noise, Air Installation Compatible Use Zones, and real property issues, engaging private, local, state, and federal agencies" (AFCEC, 2020a, para. 3). They also have both an Energy Directorate and an Environmental Directorate

which discuss sustainability in terms of energy, the former, and the environment, the latter. Still, these directorates do not seem to have a holistic approach to address sustainability or resilience as it is understood in the context of current research and doctrine. Although they do not use the term directly, what AFCEC calls sustainability is more akin to what literature typically defines as resilience, and almost exclusively in terms of energy (AFCEC, 2020b).

USACE/RPEC

Falling under the U.S. Army Corps of Engineers (USACE) national level, the Regional Planning and Environmental Center (RPEC) has sustainability as one of its primary missions, "USACE strives to protect, sustain, and improved the natural and man-made environment of our Nation, and is committed to compliance with applicable environmental and energy statutes, regulation, and Executive Orders." (USACE, 2020c, p.1). The RPEC discussed how the Corps of Engineers is a steward of natural resources, ensuring their products and services provide sustainable solutions that address short- and long-term environmental, social, and economic considerations. Unlike the Air Force Civil Engineering Center, the Army Corps of Engineers has customers and projects in both the military and civil sectors which likely requires a stronger focus for social equity and economic strength.

The Corps' Regional Planning and Environmental Center (RPEC) has been tasked with implementing the energy plans at multiple facilities, including the Energy and Water Plan at Joint Base San Antonio and the Energy Plan at the Joint Base in Anchorage. RPEC was tasked to develop the planning documents for the initial NetZero Planner, which grew into the Sustainability Component Plan and to beta test the data collection tools developed by the Corps research arm. The RPEC military master planning website stated, "These is an unprecedented

shift – driven by federal sustainability initiatives, NetZero mandates, and Base Realignment Closure Act (BRAC) initiatives – which demands a change in the established master planning mindset.…this requires an integrated master plan that focuses on resource conservation, energy efficiency, and quality of life for soldiers and their families – while remaining flexible so it can adapt to the Army's dynamic environment" (USACE, 2020d, para 1).

Local Level – JBSA AND JBER

The policies from all the previously mentioned agencies are implemented and plans are created at the local level. Each installation has its own unique set of circumstances, leadership, physical makeup, and history that must be considered when preparing master planning documents. Each installation also has its own set of master planning documents customized to its particular setting based on policies and tools made available to them.

Joint Base San Antonio

Joint Base San Antonio (JBSA), as a conglomerate of five major bases, has many initiatives toward sustainability and resilience. JBSA currently operates under the *Environmental Management System Policy Statement* of 2018, which has elements of both resilience and sustainability. This policy includes guidance for installation safety, energy efficiency, pollution prevention, environmental conservation, and mission enhancement for personnel, facilities, and operations.

To fulfill the new mandates on resilience, the installation planners selected the Army's Installation Energy and Water Plan (IEWP) which includes water as part of its resiliency plan, given San Antonio's limited water resources. Although the draft is still in the development

stages, the scope of work for the energy and water plan indicates that only resilience measures will be addressed with sustainability measures addressed only consequential to these efforts. Language in the scope of work directs the plan to include holistic solutions and specifically limits projects that would compete with, and be counter-productive to, other projects, focusing on technologies that provide long-term continuous service (USACE, 2018).

Joint Base Elmendorf-Richardson (JBER)

As with the Air Force Civil Engineering Center (AFCEC), the Joint Base Elmendorf-Richardson (JBER) sustainability references pertain to the environmental aspects of the installation. Their stated vision of sustainability is that of the DOD's: "… to maintain the ability to operate into the future without decline – either in the mission or in the natural and manufactured systems that support it….Sustainability is not an individual Departmental program; rather, it is an organizing paradigm that applies to all DOD mission and program areas" (JBER, 2020, p.1).

However, in the first draft of the Installation Energy Plan for the Joint Base in Anchorage, the document measures the robustness, redundancy, resourcefulness, response, and recovery of the power, heating, cooling, and water resources. It then measures subsets of these larger classifications. Except for the subset of demand reduction, which is related to sustainability, all measures are strictly short-term resilience measures, and none of these addresses social or quality of life issues (JBER, 2019).

Summary

While resilience and sustainability have evolved over the decades from different sources and drivers, they have arrived together in this decade as a means to promote human wellbeing in urban planning, as we struggle to adapt and thrive in an ever-changing VUCA world. Research concerning sustainability and resilience has vastly increased, with major jumps in 2004-2008 following hurricane Katrina, then again in 2009-2013 following the great recession of 2008 and the terrorist attacks of 2001. Additionally, while sustainability alone research was the primary focus of literature from 1989-1993. Over the decades, resilience research has gained in intensity so that by 2018, resilience research had grown in intensity relatively even with sustainability. Much of the recent research in sustainability and resilience suggests linking the two concepts to achieve a sustainable system that is flexible and adaptive over time. Sustainability and resilience are not independent of one another, but evidence from the literature analysis suggests they have a symbiotic, interdependent relationship with one another, meaning there cannot be true, lasting sustainability without resilience in the system, and resilience is impotent without a sustainable system.

According to literature, sustainability seeks to retain a steady state, relying on resilience to provide resistance and restoration to damage, and flexibility and adaptability to changes to create a thriving system. Much of the current literature examines the connection and interdependency of the two concepts, but there seems to be a lack of research into how or if sustainability and resilience have united in practice, or what the resulting best practices might be. The evolution of the two terms has come through different paths, each path with its own set of definitions and interpretations.

Consistently, research reflects that sustainable systems increase quality of life, protect and enhances resources, and look to the future, but it must be built on a platform of resilience to protect the system from disturbances, recover quickly from any damage, adapt to permanent changes, and learn and grow within the system to increase sustainability. To ensure enduring places, resources, and human well-being, sustainability and resilience must be integrated into policies and practices in urban environmental, built, economic, and social systems. However, on military installations, sustainability implementation often comes down to a matter of cost, unlike resilience, which is implemented because it makes installations "safer and more secure," in support of the military command's mission and vision, making it politically popular and easier to sell.

Additionally, when examining archival information from the scopes of work (SOW) for Joint Base San Antonio, Texas (JBSA) and Joint Base Elmendorf-Richardson, Alaska (JBER), the perspectives of engineers and planners, and how sustainability and resilience are framed by each level of the military complex, several perspectives become clear. First, even though the government is hierarchal in nature, responses from top to bottom take on different foci. The scope of work at the San Antonio joint base, while primarily focused on resilience, has some component of sustainability. The scope of work at the Alaska joint base is focused strictly on energy resilience. Although, sustainability is addressed in other terms, such as environmental protection, social equity and economic resilience is only addressed in terms of service member physical and mental health, and not in either of the planning documents or policies.

The analysis of the different perspectives of engineers and planners reveals planners tend to speak in terms of social and environmental health that balances economics, while engineers focus on operationalizing infrastructure that supports the social and economic aspects of urban

environments. Planners devise the elements that need evaluation to reduce fragility and bring the environment, social, and economic systems into harmony in the long term, while engineers reduce fragility and support more resilience in the built structures, looking at the immediacy of sudden and chronic shocks due to events such as the effects of climate change.

In evaluating the views of different levels of the military complex in terms of sustainability and resilience, it is observed that each level has a slightly different interpretation and focus of the terms. At the national Army Corps of Engineers level, sustainability is said to be the focus of planning, yet the directives passed down from the Department of Defense change with each administration, and are currently focused exclusively on the concept of resilience in response to current volatility, uncertainty, complexity, and ambiguity (VUCA). At the research level, sustainability is an umbrella concept that includes resilience to climate change.

At the regional and enterprise level, the Army Corps of Engineers (USACE) stated it looks at the environmental, social, and economic factors, which includes quality of life for soldiers as well as flexibility in planning, suggesting elements of both resilience and sustainability. The Air Force Civil Engineering Center (AFCEC), on the other hand, has documents that suggest sustainability is focused mostly on energy planning with a greater influence on energy resilience and cost reduction. At the local level, it is observed that the Installation Energy and Water Plan (IEWP) at the San Antonio Joint Base and the Installation Energy Plan (IEP) at the Anchorage Joint Base are both focused on resilience in terms of responding to sudden shocks to keep the mission operational in terms of energy and water for a short period of time. As the IEWP/IEP supersedes the Sustainability Component Plan that addressed energy, water, waste, and stormwater, it would seem there has been an institutional

shift from the larger components of sustainability to the more narrowly-focused and more readily understandable concept of resilience.

The importance of this research lies in the connectedness between military installations and the cities in which they are located and intertwined. Sustainable practices on the military base affect the base and associated city's energy, water, natural, and built resources. However, if these systems are not also resilient and fail, the city to which they are connected will suffer the consequences. Alternatively, if the installation focuses purely on resilience, the old "business as usual" model persists, protecting a system whose operations increase the demands on resources and may negatively impact the water and air of the city to which it is linked. Focusing on both sustainability and resilience helps to secure systems that sustain both the city and the installation. Research is needed to better understand how sustainability and resilience are being perceived within the military complex to create more informed decisions for those that are in positions to develop policy and create master plans for military installations. This research project attempts to understand how planners in the military complex are framing sustainability and resilience, and, using the Energy Plans (IEWP and IEP), to determine if both sustainability and resilience are being addressed together at the joint bases in San Antonio and Anchorage. To understand how or if the military is addressing this framework, a case study method will be used, discussed in the following chapter.

CHAPTER THREE

METHODOLOGY

Introduction to Methodology

The Case Study: IEWP/IEP at Joint Base San Antonio and Joint Base Elmendorf-Richardson in Anchorage

To understand the evolution of sustainability and resilience within the military complex and answer the research questions, a case study methodology was adopted. The case study method was chosen as it is place-based, answers the questions of "why" and "how," and allows the empirical investigation of a contemporary phenomenon within its real-life context using multiple sources of evidence. The Installation Energy and Water Plan/Installation Energy Plan (IEWP/IEP) is being piloted at Joint Base San Antonio (JBSA) and Joint Base Elmendorf-Richardson in Anchorage (JBER) by master planners. This case study subscribes to the descriptive model as it is an attempt to describe the evolution and framing of sustainability and resilience (Yin, 1994).

The case study approach is based on a constructivist paradigm assuming truth is relative and is dependent upon one's perspective (Stake, 1995; Yin, 2003). This approach allows participants to tell their stories, describe their views of reality, and give the researcher insight into the participants' actions (Lather, 1992; Robottom & Hart, 1993). This method benefits from a close collaboration between the researcher and the participant (Crabtree & Miller, 1999). Case studies are concerned with how and why things happen (Anderson, 1993), making it ideally suited to this research project because it allows for comparison.

The question being asked for these case studies was "how do the local levels of the Department of Defense define sustainability and resilience?" Data evaluated included documents that illustrated the bases' statements on sustainability and resilience, and how each was interpreting and focusing on the terms "sustainable development" and "resilience initiatives" in master planning. When looking at statements and planning documents, it was noted that coordination and consideration of forces in the surrounding communities was limited in the plans. During the data gathering and planning workshops parts of creating the master plans, certain entities or agencies were invited to participate and give input into their particular impact on the installation and its personnel and operations. Some factors were considered while creating the plans, but there did not seem to be specific coordination linking sustainability and resilience between the base and its adjacent metropolitan area, except in terms of privatized utilities providing energy use data.

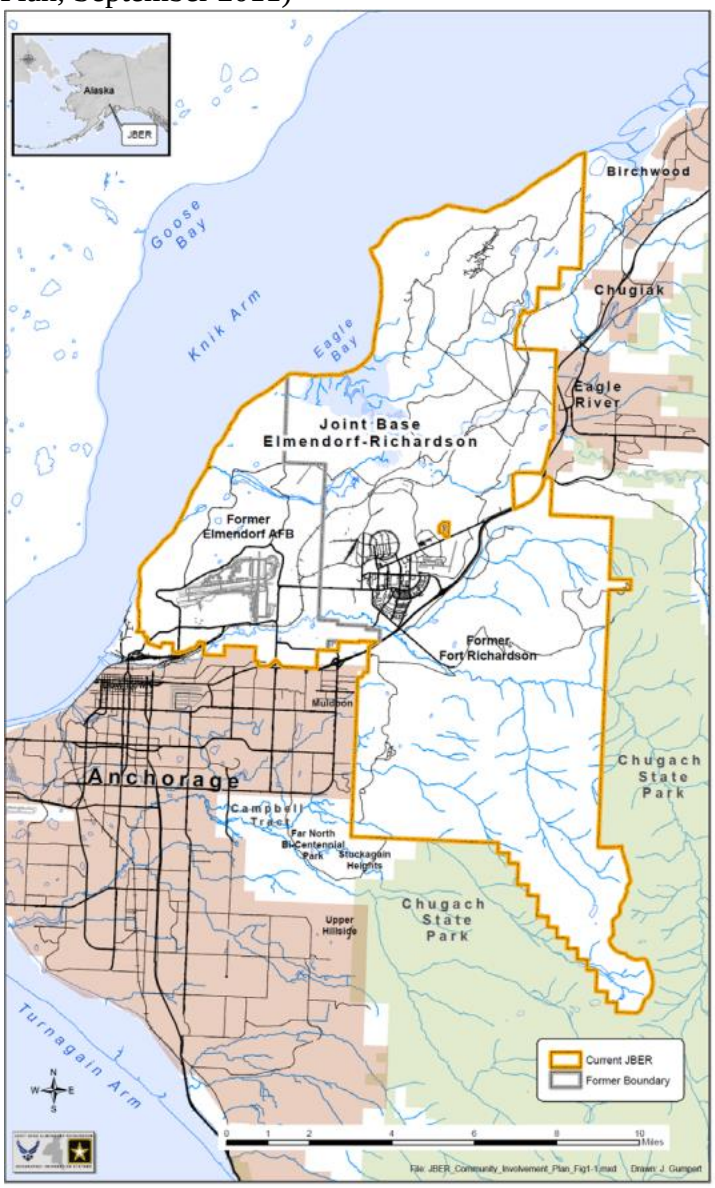
Joint Bases Study Areas in Context

The joint bases in Anchorage and San Antonio are two of the eight pilot locations for the newly-launched Energy and Water Plans which focuses on energy and water resilience on military installations. The San Antonio joint base emerged post-Base Realignment and Closure Act (BRAC) as a combination of a series of bases that include both the Army and Air Force. The Anchorage joint base emerged as a combination of an Army and Air Force base. The San Antonio joint base houses Army, Air Force, and Navy personnel and their families while the Anchorage joint base houses Army and Air Force personnel and their families. This allows for similar operational and structural dynamics including personnel with a variety of perspectives concerning sustainability and resilience from the different branches through the planning

division of civil engineering at each installation. The individual bases within these locations function both independently and collectively in terms of operations and development, therefore master planning efforts must consider the entirety of the installation's physical and operational aspects when making development decisions. Finally, both bases are intertwined physically, socially, and economically within the greater San Antonio and Anchorage regions, respectively. This creates a symbiotic relationship in which the land use planning and development decisions made on the installations have a direct impact on the regions at large.

Figure 10. Joint Base San Antonio Proximity within San Antonio, Texas (JBSA ADP, 2019)

Figure 11. Joint Base San Antonio Proximity within San Antonio, Texas (JBER Community Involvement Plan, September 2011)



San Antonio, known locally as ‘“Military City,” is the third-largest city in Texas with an estimated population of 1.39 million people in 2013, and over 1.53 estimated in 2018. San Antonio has the largest raw numeric growth in population among all U.S. cities of 50,000 residents or more (U.S. Census 2019). With a land mass of 465 square miles, (larger than Dallas

at 385, Fort Worth at 349, and twice the size of Austin at 272), there is ample room for additional growth.

The total population of the Anchorage region, which consists of Anchorage and Matanuska-Susitna Borough, is 401,108. The joint base comprises 10% of that total. Unlike San Antonio, the population growth has been gradual, with the population of Anchorage increasing from almost 226,000 in 1990 to approximately 294,000 in 2017, and Matanuska-Susitna Borough from 40,151 in 1990 to 106,532 in 2017 (U.S. Census Bureau 2019). With a regional land mass of 26,420 square miles, of which Anchorage comprises 1,944 square miles, it dwarfs that of San Antonio. However, almost 75% of the population lives in the municipality of Anchorage, with a population of approximately 294,000 in 2017 (U.S. Census, 2019).

Table 4. Regional Comparison (U.S. Census Bureas, 2019)

Region	**Land Mass**	**Population**	**Population**
San Antonio, Texas	465 mi^2	1.39mm (2013)	1.53mm (2018)
Dallas, Texas	385 mi^2	1.26mm (2013)	1.34mm (2018)
Fort Worth, Texas	349 mi^2	796,175 (2013)	895,008 (2018)
Austin, Texas	272 mi^2	875,463 (2013)	964,254 (2018)
Anchorage, Alaska /Matanuska	26,420 mi^2	106,532 (1990)	401,108 (2017)
Anchorage, Alaska	1,944 mi^2	227,583 (1990)	294,000 (2017)

As with most major large cities around the world, San Antonio and Anchorage are experiencing the effects of a volatile, uncertain, complex, and ambiguous (VUCA) world including the effects of climate change. Over the past twenty years, San Antonio, a hot, arid region of Texas, has seen hotter summers and less-frequent but more-severe rainstorms (NOAA NCDC / CICS-NC, 2020). Compounding the effects of climate change are sprawling development and traffic congestion that increase air and water pollution (San Antonio is

currently in a non-attainment[10] area for air quality), decreases in biodiversity, poor stormwater infrastructure, and more demands on the already-taxed water supply. The need for planning better development will only increase as the population continues to grow.

Alaska, including Anchorage, is a cold, subarctic region on the front lines of climate change and is among the fastest-warming regions on Earth; warming at twice the global average since the middle of the 20th century (Fourth National Assessment Report, 2018). Anchorage continues to suffer the effects of sprawling development, loss of biodiversity, decreased air and water quality due to stormwater runoff and traffic congestion, melting permafrost affecting important infrastructure including hydroelectric power generation and wildfires. Additionally, Alaska relies on the lower 48 states for 95% of its food (Meter et al., 2014) making it susceptible to shortages due to transportation disruptions. The military installations are not immune to these challenges. In fact, due, in part, to the intertwined relationships between the cities and the military installations, military master planning has included mandates and guidelines to address resilience and sustainability.

The initial focus of the planning mandates and the U.S. Army Corps of Engineers (USACE) response to them was primarily on the reduction of energy use to reduce costs. These mandates were revoked and replaced in March 2015[11] by an executive order from President Trump; the goal of which was to maintain Federal leadership in sustainability and greenhouse gas emission reductions. This mandate, along with others concerning sustainability[12], was

[10] U.S. environmental law concerning an area considered to have air quality worse than the national Ambient Air Quality Standards as defined in the lean Air Amendments of 1970 (Public Law 91-604, Sec 109)

11 EO 13693 "Planning for Federal Sustainability in the Next Decade"

[12] 13423, 13514, 13693 and all Obama-era Presidential Memorandums concerning sustainability

revoked and replaced in May 2018, by yet another Trump administration executive order[13] that aimed to achieve "Efficient Federal Operations." Providing long-term planning solutions within the ever-changing mandates has proven to be challenging.

As described in the previous sections, both military bases continue to grow in size and complexity, in mission needs, and population, putting increased demands on an already-stressed system in terms of energy, water, waste disposal, and stormwater mitigation. Additionally, the city of San Antonio and its joint base, and the city of Anchorage and its joint base each has a naturally-occurring symbiotic relationship, but only a marginal or non-existent planning or political partnership.

A case study is an empirical inquiry, referring to an event, an entity, an individual, or a unit of analysis (Yin, 2009). The approach is useful to employ when an in-depth understanding of an issue, event, or phenomenon is needed. According to Yin (2003), a case study design should be considered when the behavior of those involved in the study cannot be manipulated; contextual conditions are studied because they are believed to be relevant to the phenomenon under study, or the boundaries are not clear between the phenomenon and context. This study sheds light on broader theoretical concerns as opposed to the generalizability of sustainability and resilience and has been the choice of scholars working with similar theoretical orientations (Harrison et al., 2017; Yin, 2009). Additionally, the research on sustainability and resilience is, by its very nature, place-based and, as the truth of either is relative and based on perception, the framing of sustainability and resilience cannot be separated from the place in which it is planned and exercised. A case study analysis is required, as the phenomena of sustainability and resilience are dynamically co-produced by the context of the people and the place from which it

[13]

is happening (Flyvbjerg, 2001; Yin, 2009). Case studies allow researchers to get a holistic view of a certain phenomenon or series of events (Yin, 2003), focus on "real-life situations and test views directly in relation to phenomena as they unfold in practice" (Flyvbjerg, 2001, p. 82), which is appropriate for this research project. The evolution of planning theory at different military bases may yield other unique results than those studied, thus not generalizable over all bases, due, in part, to the truth being relative and dependent upon one's perspective (Stake, 1995; Yin, 2003).

There are limitations to the case study methodology. Case studies are more vulnerable to bias, validity, and reliability issues due to their dependence on one point and one place in time, and in this case, perceptions of master planners in that place and time. Another limitation of this methodology is the inability to generalize results to the wider population. However, as Haraway (1988) noted, scientific research is composed of constructs of discourse and situated practices. Additionally, each case study adds to the broader story and thus sheds light and understanding of the phenomena from which to compare results.

Data Collection

As a military master planner, I have access to master planners in private firms who are responsible for developing policy responses and creating master plans on military installations. To gather data, in-depth, semi-structured WebEx interviews were conducted with key master planners in positions that are directly involved with sustainability and resilience planning for military installations. Data were collected between August 24 and September 2, 2020, following approval by the University of Texas at Arlington's Institutional Review Board (IRB).

A variety of archival documents were analyzed, including the current executive orders concerning resilience and sustainability, guidance for the Energy Plans, the Scopes of Work for the Energy Plans at both Joint Base San Antonio, Texas (JBSA) and Joint Base Elmendorf-Richardson, Anchorage, Alaska (JBER), and the guidance for the past sustainability planning such as the Sustainability Component Plan, to trace the evolution and framing of sustainability and resilience planning for military installations. Documents gathered and analyzed for this study are available to the general public or are unclassified and approved for public release. While the Scopes of Work examined are not released to the general public, there is no unauthorized or sensitive information within the documents. No classified or for-official-use-only information was examined for this study.

Study participants for interviews were selected from the architecture and engineering firms contracted by the Corps of Engineers to perform the master planning work at Joint Base San Antonio, Texas, Joint Base Elmendorf-Richardson, Anchorage, Alaska or doing similar work at other locations, and have been involved with a wide range of other military installations for the Department of Defense. Master Planners from private architecture and engineering firms conduct the majority of master planning on military installations. Each of the selected participants has conducted master planning for military installations all over the world and have worked through decades of changes in administrations, mandates, and climates. They are responsible for gathering background information, recruiting and engaging stakeholders and leadership with the help of the base planning team, analyzing and interpreting the data and implementing the master plans in line with current mandates and guidance as well as leadership desires and installation needs.

Selection criteria were based on individuals known to have extensive experience as project managers for military master planning projects and who have worked on projects with the U.S Army Corps of Engineers' Regional Planning and Environmental Center since 2015. These consultants contribute substantial and full knowledge of past and current military master planning, including sustainability and resilience criteria in policy, and best management practices. A total of six interviews were conducted, which was a saturation point due to the small number of experienced military master planners overall, and the consistency of information gathered as interviews were conducted.

For this study, data were first analyzed qualitatively by categorizing terms found within the text of documents and the online presence of each of the governmental agencies that impact Air Force and Army installation master planning as they relate to sustainability and resilience. Appendix 2 is the result of the categorization with the table illustrating each governmental level's framing of sustainability and resilience. Next, interviews were conducted with the six participants and transcribed. These transcriptions were sorted, coded, and classified, which resulted in four themes, 13 categories, and 35 subcategories emerging from the data.

Developing a Sustainability and Resilience Framework

The criteria from archival data including perspectives on sustainability and resilience were based on the framework developed by Marchese et al. (2018), which looked at the framing of sustainability and resilience relative to one another. As documents were analyzed for this study, an additional category emerged and was added; *Sustainability and Resilience Equally*. Documents were evaluated and categorized (Appendix 2), then each organizational level was evaluated separately to determine the categories under which the majority of the data examined fell. Table 5 presents a summary of these findings:

Table 5. Sustainability and Resilience Documents and Statements by Organization Level

Organization Level	Sustainability and Resilience Categories				
	Resilience as a Component of Sustainability	Sustainability as a Component of Resilience	Sustainability and Resilience Equally	Sustainability Alone	Resilience Alone
National (14 documents)	1	0	1	6	6
Research and Development	1	0	0	5	1
Regional	0	0	3	1	3
Local JBER	0	0	1	0	2
Local JBSA	0	0	1	0	1

At the national level, the majority of the data reviewed fell under *Sustainability Alone* (six) and *Resilience Alone* (six), making up a total of 12 of the 14 documents examined. One document fell within the concept of *Resilience as a Component of Sustainability* (the IEWP Guidance), and one document as *Sustainability and Resilience Equally* (USACE-HQ's sustainability definition). This would indicate that, at the national level, these two concepts are considered to be separate, which supports Marchese (2018) findings that this framework is prevalent in civil infrastructure (Marchese 2018, 1278). This finding could have implications for future installation development as policy is created at the national level, and current research suggests sustainability and resilience must work in tandem to achieve desired urban outcomes (Redman 2014: Marchese et al. 2018, Mulligan et al. 2013; Davidson et al. 2019).

At the research and development level, the majority of the data examined fell within *Sustainability Alone* (five out of seven), with one in *Resilience Alone* and one in *Resilience as a*

Component of Sustainability. Significantly, resilience as a component of sustainability is in ERDC's policy statement. As much of research and development level's work is in developing and testing theories and tools to help implementation, the implication is, though policy has included more resilience language, the tools developed at this level focus on measuring and testing sustainability.

At the regional level, *Sustainability and Resilience Equally* and *Resilience Alone* each received three, for a total of six out of seven, with the seventh being *Sustainability Alone.* The current focus on resilience and the current focus on energy and water resilience through the Energy Plans (IEWP/IEP) contributed to the *Resilience Alone.* However, the overall mission statements and directorates for the two organizations at this level fall into *Sustainability and Resilience Equally*. This suggests a guiding perspective of the importance of both concepts acting together.

Finally, at the local level, two of the five data examined fell under *Sustainability and Resilience Equally* while three fell under *Resilience Alone.* The former is found in the guiding documents for environmental management (JBSA, Texas) and the mission statement (JBER, Alaska). As the current focus handed down is concentrated on resilience, this is not surprising. It could be said that while their guiding documents created at the installation level focus on sustainability and resilience, directives from upper organizational levels concentrate on resilience.

Overall, the predominance of data examined fell under *Resilience Alone* (13) and *Sustainability Alone* (12). However, the guiding mission statements in all but the national levels examined would indicate a perspective leaning toward sustainability and resilience equally, or resilience as a component of sustainability.

Gathering Planners' Views

Through my in-depth knowledge of military master planning and relationships with military master planners throughout the Department of Defense (DOD) and particularly the Corps of Engineers and private firms, I requested interviews with key military master planners in private architectural and engineering (A&E) firms who have been involved in sustainability and resilience master planning for the DOD. These planners have more than 15 years of military master planning experience, are the project managers and leaders within the industry, and have helped shape military master planning policy and implementation within the Department of Defense. I asked participants permission to audio record interviews over WebEx to be transcribed by me as accurately as possible. All interview participants signed an informed consent form (Appendix 3). The consent forms were sent via e-mail and returned prior to conducting the interviews.

Taylor and Bogdan (1998) define in-depth interviewing as "flexible and dynamic…nondirective, unstructured, non-standardized, and open-ended...modeled after a conversation between equals rather than a formal question-and-answer exchange" (Taylor and Bogdan 1998. P.88). They also noted the suitability of in-depth interviewing under the following circumstances (Taylor and Bogdan, 1998. Pp. 90-91):

- The research interests are relatively clear and well-defined
- Settings or people are not otherwise accessible
- The researcher has time constraints
- The researcher is interested in understanding a broad range of settings or people

The range of interviewees in this study provides a variety of perspectives within DOD master planning. Interviews took place via WebEx over the course of one week and took approximately 30-40 minutes. Interviewees were advised their identities would not be revealed in any reports of the research to encourage them to speak honestly about sustainability and resiliency issues and challenges they face.

Participants were selected based on their involvement in master planning at military installations in general and the joint bases in San Antonio and Anchorage, specifically. The six in-depth interviews were conversational and used an unstructured approach with open-ended questions. The questions serve as a conversation guide and to remind the interviewer to ask about certain topics. Respondents were encouraged to discuss topics and issues they deemed important, even if the topic was not covered in the interview script.

Respondents were given an alpha-numeric code to protect their anonymity. The interview recordings were e-mailed to the interviewee to check for accuracy and ensure no sensitive or classified information was inadvertently given and corrected where appropriate. The audio files containing interviews and the transcripts will be destroyed after the completion of the study.

To meet the research goals, the following open-ended questions were asked of each participant:

1. Tell me a little about yourself and your connection to military master planning.
2. How have you seen master planning on military installations change over the past 30 years?
3. How do you define the term “sustainability?”

    How have you seen sustainability being implemented on military installations?

4. How do you define the term “resilience?”

   How have you seen resilience being implemented on military installations?

5. How do you see sustainability and resilience as they relate to development on the installations?

   Do you see benefits or challenges in focusing on one or the other?

6. The IEWP is being created at ([JBSA], [JBER], [JBSA and JBER], as appropriate for the interviewee), what do you feel is the ultimate goal of implementing the IEWP (i.e., what do you perceive as being the outcome of implementing the IEWP?
7. Do you think the military has shifted one way or another (toward sustainability or toward resilience, or both?
8. In your role as a military planner, what would be the ideal approach for improving planning on military bases? What prevents you from taking this approach?

Interview and Data Analysis

Using the framework from the literature review and archival data based on Marchese et al. (2018) concerning the relationship between sustainability and resilience as a starting point, the categorizations of the interviews were analyzed to determine if the participants’ responses to the questions fell within the same categories and if new insights could be obtained concerning sustainability and resilience master planning within the Department of Defense. The data were then categorized to identify their perceptions of the two concepts as they relate to military master planning, sustainability and resilience in military master planning, the implication of changes, and planner’s roles.

Taylor and Bogdan (1998, p. 7) noted "qualitative researchers develop concepts, insights, and understandings from patterns in the data rather than collecting data to assess preconceived models, hypothesis, or theories." The process of identifying patterns in the data was not mechanical or preconceived, in other words, the data were not automatically checked for specific key words or phrases or tabulated using computer software. While it is impossible to set aside induction and personal interests, the goal of the research is to verify the theory fits the data rather than forcing the data to match the theory (Taylor and Bogdan 1998).

The strategy I used to gather and analyze the data, based on the approach put forth by Taylor and Bogdan (1998), has some aspects of grounded theory based on theoretical sampling combined with some aspects of analytic induction. As described by Taylor and Bogdan (1998, p. 137) theoretical sampling is evident when "…the researcher selects new cases to study according to their potential for helping to expand on or refine concepts and theory that have already been developed. Data collection and analysis proceed together." The emphasis is on understanding people on their terms through description and theory while also analyzing negative cases to refine and qualify the hypothesis (Taylor and Bogdan 1998, pp. 130-140).

The data analysis and categorization were based on inductive reasoning and theorizing, rather than a mechanical or technical process. Taylor and Bogdan (1998 p. 141) stated, "In qualitative research, data collection and analysis go hand in hand. Throughout participant observation, in-depth interviewing, and other qualitative research, researchers are constantly theorizing and trying to make sense of their data." I completed the interview transcriptions myself to further my understanding of the interview before categorizing the data. Data was read and reread looking for emerging themes. Several concepts were developed and uniting themes identified in the data (Taylor and Bogdan 1998). The interview transcriptions were analyzed for

common responses and perceptions, as well as ideas and thoughts unique to the particular respondent. Coding of the interviews was conducted and analytical notes were developed as themes emerged.

The analysis of the interview questions yielded four core themes that aligned with the research questions, 13 categories, and 35 subcategories, shown in Table 6.

Table 6. *Data Categorization*

	Themes	**Categories**	**Subcategories**
I	Evolution of Military Master Planning -what is the definition or components of this theme	1.a. Evolution of practice and policy 1.b. Reason for change 1.c. Items that have helped the Evolution in Military Master Planning	1.a.1 General Plans Era 1.a.2 2012 Unified Facilities Code 1.a.3 Sustainability Component Plans 1.a.4 IEWP 1.b.1 Funding 1.b.2 Environmental Issues 1.b.3 Land Limitation 1.b.4 Climate Change 1.c.1 Policy 1.c.2 Stakeholder Involvement 1.c.3 Changing Mindset
II	Sustainability and Resilience in Military Master Planning	2.a. Sustainability 2.b. Resilience 2.c. Relationship between Sustainability and Resilience 2.d Shift in Master Planning	2.a.1 Definition 2.a.2 Area of Focus 2.a.3 Implementation 2.a.4 Items that are Helpful 2.b.1 Definition 2.b.2 Area of Focus 2.b.3 Implementation 2.b.4 Items that are Helpful 2.c.1 Relationship 2.c.2 Reasoning 2.c.3 Challenges
III	Impacts of Changes in Military Master Planning to Installations	3.a. Challenges to change 3.b. Need for the future	3.a.1 Stovepipe Planning 3.a.2 Reactionary Policies 3.a.3 Leadership 3.a.4 Funding 3.a.5 Mindset 3.b.1 Updated and Evolving 3.b.2 Planning Policy 3.b.3 Integrated Plans 3.b.4 Data Driven Decisions 3.b.5 Mindset

	Themes	Categories	Subcategories
IV	Role of Planners in Military Master Planning	3.a. Proponents 3.b. Interpreters 3.c. Research-Educators 3.d. Innovators and Change Agents	

A few surprises arose from the analysis of the data which are further discussed in Chapters 4 and 5. They included the difference between how sustainability is described in documents and on web pages for the different organizations compared to how sustainability was described by respondents. Although archival data indicated sustainability deals with long-term resource use and quality of life issues, respondents described it in terms of mission sustainability and resilience. Also surprising was that, although the archival data from the different levels of the DOD indicated it was the Sustainability Component Plans that ushered in the focus on sustainability, it was the 2012 Unified Facilities Criteria that caused the paradigm shift in master planning on military bases This reflects the power of policy within the military complex to affect real change in building sustainability and resilience.

Ethical Considerations and Potential Limitations

No major risks were anticipated in this study. However, potential limitations to this research involve (1) potential bias of interviewees based on perceived favoritism for future contracting work; (2) researcher bias; and (3) the small sample size.

Concerning study participants' bias, it is noted that the selection process for future contracts is based on a stringent set of criteria that is reviewed by an independent board outside the researcher's influence, prohibiting the ability of any single person to influence future contract

awards. Additionally, the process is highly visible to other contractors to ensure fairness and equity in contract award for federal work.

The small sample size in both cases studied and planners interviewed potentially limits the generalization of this study to the larger issue. Other military bases could deal with policy differently and interview respondents were selected from a small pool of planners doing very specific work. It is possible planners doing work in other parts of the federal government with different stakeholders would have a different perspective on the issue of sustainability and resilience with the Department of Defense.

Because I work with these contractors within the Corps of Engineers, there could be the perception of favoritism amongst the interviewees. However, while we strive to build good working relationships between our customers and our contractors, the system itself does not allow for favoritism in contract selection. Further, there is no financial or other incentive associated with this study, merely an inventory of their perceptions of the topics at hand.

This research used a case study methodology to examine the evolution of sustainability and resilience and the current framework for the relationship between sustainability and resilience. First, a matrix was completed comparing sustainability and resilience planning evolution and concepts using the literature and archival documents to determine how sustainability and resilience have evolved and are being framed at different levels of the Department of Defense (DOD). Then, in-depth interviews of planners contracted by the U.S. Army Corps of Engineers (USACE) for the DOD in general and military bases including Joint Base San Antonio (JBSA) and Joint Base Elmendorf-Richardson (JBER) specifically, were used to identify the perceptions regarding their definitions and framing of sustainability and resilience on military installations and the perceived impact of the change in focus from sustainability to

resilience. Interview questions were developed to serve as a guide for the conversation and to elicit the views of the subjects based on their knowledge and experience in this area. The interview transcripts were analyzed to identify patterns and categories that might emerge.

Analysis and data collection proceeded together. The data were read and re-read to identify emerging themes and categories. Several concepts were developed and uniting themes were identified in the data. The final list of themes, or primary categories, was created and the data classified using these categories. The details of this analysis can be found in the following chapter.

CHAPTER FOUR

RESEARCH FINDINGS

Introduction

Research Questions and Data Analysis Process

This research presents new research on the evolution of military master planning and the impact of sustainability and resilience as perceived by military master planners. The overarching research question for this case study project is, "What are the planning implications of the shift in focus from sustainability to resilience as perceived by planners within the military complex?"

Open-ended interviews were conducted with six military master planners from private firms who were involved in military master planning over the last one to three decades with a cumulative 130 years of military planning experience. The interview data were analyzed, coded, categorized, and sorted into themes for further analysis to answer the following questions that made up the theoretical framework:

1. How do military master planners at private firms and the different levels of the Department of Defense (local, regional, enterprise, and federal) define sustainability and resilience?
2. Have military complex planners perceived a shift from sustainability to resilience, and if so, what is the perceived cause of this shift?
3. What role do military complex planners play in the shift from sustainability to resilience?
4. What is the perceived outcome of the shift?

To understand the participants and their connection to military master planning, descriptions of the participants and their educational and professional backgrounds are provided. The results of the interviews are organized first by theme, then categorized and subcategorized to highlight unique components of participant responses within each theme. Direct interview quotes are used throughout the analysis to highlight and personalize data. All names and identifying information have been removed, with names replaced by a code to protect participant and project identity.

4.1.2 Study Participants

Six participants were selected from private architecture & engineering firms based on their involvement with military master planning, and each agreed to open-ended, semi-structured interviews. Three of the participants began their careers in college Air Force ROTC programs and served in the Air Force. One participant attended the Air Force Academy, one participant served in the Army, and two participants have no military service. Three participants hold degrees in architectural engineering, architecture, and civil engineering, one participant holds a degree in urban and regional planning, and the remaining two hold degrees in environmental planning. Four participants hold at least a master's degree. All are currently working in military master planning.

Two participants began in environmental planning before moving into master planning, one participant began in GIS mapping before moving into planning, and three were in the architecture or engineering profession before moving into master planning. All the study participants are AICP certified, and all have more than 10 years of experience in master planning, with four participants having more than 20 years of experience. Each has completed a

wide variety of master plans for multiple branches of the service. Each has knowledge and/or experience in the changing nature of military master planning over the past 30 years.

Data Analysis: Themes

Taylor and Bogden (1998) proposed the steps for examining qualitative data. Once the interviews were completed, the recordings were transcribed by the interviewer. Then the transcriptions were analyzed, sorting quotes into different categories. These categories were organized into themes, and then the categories were re-examined to determine the subcategories within the categories. The data for this study were analyzed using the constant comparison method to identify common themes, as well as ideas and thoughts that were unique to the particular respondent. The themes, categories, and subcategories are illustrated in Table 7 :

Table 7. Data Categorization

Theme	Definition
Evolution of Military Master Planning	Any statement related to evolution of practice and policy; Reason for change; elements that have helped the Evolution in Military Master Planning
Sustainability and Resilience in Military Master Planning	Any statement that provides a definition of resilience and sustainability; Statements on the relationship between Sustainability and Resilience; statements on the Shift in Master Planning
Impacts of Changes in Military Master Planning to Installations	Any statement that provides information concerning how military master planning policy has changed, or potentially will change, military master planning.
Role of Planners in Military Master Planning	Any statement related to the experience of military planners and the role planners play through their interaction with military installations

The first theme, *Evolution of Military Master Planning*, was identified to classify responses that explained the evolution of military master planning as experienced by the participants.

The second theme was *Definitions of Sustainability and Resilience*. This theme helped identify the respondent's core definitions of sustainability and resilience by examining responses to direct questions and examining their responses to how they see sustainability and resilience being implemented. The theme was further sorted into four categories that included sustainability, resilience, the relationship between the two terms, and information related to the shift in master planning.

The third theme, *Impacts of Changes in Master Planning to Installations*, looked at how the respondents described the impacts they have seen and expect to see from the shifts in planning priorities and philosophies. This was further divided into two categories that included challenges to the change and need for future planning.

The fourth theme, *Role of Planners in Military Master Planning*, evaluated how participants perceived the role of planners in military master planning. There are four categories under this theme to help explain how the role of planners is experienced by respondents.

Summary of Findings

The findings are presented by first providing the regulatory institutional conditions that make planning on military bases unique. These contextual parameters take the form of planning and building criteria addressed in policies such as the 2012 Unified Facilities Criteria (UFC) and component plans on energy and water that frame the approach to planning. Planners interviewed for this case study welcomed the 2012 UFC as a first step to developing policy that could more

effectively guide planning at military bases. This section then presents the progression of planning approaches on military bases as described by planners, the challenges and opportunities various approaches presented as the military wrestled with defining sustainability and resilience

The findings for this research suggest military master planning has evolved from simple land-use planning using complex and rigid requirements to planning that is concerned with good urban form, with sustainability, and now, with resilience plans as overlays. Respondents agreed there is now more of a focus on resilience in military master planning, however they were mixed on how they define the two concepts, with some defining and describing them as they are defined in literature, and others defining both sustainability and resilience in terms of resilience.

Overall, the interview analysis revealed all six participants supported mandates that encouraged creating more sustainable and resilient bases. Three of the participants focused on the importance of infrastructure and building designs to ensure mission sustainment. The other three participants indicated they were interested in bringing innovation into their planning practice They shared a desire to encourage exploration of possibilities to improve military master planning for our service members around the world and the communities that surround them. They each indicated a pro-active approach in planning, leading stakeholders toward thinking holistically and comprehensively in terms of development. Two of these participants explicitly expressed a desire to integrate more of the social and financial aspects into military master planning such as ensuring there is affordable base housing and that stores, schools, and recreation centers are within easy walking distance along safe, comfortable routes and businesses have the facilities and support they need to supply a variety of affordable product and services.

General Plans

All the participants stated the introduction of the 2012 Unified Facilities Code (UFC) for master planning fundamentally changed the way master planning is done within the military. Previous to this planning and design criteria, respondents had two experiences with master planning. First, they perceived master plans as consisting primarily of color-coded maps that lacked details and highlighted high-level land uses. Participant A2 stated, "Master plans used to be a piece of worthless junk. [It] used to be like pulling teeth to do good planning. Then we started doing regulating plans, building standards, and didn't focus much on land uses." Participant A1 similarly stated, "Big picture General Plans did not give much information. District Plans were being done but not any great detail." In a comparison between the Army and Air Force planning, participant A6 stated, "The Army has been very modular and focused on requirements, while the Air Force was the Wild West but has refined into requirements planning."

Secondly, the participants perceived master plans as large, complex plans which focused on a set of requirements but were too difficult to navigate or understand, and thus, were largely ignored. Participant A4 stated, "Used to be big, bulky comprehensive master plans addressing all the infrastructure systems." Respondents noted this led base planners and public works personnel to make decisions on siting buildings and other infrastructure on the availability of open land rather than having a well-prepared, long-term plan that allowed for future growth and development. Much like the private sector, this planning practice led to auto-centric sprawl and a heavy reliance on excessive infrastructure that is hard to maintain. As respondent A5 stated, "It [planning] has gone from requirements-based, to higher level, and now back to

requirements-based planning. There was a push about 10 years ago for sustainability but [it] focused on energy and stormwater reduction."

Creating a Unified Facilities Code

Participants regarded the 2012 UFC for Master Planning as a big evolutionary jump and paradigm shift in military master planning. As participant A1 said, "Introduction of the 2012 UFC Master Planning guidance was a pivotal moment." This policy set guidelines for developing military bases using the principles set forth by the APA for developing good urban places and included sustainability strategies such as compact, infill development, narrow buildings, and Smart Streets. As A2 stated, "Folks are starting to move away from land-use planning and toward more urban design - it's a big shift. The UFC was an enterprise-wide policy that changed how we plan on military installations." According to participants, the UFC initiated new ways of thinking about how development occurred on bases. In summation, A4 said: "Focus has changed from building brand new installations to how to use budgets smartly and build layers of resilience."

The Addition of Component Plans to Master Planning

Component plans, which include the Sustainability Component Plan (SCP) and the Installation Energy and Water Plans (IEWP), mark the newest evolution in military master planning. These component plans function like overlay plans to the master plan, which are comparable to the overlay plans developed in city and community planning, such as a historic district overlay. Participants recalled that the UFC was followed by other component plans. Evolving from the 2012 UFC, first, the Sustainability Component Plans (SCP) and now, the

Installation Energy and Water Plans (IEWP), have been put into place as overlay plans to the master plans. A5 commented, "It [IEWP] is like the ultimate goal of the SCP - focus on sustainability to the master plan," while A1 stated "They are a component of the master plan."

Some participants view these plans as allowing the master plans to be more flexible, but some of the planned projects under the SCP and its accompanying Net 0 were not always practical or cost-effective. A1 stated "Component plans have kept the master plans more flexible, but projects need to be usable by the client." A4 stated, "The Net 0 fell down upon coming up with these plans and the money for installations to implement and really do the research and hypotheses for strategies and then sharing the data and turning it into policy." The SCP and Net 0 were also viewed by participants as focusing on the environment, as stated by A6, "Ten years ago it was about Net 0 sustainability, especially in the environment."

The Sustainability Component Plan addressed Obama-era sustainability executive orders, but have been replaced in recent years by the IEWP, which addresses resilience. There is some concern by respondents that these are generally too near-sighted and, specifically, not tied closely enough to the base master plans. A3 stated, "The resiliency component plans will fill a lot of gaps that are left in the Area Development and Installation Plans and will have great value in bringing things into a cohesive way." Insights into the IEWP revealed that, in some cases, it is viewed as a subpart to the Sustainability Component Plan but is seen as short-sighted due to its too-narrow focus and reliance on technical solutions. This deficiency is evident through A3's comment that the purpose of the IEWP is to "Identify critical systems and provide redundancy to those critical facilities in time of natural and man-made disasters."

A3 added, "The military has come a long way over the past 15-20 years. They are slowly getting to the point that mission sustainment and mission assurance, is becoming a priority

focus." Respondents were unanimous on this point. Participants look hopefully to the future of planning on military installations. A4 said, "Since 2012, planning is regulated by the UFC with plans being updated every five years with new vision and area development plans. There is a big push in thinking about how our installations are poised to sustain their readiness throughout natural disasters."

Funding as a Catalyst for Change

Participants viewed two critical events as the catalysts for the changes in military master planning. The first was the implementation of the BRAC policy which closed some bases and moved missions around along with personnel and equipment to increase efficiency and reduce the cost of the military. Respondent A6 stated, "BRAC actions evolved to change standards and requirements."

The second event, which was a factor both before and after BRAC policy, was the reduction in military construction spending. A4 said, "Relied on big MILCON [Military Construction] money and projects. Funding was cut in the 1980s, and now, many bases have failing infrastructure systems, and buildings have been left to demolish-in-place." BRAC policy was a response to limited funding, but closing bases and moving missions to other bases cost significantly more than the overall money projected to be saved by the actions. Thus, the base realignment policy coupled with cuts to military construction spending restricted the ability of military bases across the world to function and develop efficiently.

Environmental Issues

Participants stated that the initiation of the component plans, such as the Sustainability Component Plan and the Net 0 Planner, also impacted planning as environmental concerns emerged in response to Obama-era executive orders. A2 remarked, "Policy guidance has helped, especially the Obama era EOs [Executive Orders], with pretty clear targets, though they are difficult to achieve." When asked to reflect on its impacts on planning for military bases, A1 stated, "These are things that don't burden the environment and whatever local conditions you have." Echoing this, A6 spoke about the focus of the plan as "fiscal, environmental to include xeriscaping and address stormwater problems." A4 stated, "Sustainable land use, where we don't use all the land and allow for future growth. We really need to think about growth boundaries."

Land Limitations

Brought to the surface by BRAC policy, participants identified limited land as a factor in the evolution of master planning. Hinting at the damage BRAC did by disposing of land by selling off parts of bases deemed as unnecessary, A3 stated, "We can't get new bases or ranges, so we need to protect what we have. BRAC hurt some places… "They can't get more space. The plans were not implemented like they hoped. We need more support from the base." More than 350 bases comprising over 315,000 acres were closed as a result of the five BRAC rounds which were implemented under the Reagan administration in 1988, the George H. W. Bush administration in 1991, the Clinton administration in 1993 and 1995, and the George W Bush administration in 2005.

Climate Change

Participants were closely aligned in their views that component plans are the latest evolution in military master planning. These plans are reactionary in the face of natural disasters brought about by climate change. A4 stated, "We are reactionary, and where installations have experienced disaster they are really future thinking, and there is a lot we can do with this in planning." A3 stated, "The cause of the shift is due to people becoming more aware [of disasters related to climate change.]" A component plan addressing this shift is the Installation Energy and Water Plan (IEWP) which was introduced in 2019 in response to several natural disasters affecting military installations, including the destruction of Tyndall AFB by Hurricane Michael in October 2018.

Promoting Change and Evolution in Military Planning

Policy

Respondents had similar positions on the elements that helped to promote the evolution of planning in military bases and incorporation of both sustainability and resilience. These include the budget constraints that were the catalyst for BRAC and tightening of funding for large projects as discussed previously. A3 explained that early environmental policies, such as the Installation Complex Encroachment Management Action Plans (ICEMAPS), which supported balancing mission needs with those of neighboring communities in terms of environmental impacts, were the predecessors of sustainability and component plans. A3 also indicated the environmental plans need further refining, "The encroachment Action Plans from the early 2000s have helped. The master plan needs to enhance modeling, look at how we build things, and change design standards." Respondent A3 pondered the impact of the environmental

mandates from early 2000 in the form of the Encroachment Complex Management Maps, which A3 believes began the discussion of sustainability on installations.

A key catalyst upon which respondents argued promoted this evolution in military planning and supported continued change was the 2012 Unified Facilities Code. As A2 stated, "It helps to have policy now to follow." Likewise, A1 stated, "the Low Impact Development guidelines, which were developed in the private sector to address stormwater issues, have helped pave the way for an evolutionary process that takes into account how building siting, paving, and infrastructure development affects stormwater runoff; a major issue on many bases."

The Importance of Stakeholder Involvement

Respondents also thought that the new UFC with its focus on stakeholder involvement was key to building sustainable, resilient bases. Stakeholders are involved in hands-on planning charrettes that bring together planners and residents to share ideas, sketch out suggestions, and actively engage in driving change. A5 stated, "Key to new planning is the week-long Charrette - it is important to get the right people in the room. You rely on them to give you information about projects and needs"

Respondent A2 agreed with the importance of stakeholder involvement, "We could save a fortune just by changing land management - letting people on the ground make decision - getting rid of all the mandates from higher up."

This shift in mindset may be occurring now as stakeholder involvement was raised as an important element by participants that thought it was driving change. A3 stated, "They are starting to think differently which will improve and increase resiliency on the installation." A4 also noticed a shift in mindset has occurred in what is getting funded: "They are thinking more

about materials, locations, and kind of planning for wanting to justify more expensive methods or approaches." In addition, ease of access to information and a 24-hour news cycle may be aiding in the evolution. A4 said, "Bases that have experienced disasters are more focused on resilience and are sharing their experiences and talking about what they wish they would have planned for differently."

Introducing Sustainability and Resilience in Military Master Planning

How planners define sustainability and resilience is one of the core questions of this research project. During the interviews, it was noted that, while some participants were able to articulate clear definitions of sustainability and resilience, their definitions largely encompassed what the literature defines as resilience, which is the capacity to withstand, rebound, and learn from and adapt in the face of acute and chronic stressors. Definitions of sustainability often focused on mission sustainment, and when further described by participants, was really about the continuance of the mission, or resilience.

Defining Sustainability

Although the concept of sustainability has been around for more than 30 years, respondents had a variety of thoughts on defining sustainability. Two of the respondents gave the currently accepted definition, which is exemplified by A2: "Commanders need to meet their mission requirements today without jeopardizing the ability of future commands to meet their missions." The remaining four respondents defined sustainability in terms of continued operations, carrying on the mission, and building durable structures. These definitions are more closely aligned with as the literary definition of resilience as reflected in A3's statement: "That's

the golden question: Sustainability today means mission assurance." All participants included the idea of mission assurance in their explanations. A2 stated, "From a military perspective, start off with mission sustainability, then we can focus on the triple bottom line."

In defining sustainability, most respondents cited the environment, land use, and fiscal or economic areas of focus. Only one respondent, A2, specifically addressed the social aspects of sustainability, "Mission, environment, and social sustainability, which is hugely important in an age of increasing suicide and domestic and child abuse." Respondent A3 also included the social aspects of mission sustainment, citing the need to respond to situations that are happening off the base. Other respondents focused on strategy-based issues related to both sustainability and resilience citing a focus on energy or stormwater.

To understand the deeper meaning of sustainability, one of the interview questions focused specifically on implementation. It was noted that most of the sustainability strategies being implemented are low-hanging fruit, such as replacing LED lights, improving mechanical systems, and promoting Low Impact Development. Implemented strategies also had a resilience bend to them, as A4 stated, "Early on, we had recycling programs and opportunities and looked at risk management."

Many of the participants thought the military still has a long way to go in building sustainable installations. Three of the respondents reflected that sustainability measures are predominately driven by cost. This is perhaps because the Sustainability Component Plan, which was the guiding policy document for sustainability, used the Net 0 measurement tool to calculate the payback period of energy and water projects. As A4 said, "We had the Net 0 and SCP's [Sustainability Component Plans] that were part of the ADPs [Area Development Plans], and now we have the IEWP, but installations don't integrate them. The lifecycle costs for alternative

energy were prohibited. Net 0 for energy, water, and waste were great but we didn't capitalize on them."

Lack of financial payback is considered a hindrance to the base's ability to implement development that is beyond simple light fixtures and low-flow toilets. The lifecycle costs necessary to have sustainable bases that reflect the triple bottom line, which is the balance between the environment, the economy, and social equity, are not readily clear and thus not considered in the calculation. As A2 questioned, "How do we do some of the heavier lift on the installation? The AF Base of the future initiative calls for moving housing and services off base, which they think is sustainable because of the budget. The next step in the UFC is to tackle fiscal sustainability."

Respondents suggested several helpful ideas to advance sustainability, but overwhelmingly having good policy was cited as most important. As stated previously, respondents thought policy guidance has helped, especially the Obama-era executive orders which they felt gave clear, if lofty, goals and targets. Respondent A4 noted "the scale of the DOD is such that great innovations can be replicated across multiple installations; thus the implementation is magnified.

Several comments were made concerning the importance of leveraging technology and integrating plans. The planners argued that having access to good, manageable information to make decisions was important to better implementation. A1 stated, "The key is leveraging and integrating new technology in terms of analyzing and focusing conditions."

Defining Resilience

Respondents gave definitions for resilience more confidently than they did for sustainability. The definitions provided closely aligned with definitions in the literature.

A5 stated, "Resilience is being able to adapt to stressful situations with minimal impact." Most of the definitions focused on efficiency, redundancy, and the installation's ability to rebuild quickly." The overriding emphasis is responding to an emergency or short-term stressor. This is consistent with the literature which implies resilience deals with more immediate and acute issues thus is easier to understand. However, when describing resiliency, the respondents' focus tended to be on water and energy. The literature describes resiliency as the ability to withstand, rebound, and learn in the protection of social, environmental, and physical systems. Participants focused a great deal on system redundancy. Also, while participants defined sustainability in terms of resilience, many of them spoke about how resilience and sustainability are related.

Additionally, respondent A4 stated military base leadership has always emphasized resilience in terms of adaptability and flexibility. Respondent A6 also defined resilience in terms of adaptability, "[Resilience in] buildings and personnel, because you can't have resilient warriors without buildings that are easily adaptable." These were the only respondents who talked about the adaptability and flexibility components of resilience.

When referring to resilience, respondents consistently focused on infrastructure elements, specifically power and water systems. A5 confirmed this when he stated, "As a planner and engineer, I look at the infrastructure piece of it." Energy and stormwater were the predominant topics for resilience among respondents, as were engineering solutions such as developing looped water and power lines, installing alternative energy sources, and ensuring availability of

redundant systems. Respondents also focused on the ability to respond to short-term, immediate threats of climate change.

When asked about the implementation of resilience on military installations, responses were similar to those of sustainability with its focus on low-hanging fruit. A1 said, "It's a work in progress. We are still trying to figure out what needs to inform resilience. It's in the back of our minds when we plan." This is a clear indication that, although resilience has been a driving force in the military for decades, its implementation is still not well understood. The emphasis on infrastructure is evident by the types of projects being planned. Respondents gave examples of projects such as looped energy and water lines, micro-grids, and alternative energy as components of the resilience plans. A5 agreed, stating the importance of the military to focus on critical points of failure.

One respondent, A2, referenced the seminal work of Ian McHarg, *Design with Nature*, as being the basis for resilience planning. In discussing resilience, the subject of land use surfaced frequently but A2 is the only respondent who voiced the idea. Others considered resilience as a component of sustainability which, by their definition, includes land use but does not seem to be included in their framing of resilience.

Interestingly, when talking about resilience, funding was no longer stated as a driving force. In corroboration, respondent A3 stated, "Some of the new planning initiatives are being solidified through funding in energy and water projects." Respondent A3 voiced a concern, "…too much considering the payback period of things…." However, as stated previously, the projects getting funded are still low-hanging fruit, and much of the heavy lifting, such as pulling back from coastlines and moving vulnerable installations to better locations, is not even on the table for consideration." Overall, participants saw resilience as just emerging, though clearly, it

has been a topic of conversation by other names in planning for many years in terms of mission sustainment.

Respondents reflected on ideas that have helped advance the concept of resilience. Respondents A3 and A4 noted that there has been a general change in thinking. Leadership and planners are asking the right questions. A4 asked, "What are we doing to ensure there are good plans in place and there is a flexible environment? How do we anticipate these in the future and ensure our mission-critical facilities are constructed properly to withstand the situation?" and A3 commented, "They are starting to think differently, which will improve and increase resiliency on the installation."

Interestingly, there is not as much talk about the importance of policy, but rather, there is a focus on the reaction to natural disasters as the catalyst for building more resiliently. It is surmised that the threat of immediate danger is easier to understand thus easier to plan and implement. The only reference to policy came in the form of a proposed National Defense Authorization Act which the respondent stated will have a resiliency component. Until asked specifically, none of the respondents referenced the IEWP that is being piloted at some installations. While it was apparent that they each knew of the IEWP based on their responses to direct questions on the topic, when asked about resilience, they did not immediately relate the topic of resilience to the IEWP. This is perhaps an indication that even among planners there is somewhat a phenomenon of "stove-piping" in which thinking about resilience is separated from the policy that addresses it.

Relationship between Sustainability and Resilience

Respondents were mixed in their explanation of the relationship between sustainability and resilience. Some respondents spoke of sustainability in terms of mission, being able to continue the mission, not in terms of the traditional definition of sustainability as a triple-bottom-line concept that includes the broader issues of balancing environmental, economic, and social equity outcomes of urban development. They are essentially defining sustainability as resilience. A3 reflected that if buildings and infrastructure can stand up to stressors, the mission can be sustained longer, which is clearly focused on resilience.

Some saw the relationship between the two concepts as being co-dependent. A2 stated, "There is one coin; one side of the coin is sustainability that are more long-term threats, and how we can develop institutions to protect against long-term threats. The other side of the coin is short-term threats, which is resilience. Man-made and natural threats to our mission." Likewise, respondent A4 said, "[Resilience] goes hand-in-hand with sustainability," and A6 stated, "Sustainability needs resilience."

Other respondents saw sustainability evolving into resilience. This is reflected in the way that many of the respondents defined the two terms. When asked about the relationship between the two, A1 stated, "Sustainability is evolving into resilience." A1 also expressed the need for a better understanding of what the two concepts are and how they relate. This would indicate the two are not well defined by planners as they engage with military leadership. This is similarly expressed by respondent A3 who also sees the close connection between the two concepts. A3 said, "Those terms blend together… Sustainability and resilience are very close; if you are resilient you are more sustainable mission-wise."

When further asked to examine the relationship between the two concepts, respondents spoke of the importance of the two concepts being framed together. They see that some of sustainability's strategies conflicting with resilient strategies such as the need for multiple redundant systems that require extra land and energy resources as well as maintenance. A1 considered the importance of having multi-disciplinary teams to help resolve conflicting sustainability and resilient strategies. Respondent A4 voiced this thought, "Installations are really looking holistically at projects and considering what will ensure a more resilient future and what's going to help us be more sustainable with our resources."

Respondents also saw resilience as overtaking sustainability as a focus area. A5 reflected, "I think nowadays we should be focusing more on resiliency because I think we have come to a point where we live in a crazy world that we have never experienced before." This thought illustrates a shift in the paradigm for military master planning.

Challenges

Respondents identified many challenges in addressing sustainability and resilience. One of the main challenges is coordinating efforts and integrating the concepts into the master plan. A2 and A3 expressed the need to think holistically and have a fundamental change in mindset about military installation planning. Other challenges included the commitment of time and money because these projects will require longer timeframes and greater costs to initiate than the business-as-usual model due to the change in standards, moving building and infrastructure to more appropriate locations, installing alternative energy sources, and creating walkable environments out of the current auto-centric development.

One particularly insightful challenge was expressed as the need for a change in leadership's approach to sustainability and resilience. A4 stated, "Some leaders are only thinking in terms of things that get funded, and others are driven by 'this is the right thing to do' so that we are sustaining our installations, lands, and resources." As stated previously, besides policy, respondents suggested that leaders who recognize the long-term benefits of sustainability and resilience to the installation make the implementation over the long-haul possible.

A Shift in Master Planning

Overall, respondents recognized a shift in master planning for military installations, but there are differing opinions. Three respondents thought there is a general move in the direction of sustainability and resilience, but sustainability is being put aside with a new focus on resilience. Respondent A5, likewise, simply stated. "[Military planning has] shifted toward resilience." These observations were based on their interactions with leadership and stakeholders at the installations for which they planned, as well as policies and mandates handed down from the Department of Defense and presidential administrations.

Respondent A4 disagreed and argued that while a shift has occurred first toward sustainability and now away from sustainability and toward resilience, it is not something that has proven to be lasting over time, and may be fleeting as policy changes. A4 said, "The proof is still to come. I have not seen a sustained shift. A couple of years ago I would have said it was toward sustainability and now in the wake of hurricanes, earthquakes, and floods it's been more on resilience." Respondent A6 had a similar opinion but saw sustainability and resilience not as an "either/or" choice. "There is a push toward resilience. They ebb and flow and are not mutually exclusive, and they benefit each other."

Perceived and Expected Impacts of Changes in Military Master Planning

The impact of a shift from sustainability to resilience in military master planning, including the evolution of policy and practice as perceived by respondents, appears evident in the changing nature of the plans. Respondents see the master plan as a guiding document, and sustainability and resilience must be coordinated and integrated into those plans and not treated as separate documents. A1 stated, "The master plan should be the guiding document, so it's about planning and coordinating the goals and approach to the overall goals of the master plan." Respondent A4 added, "It's an evolution in planning, since planning is a living beast and should always be changing." The implication is that planning, including planning for military bases, should always be evolving to meet the current challenges.

However, one respondent voiced frustration over the changing nature of mandates and executive orders. This perhaps reflects the notion that planning is a practice and planners do not always know the outcome until after it has been implemented. A6 stated, "Sometimes it's frustrating. We focus on EO [executive order] changes and status of work. The DOD is the tip of the spear in implementing sustainability and resilience." Other uncertainties exist in that not only do policies and mandates change, but development plans can change with the rotation of commanders as each has a different set of priorities and seeks to place their mark on the installation in the short time they are there.

"Additional challenges toward implementing sustainability and resilience in master planning were also raised by respondents. These were coded into four categories: stovepipe planning, reactionary policies, leadership, and mindset.

Stovepipe Planning

One challenge to implementing sustainability and resilience in master planning is referred to as "stovepipe" or silo planning. This is a result of each discipline planning for their specific area of responsibility or expertise. A2 stated, "As the sift is happening, the energy people take a look, then the water people take a look - there is a tendency to stovepipe." This is understood to be detrimental to the ability to holistically examine the installation and its people to determine the best course of action. Respondents suggested it does not allow for the multi-disciplinary approach needed to address all the installation's needs. A5 expressed, "They have to understand what resiliency means to them, as each profession and stakeholder thinks about resiliency in terms of their own different challenges."

Reactionary Policies

Respondents found another challenge in the reactionary nature of planning. Rather than being proactive, learning from other installations, and planning for potentially long- and short-term resource and stressor impacts, respondents experienced sudden policy and program shifts that only address the problem right in front of them. A4 said, "We see more reactionary programs and policies. There are some energy management policies, but some people take it more seriously than others, and there are some installations that are not thinking about it at all." Similarly, when asked about impacts, A6 simply stated**, "**Reactionary policies. Sustainability is preventative, but the change in administration brought an end to the sustainability EOs [executive orders.]."

Additionally, the short-sighted nature of short-term planning was seen as a hindrance. As A1 stated, "We tend to build things short-term because it is expedient and cheaper in the short-

term: component work instead of holistic." This short-term approach is seen by respondents as an issue that particularly gets in the way of long-term sustainable resource planning.

Leadership

The importance of good leadership is a recurring theme. Respondents reflected that it is only through leadership that is willing to embrace change, do the right thing, and commit resources to these efforts that sustainability and resilience plans are created and implemented. In addition, having dedicated support personnel can also be instrumental. A1 stated: "Some installations have had a more robust planning capability and have more resources available to address these issues…, "[We] need leadership to focus on ensuring that the base does have a robust planning capability - focus on excellence."

This leadership extends to planners as well. Respondents recognized the importance of planners leading the charge. A2 stated, "The old guard wants to go along to get along, but the newer generation of planners know that sustainability is about the mission and resilience is about the mission. Street trees and sidewalks will support it, and we think in that terminology and understand the mission and perspectives [to lead decisions toward sustainable, resilient bases]." This points to planner's ability to help or hinder the planning process through engagement in the process, with planners promoting either business-as-usual or new and innovative measures for improved bases. As A5 said, "At this point in time, I think we are still in the educational stage." This is reflected in other responses and indicates planning is still evolving and additional education is needed.

Funding

Respondents also saw funding as a major hurdle in implementing sustainability and resilience planning. Mandates aside, respondents thought that without dedicated funds to implement the plans, better planning will not result in better bases, no matter how badly the change is wanted. The issue of funding has been addressed in previous sections of this work, and it is perceived as a significant barrier. A4 stated leadership needs to think beyond funding. Additionally, the uncertainty of determining outcomes or known value from long-term sustainability and resilience efforts is seen as a hindrance to good plans. In addition, the DOD does not have a good grasp on the value of its lands, thus projects protecting that land are underfunded or remain forever in the planning stage.

However, respondent A2 had a different take on the issue identifying a lack of good planning as the source of the lack of funding. A2 stated, "People complain that there is never enough money, but with good plans they can get the money to execute them." A2 also noted the full trade-off of implementing good plans is that the money will be spent anyway in other forms. A2 stated:

In reality, we are spending the money anyway, and we need people on base to provide a system of environmental and social sustainability. Living off base is counter the to mission support and damages esprit-de-corps. It's not about construction. If we transfer the money to weapons and away from people, we have lower retention rates and higher domestic violence and child abuse.

Mindset

Respondents identified a final challenge to sustainability and resilience planning and implementation: mindset. As previously noted, the mindset of leadership, planners, and decision makers at the installation level is paramount to creating and implementing policy that holistically looks at sustainability and resilience. A3 stated, "There has to be a fundamental change in mindset." Currently, federal policy mandates the inclusion of resiliency and developing energy efficiency in planning. However, respondents believe the paradigm shift toward developing more sustainable and resilient installations is a sign of this change in mindset.

The Promise of Future Change

During the interviews, all of the respondents provided specific areas that need to change to improve planning on military installations. A1 reflected on some of the evolutionary change needed beginning with the Unified Facilities Criteria. While the 2012 UFC was a paradigm shift in military master planning, respondents thought it needs a comprehensive look with sustainability and resiliency planning as an integrated part of the whole. The Regulating Plan in 2012 UFC was also discussed as it is currently "just pretty pictures," but respondents believe it should be the guide for all other master planning. A1 stated, "We need plans to be integrated and continue to change and evolve."

The idea of pursuing more integrated plans and less stovepipe planning was expressed by most of the participants. This was seen as an important part of having both sustainable and resilient plans that can be implemented. A4 stated, "It needs to be integrated into the other plans which are overarching documents." Respondents believed that having separate plans and separate departments and experts planning separately from the master plan were detrimental to

sustainable installations that embrace the triple bottom line and support the installation's ability to resist, rebound, and adapt to stressors. As A2 reflected, "[The] bigger picture for planning is using the resiliency measures and adapting to climate change, simplifying policies. We need to do the heavier lift."

Data-Driven Decisions

Respondents also thought more data-driven decisions and scenario-based planning were needed. Respondents thought data is being collected, to the point of having too much data, but there needs to be a better way to access, filter, update, and use it. This is believed to not only help in making project decisions but will help ensure better plans that address contingencies. As A1 stated, "We need to be mindful of other events that have happened that are not as newsworthy. Maybe a geopolitical issue that happens. We talk about cyberattacks - how do we protect controls and information?"

Additionally, options for different contingencies in the future must be considered. A6 stated, "We need to do scenario-based planning for the highest theaters and develop courses of action - determine if they are resilient and sustainable." Respondents determined this will require both mathematical and social data to make appropriate planning decisions. Essentially, this is the idea of learning from history. A4 stated, "We need to learn from history and look at our reactions and their consequences to events." This, by its nature, will require data-mining of all kinds to be effective.

As stated in previous sections, respondents believe the mindset of leaders, planners, policy makers, and funders must be changed. This is key to better planning on military installations. Respondents stated that the mindset toward integration and project execution

should be developed. They believe there needs to be a wholesale mindset change about the way land on installations is valued and used so the heavy-lift items of sustainability and resilience, such as refraining from building in unsuitable areas can be achieved.

Role of Planners in Military Master Planning

The respondents shared various views on the role planners play in military master planning. The areas mentioned during the interviews consisted of planners as (1) proponents for including sustainability and resilience measures in the master plans, (2) interpreters of complex information, (3) researchers and educators, and (4) change agents. Several respondents hinted at the need for planners to be proponents to encourage leaders and stakeholders to include planning options outside the business-as-usual model.

A4 said, "We are trying to push in our alternative planning to work on sustainable strategies to think through the type of planning." The respondents saw planners as the cheerleaders for better planning practices against an old guard. As A2 stated, "We have a new generation of planners who are replacing the old guard. They understand we are trying to do the same thing cities are doing to make a more sustainable type." This proponent attribute is also expressed in terms of promoting planning early. A6 stated, "Address things early on - planning, design, validation 10-15 years out,"

As well as being proponents for better planning, several respondents saw their role as interpreters of policy and mandates. Respondent A3 cited involvement in other planning programs used for sustainability programs in the environmental realm: "Master planning can solve all their needs - they are realizing through the ACUS programs and communities surrounding military installations that their missions are impacted, and it's not easy to move."

This is also reflected in a statement by A6 who sees the value of helping installations understand what EOs and mandates mean to each place: “Every installation is unique.”

Respondents cited the importance of providing research and education to installation planners and stakeholders who often wear a number of hats and have limited time. Several respondents have been involved in delivering and attending courses that expand the planning knowledge base, bringing those back to the installations with which they are collaborating. In speaking about installations that lack a robust planning team, A4 stated, “But in places without the leadership to influence, it is incumbent upon us, as planners, to ask the questions and share lessons learned.” A2 expressed the willingness of leaders to change: “Leaders want to get out of the stovepipe.”

Finally, respondents agreed that military master planners have a responsibility to be both innovators and change agents. They see their other roles as leading to this ultimate goal of being the voice and vehicle from which sustainability and resilience are brought to installations. This includes broadening the current understanding of needs and bringing to the table new and innovative ideas. A4 said, “Not just utilities and water but also space planning in thinking about ways to protect people and equipment. Use the opportunity to solve other problems and consider an alternative that really looks at sustainability and resilience strategies - what else can we be doing - what other ideas are out there.”

A1 also provided this idea: “Planners should always think about what comes next, look at new ways to look at things. Keep ears open to things that become an issue. Be proactive. Planners can be a voice for leadership to say we need to be addressing these things.” A1 went on to emphasize the importance of planners taking the lead in ensuring they stay relevant in

planning: “We have to be flexible enough to adapt and make changes.” Likewise, A5 added, “The world is changing rapidly, and you just never know what is going to come.”

A4 expressed the excitement of planners in their roles: “[We bring] a variety of things with different priorities and funding and reporting mechanisms. Really excited about the opportunity to really innovate.” Innovation and the ability to make a difference for military personnel and those who live and work on the base was a recurring theme from some of the respondents.

Conclusion

Overall, the consensus was that there has, indeed, been a shift from sustainability toward resilience. However, there is still a lot of work to be done to plan and implement strategies that support both long-term sustainability and acute and chronic resilience measures on military bases, especially beyond energy and water measures. Respondents had different definitions of sustainability and resilience with all but two defining sustainability in terms of resilience. Some respondents focused on environmental and infrastructure issues in terms of sustainability and resilience planning. Two respondents expressed the definition of sustainability more holistically, including social and financial aspects, in their comments concerning sustainability. They also recognized broader aspects of resilience that included doing more of the heavy lifting such as moving away from the water’s edge and changing the way military installation lands are managed.

Respondents also commented on the role of planners in bringing about change. They expressed that planners have a large role to play in being change agents for planning military installations. This includes being proponents, interpreters, educators, and innovators. The

consensus among respondents was that planners have a responsibility to guide leadership and stakeholders to make good planning decisions that include sustainability and resilience.

Respondents were also appreciative of mandates and policies that promote these initiatives. They advocated for policies to continue to evolve, for plans to be data-driven, and for sustainability and resilience to be integrated into master plans and not be separate components.

Several respondents expressed the importance of leadership support and a general change in mindset to move solidly in the direction of sustainability and resilience. They determined sustainability was closely examined in terms of cost and savings and had a strong focus on energy. Resilience measures, however, did not seem to suffer from the same cost-cutting scrutiny and are focused on responses to the impacts of climate change. Some considered this narrow focus to be short-sighted and will lead to even more "stovepipe" thinking and planning.

The summary of findings for this research project is that there has been a paradigm shift in military master planning beginning with the implementation of the 2012 Unified Facilities Code. However, there are gaps in policy, especially in terms of social and financial considerations, and there is still a great deal of work to do to create military bases that are both sustainable and resilient.

CHAPTER FIVE

DISCUSSION AND CONCLUSION

Floods, hurricanes, droughts, wildfires, pollution, and degradation have compounded to create a volatile, uncertain, complex, and ambiguous (VUCA) world affecting millions of people on U.S. military installations. Playing a critical role in addressing the response to these conditions on military installations are planners. Planners use their skills, knowledge, and experience to work with stakeholders to create policies to promote better development that sustain a high quality of life, preserves the environment, enhances economic strength and resilience, and builds human capital and social equity. Military bases, like cities, are not immune to these threats and the evidence from this research suggests that addressing these threats will take a cooperative effort between planners, the military, and leadership at the local, enterprise, regional and national levels. The findings from this research suggest that over the past decades military planners have seen a shift in master planning on military installations that has far-reaching implications for the future. However, research on this shift from sustainability to resilience for military installations, and the impact of this shift, is lacking.

The overarching research question for this project is born from the literature related to sustainability and resilience planning, and posits, "What are the planning implications of the shift in focus from sustainability to resilience as perceived by planners within the military complex?" The questions that create the theoretical framework include:

1. How do planners at private firms and different levels of the Department of Defense (local, regional, enterprise, and federal) define sustainability and resilience?

2. Have military complex planners perceived a shift from sustainability to resilience, and if so, what is the perceived cause of this shift?
3. What role do military complex planners play in the shift from sustainability to resilience?
4. What is the perceived outcome of the shift?

The topic of sustainability and resilience in military master planning is important for several reasons. First, because planners are at the forefront, helping to guide leaders and stakeholders in developing master plans, the way they define sustainability and resilience may frame the outcomes. Second, the way planners think about these terms affects the way they are formulated and implemented. Third, planners, especially military planners, rely on policy to achieve their ends. Having a well-written policy that is well-understood is foundational to building sustainable, resilient development. Finally, due to their proximity and influence at the beginning of the development process, planners are instrumental in bringing about change in the face of poorly understood policy, conflicting motives and priorities in leadership, and challenges of changing administrations and government mandates.

This study provides insights into the field of sustainability and resilience in military master planning through three key findings. First, military master planning has evolved from focusing on large-scale, land-use plans to utilizing urban design best practices. However, the focus of plans has shifted away from sustainability and toward resilience. Secondly, it is critically important to link sustainability and resilience and integrate them into master planning to ensure gaps in strategies are exposed and conflicting strategies are resolved. The third finding highlights the importance of the role of military master planners, as they are what Lipsky (1980) called street-level bureaucrats, influencing the outcomes of master plans both with the help of policy and in the absence of leadership.

Evolution of Suitability and Resilience in the Military Complex

The first finding is that, while sustainability grew out of the environmental movement (Jabarine, 2008 Wheeler, 2013) and resilience out of the emergency management sector (Coaffee, 2013; Goldstein, 2012), over the past three decades, the military has focused primarily on resilience. Although military bases planned for environmental issues in the past, the 2012 Unified Facilities Criteria (UFC) was the first attempt at realizing the larger goals of sustainability in energy, water, waste, and stormwater. As threats around the world increased and federal mandates changed, sustainability was superseded by resilience in military master planning.

Early research in sustainability focused primarily on the environment and human-natural systems, with a lesser focus on resilience (Folk et al. (2002), Maddox (2013) Portney, (2003), and Wheeler (2013). Attention to resiliency has dramatically increased in the past 10 years due to increased focus on national disasters such as hurricanes, droughts, wildfires, the great recession, terrorist attacks, and now, a global pandemic. A survey of existing literature over the past 30 years on the evolution of sustainability and resilience indicates the growth of research on sustainability and resilience research has grown with steep upticks in research on resilience following national disasters.

While the civilian planning sector adopted sustainability and resilience organically over time, military base master planning has lagged in its evolution, relying on federal mandates to incite changes. The reliance on governmental mandates that change as a result of presidential elections causes abrupt changes, for which the hierarchical nature of the military must then interpret, develop guidance and tools, and finally, execute at the installation level. This process may take years, at which time the White House administration and rules may have changed. It

was not until the funding pressures that brought about the Base Realignment and Closure Act and the subsequent adoption of a base master plan policy guidance (2012 Unified Facilities Criteria) that real change began to happen, and sustainability, as it is currently defined, was seriously considered. Previously, resilience in the military was thought of in terms of troop readiness, while sustainability was viewed narrowly in the Department of Defense's response to the federal government's mandate under the National Environmental Policy Act (NEPA) for environmental protection on military installations.

Several overlay plans were created to provide more nuanced approaches to specific elements of sustainability and resilience. The Sustainability Component Plan overlay was created through the targets set by the Obama era executive orders in response to climate change and massive environmental issues. The Installation Energy and Water Plan overlays were created through the Trump administration's subsequent revocation of the Obama-era sustainability mandates, replacing them with simple, efficient government operations following hurricane Katrina, the terrorist attacks of September 11, 2001, and a series of climate-related events. Thus, the focus shifted from sustainability to resilience to address vulnerability on military installations. This is supported in both the review of military complex documents (see Appendix 2), the examination of research documented over the past 30 years, and through interviews with planners, affirming Marchese's (2019) findings in his research on the topic. Marchese (2019) argued that research focused first on sustainability, then, as VUCA increases, on resilience, and now has begun to more fully address the relationship between resilience and sustainability.

Linking Suitability and Resilience

Reliance on policy to effect change introduces the second key finding. Separate policies were adopted for sustainability and resilience, and due to the reactionary nature of military master planning, "stove-piping," occurred, which, in effect, means these two concepts were considered separately and apart from one another. It is noted that resilience tends to be more reactionary whereas sustainability if more consistence and long term, thus resilience fits the military mindset more readily. McQuade and Hunters (2019) asserted the military's hierarchical focus on programmatic approaches, rather than systems approaches, may mean that in addressing one set of issues in isolation, a new set of issues are created. The reliance on separate overlay plans and lack of integration into the master plan means sustainability and resilience strategies, which can conflict and compete, are planned separately and by separate departments at the installation level. Because there is no unifying mandate for resilience and sustainability, these two concepts are not used together in military planning nor are they integrated into the master plan together.

Portney (2003), Maddox (2013), and Wheeler (2013) indicated sustainability and resilience have historically been conceptualized as two different notions. However, over the past few years, Marchese (2019) argued that research has begun to more fully address the relationship between resilience and sustainability.

He noted the danger of treating them separately, and respondents seemed to agree, including conflicts in strategies that undermine overall goals at different temporal or spatial scales. Sustainability initiatives tend to focus on preserving traditional methods of resource use, while resilience initiatives tend to focus on adapting to new conditions, creating innovative uses of traditional knowledge (Lew et al., 2006).

Although Davidson et al. (2019) presented resilience as the dominant organizing framework, the relationship between sustainability and resilience is clearly more nuanced. A sustainable system creates a continuous resource stream that ensures future resources, while a resilient system ensures the system can resist outside pressures, bounce back when disaster strikes, and adapt or create a new normal (Coaffee, 2013; Walker & Salt, 2006: Folk 2016; Holling, 1996; Davidson et al., 2019). Both concepts are essential for developing comprehensive approaches to facing a variety of natural and human-made threats to military installations.

Over the decades, industry and government leaders, as well as the general public, have become more aware of sustainability, yet researchers argue there is a need for a systems approach to addressing sustainability while linking it to the concept of resilience (Fiksel 2006). Redman (2014) posits that both sustainability and resilience should be continually applied to improve society and the environment. However, Davidson et al. (2019) see resilience as the dominant organizing framework. He stated that modeling the future based on the past to achieve sustainability and building a systems-adaptive capability to favorably respond to shocks results in resilience (Davidson et al., 2019). Schewenius, McPhearson, & Elmqvist (2014) caution against using resilience as a one-size-fits-all approach to achieving sustainability, and Marchese (2018) established that sustainability and resilience are separate, yet inseparable, concepts in achieving the goals and mandates of both.

Highlighting the connection between these two concepts, the military planners interviewed supported the notion that sustainability and resilience should be managed together. One respondent stated, they are “two sides of the same coin.” However, among respondents, the definitions were not always clear, with respondents defining sustainability and then describing the implementation in terms of resilience, or sustainability in terms of mission and not the

broader definition of the triple-bottom-line. This supports the findings of Lew et al. (2016), who that framing has been removed from sustainability and resilience's core definitions, with some believing they are effectively the same phenomenon or that the conservation goals of sustainability conflict with the resilience goals of adaptation. Greater understanding is needed for the way the concepts of sustainability and resilience can be reframed and co-exist which will help planners guide more informed decisions in the creation of master plans for military installations. Understanding that the confusion exists in framing, these terms and their impact on master planning is the basis for the third significant finding of this study.

Perception of Planners

The perceptions of planners and the causality and impacts of those perceptions, especially concerning the way they understand the relationship between sustainability and resilience planning on military installations and its influence on leadership and stakeholders, has not been well examined, (Jun & Conroy 2014; Jabareen, 2008; Marchese et al 2018; Wilkinson, Porter, & Colding, 2010). As revealed during the interviews, planners influence leadership and decision makers, thus their perception of these terms and interpretation of policy has a direct impact on what gets planned. The importance of the role of planners in interpreting policy for military installation leadership was stated outright by three of the respondents and noted by other respondents. Lipsky (1980) noted this role made military master planners street-level bureaucrats because they have the power to influence stakeholders and leader's understanding of master planning.

Thus, understanding how planning policies such as those that promote sustainability and resilience is perceived, framed, and implemented in the military complex is reliant on the perceptions of planners at each level of the military complex. Planners struggle at the local level

with vague or conflicting expectations as they attempt to educate and influence leadership in development decisions for sustainability and resilience as the strategies that make up these concepts, especially sustainability, are often perceived as costly or impractical. Additionally, because of the hierarchical nature of the military, and planners in private firms who are not part of the formal chain of command, it can be difficult to help stakeholders achieve their goals at the local level. Therefore, these planners must use their knowledge, expertise, and case studies from other military projects to gain leadership and stakeholder confidence and buy-in.

Marchese (2019) provided a framework for examining the relationship between sustainability and resilience offering four different approaches: sustainability alone, resilience alone, resilience as a component of sustainability, and sustainability as a component of resilience. Analysis of military master planning archival data for the different levels of the Department of Defense (DOD) indicates sustainability and resilience are considered as stand-alone concepts. An analysis of the different levels of the military complex (see Table 5) revealed the additional category of Sustainability and Resilience Equally. This could hold promise for future sustainability and resilience policy and guidance to see the two concepts equally as two sides of the same coin, as one respondent stated, if not wholly integrated into master plans. One complicating factor is that, while the statements that were analyzed concerning resiliency and sustainability within the different military complex agencies (national, research, regional, and enterprise) clearly define each of the concepts, policy guidance and planners' understanding of the meaning of these terms is not always clear. This lack of clarity about the defining elements of these concepts could cause problems in the plans achieving the desired results as planners implement their translation of policy and guidance in the field.

Relevance to the Profession of Planning

The profession of planning is built on the principles of public service, ensuring the well-being of people and their health, safety, and welfare, which includes, by its very definition, the recognition and protection of resources and lands on which we all rely. The research clearly shows the dynamic part planners play in ensuring the principles of planning are addressed on our nation's military bases both at home and abroad. These planning best practices are achieved through a planner's readiness to be a change agent, involving multidisciplinary teams, stakeholders, and leaders in the planning process, thus ensuring everyone has a place at the table.

Military master planning has evolved over the past 30 years, but the 2012 Unified Facilities Criteria (UFC) brought about a paradigm shift that provided the basis for the implementation of good urban design on military installations. The UFC included the principles of sustainability through component plans such as the Sustainability Component Plan (SCP), and now the IEP/IEWP, which is designed to evaluate the base's energy and water resilience. While the environmental issues are mandated and addressed through the National Environmental Policy Act (NEPA), and the UFC's planning principles include principles that protect the environment, there are large gaps in incorporating resilience and sustainability in planning on military installations. Both the SCP and the IEWP tend to be narrowly focused, with the SCP weighing the cost savings of energy and water and the IEWP planning for 14-day continued operations of critical buildings in energy and water. The current implementation of strategies only achieves the low-hanging fruit while the heavier lifting issues that involve costly and long-term efforts are left for future plans and implementation. There is currently no planning mandate that addresses the larger and more complex issues of social and financial sustainability, nor is there a criterion that

takes a holistic look at the triple-bottom-line which is the balance between environmental, social, and economic resources.

However, there are promising developments. As of this writing, the U.S. Army has published the U.S. Army Climate Resilience Handbook, and the Unified Facilities Criteria (UFC) has a draft update that now includes resilience as well as sustainability criteria. Updates to the UFC include energy and climate resilience and requirements for transportation and military installation resilience components. The stated impacts on planning for the current military installation include additional costs to complete the Installation Energy Plan and Installation Climate Resilience Plan; improved installation efficiency, safety, resilience, and mission sustainability, and enhanced integration of comprehensive planning and project programming (project implementation) activities. It remains to be seen what true impact these new planning tools and guidance will have on military bases, and if they will truly be integrated smoothly into the master plan. Still missing, however, is any direct mention of social or financial resilience or sustainability. Additionally, as the current pandemic has shown, these plans do not necessarily cover the human contingencies. Policy recommendation for the upcoming administrations would include examining the integration of sustainability and resilience components into all master planning and development efforts, with collaboration with impacted entities outside of the installation. It is hoped that the next iteration of mandates, guidance, and the plans that arise from new policies will build on what we have learned, and create the sustainable, resilient, livable places we desire.

Recommendations for Further Research

Several respondents in this study expressed the need for the full integration of sustainability and resilience planning into the master plan. Future research on this topic might include a look at the emerging concept of *thrivablility*; the notion that is being advanced in many fields including urban planning, architecture, business, information systems, and social ecology by researchers and advocates such as Jean Russell (2013), Radziwill Nicole (2016), Sam Bikram (2018), and Michelle Holliday (2020). As Figure 12 illustrates, this is a natural evolution in planning, moving from survival (outlast, react), to sustainability (repair, return), then resilience (rebound, re-establish), and finally thriveability. Marchese et al. (2018) and others promote the importance of combining sustainability and resilience, which is some of the grounding notions in creating places that are *Thrivable*. The Urban Institute includes financial health and racial equality, which were issues missing from sustainability and resilience in military master planning and are key components of the field of positive psychology, which considered thrivability (Gaffaney, 2017). Thrivability is stated to be the next stage of development for sustainability (Baue 2015).

Figure 12. Thrivability Progression (http://thrivable.net/philosophy/what-is-thrivability/)

This concept, which has been building over the decades, is founded on the idea of livability as defined by Tyce Herrman and Rebecca Lewis (2018) from the University of Oregon research in the 2015-2017 *Sustainable Cities Initiative* and includes combining sustainability and resilience measures to truly encompass social and economic viability. As far back as 1998, Carver (1998) linked resilience and thriving which posits thriving as reduced reactionary systems and a higher level of functioning that heals as it operates. In resilience and sustainability, the human element of livability, which is an integral part of thrivability, has been peripheral to the demands of the mission and the built environment in military master planning. Thriving systems are sustainable systems that are resilient, resilient systems that are livable, and livable systems

that are sustainable: systems that are more effective, appealing, satisfying, and beautiful to its stakeholders.

A second area for further research is the effectiveness of sustainability and resilience policy in achieving the desired goals on military installations. This would include examining how decisions are made, how often and under what circumstances projects are implemented, and how further policy changes can influence decisions to ensure what is actually getting built on installations is in line with master plans. As this research suggests, planners have a powerful impact on master planning on military installations, but it is military and governmental leadership that has the final say in what gets built. Understanding how policies are implemented, and under what circumstances, will help future planners and policy makers create stronger plans.

Related to a planner's ability to interpret policy in master planning, a third area for further research involves the planner's role in bringing about change. This might require a fresh look at Arnstein's ladder of public engagement, especially as it relates to military master planning. Arnstein (1969) suggested the top of the ladder is citizen control, which perhaps is more of a goal than a potential reality. It suggested citizens have equal knowledge and equal power to make meaningful decisions for themselves. However, whether in the civilian or military complex, this is rarely, if ever, the case. In military master planning, planners fundamentally need to know who makes the ultimate development decisions, how best to involve stakeholders and leaders, and understand the planner's role in that process. It is important to understand how planners can be more effective in bringing about change that is needed in the face of budget constraints, ill-informed stakeholders, and hesitant leaders with different or conflicting goals and priorities. As established in this research, decisions are made at the upper end of the hierarchy and executed at the local level where funding, power, priorities, and conflicting goals often get in

the way of good planning. How can we use the power of planning and planners to give voice to the local level?

Finally, an important area of research rests in the realm of master planning and implementation and cooperation between military installations and their adjacent cities. As is demonstrated with the relationship between the joint bases in San Antonio and Anchorage, these military installations do not exist in isolation. The symbiotic relationship means that actions taken on one side of the fence has an impact on the other side of the fence. This is true of the environmental, economic, and social factors of both sides. A closer look is warranted to gain a greater understanding of how military bases and their adjacent cities work together, what are effective partnerships, and how can each evolve to help the other thrive. As cities around military installations continue to grow, and military strategies such as "Base of the Future" in which all non-mission related activities are pushed off base, are tossed back and forth, it will be critical to better understand these relationships if we hope to have sustainable, resilient, thriving urban systems.

Conclusions and Limitations

This study has been about the evolution of military master planning and how planners perceive the shift from sustainability to resilience. The evolution of master planning on military installations has gone from high-level, general plans, to detailed facility plans, to the Unified Facilities Criteria for master planning's inclusion of sustainability measure, to the overlay plans for sustainability, and now, to resilience. It was found that, to achieve the desired long-term outcomes of development on military installations, sustainability and resilience must be implemented together and integrated into the overall master plan. It was also found that planners

have an instrumental part to play in determining if these concepts and strategies are included in the military master plans. This study did not consider implementation of sustainability and resilience in master planning on military installations. Implementation is separate from the planning process and may deviate, sometime considerable, from the plan because the process involves other structural decision making in the military.

Limitations of this study include the small pool of respondents. While representative of the larger group, their perspectives could be influenced by their backgrounds and the types of projects to which they have been exposed. Another limitation could be in the limited number of military installations examined. The archival documents examined were narrowly focused to these two installations whereas consideration of more military bases may yield a different perspective. Finally, this study examined the perspective of military master planners in private firms. It is possible the military planners that work on the bases and do the day-to-day planning might have a different perspective than those in the private firms doing the longer-term military master planning.

In summary, this study can serve as the essential groundwork for further research on the topic of combining sustainability and resilience on military installations as well as be extended into urban, suburban, and rural development. The concepts and lessons learned here for planners can serve as a basis for better understanding and engaging leadership and stakeholders toward more livable, equitable places. This study examined the perspective of planners as policy and practice evolve around them. Finding our footing and our voice as planners will help improve future policies that guide changes on our military bases and beyond.

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APPENDIX 1

SUSTAINABILITY AND RESILIENCE RESEARCH IN URBAN PLANNING ARTICLES

AUTHOR/	YEAR	SUBJECT	CATALYST	RELATIONSHIP BETWEEN SUSTAINABILITY AND RESILIENCE		
				SUSTAINABILITY	RESILIENCE	OUTCOME
Folke et al.	2002	Human-nature systems policies	Erroneous Independent treatment of human-nature systems in natural resource issues	Sustainability linked to nature and human use is not linear or predictable	Resilience is the capacity to buffer change, learn, and develop	Using resilience as a framework for understanding how to sustain and enhance adaptive capacity in a complex world of rapid transformation
Fiksel	2006	Urban vulnerability and decision making and the need to link social and environmental systems	Increasing global complexity and volatility	Sustainability is steady state, lacking flexibility, and adaptability	Resilience systems are dynamic and adaptive to address	Linking social and ecological systems to move beyond steady-state model of sustainability to adaptive policies and strategies of resilience

AUTHOR/	YEAR	SUBJECT	CATALYST	RELATIONSHIP BETWEEN SUSTAINABILITY AND RESILIENCE		
				SUSTAINABILITY	RESILIENCE	OUTCOME
McNally et al	2009	Multi-scalar and transboundary analysis	Spatial abstraction of a power-shed (hydropower)	Sustainability discourse broadened to include human systems, as security broadened from issues of war and peace to incorporate human-environment relationship	Resilience and vulnerability on a continuum within the framework of sustainability	Resilience is used to operationalize the less tangible concept of sustainability
Ahern	2011	Green Infrastructure	Globalization	Sustainability is framed as a steady state that depends on resilience principles in order to succeed	Multifunctional, redundant, and modularization, bio and social diversity, multi-scale networks and connectivity, adaptive planning and design	Cities that are able to manage change, disturbance, uncertainty, and adaptability

AUTHOR/	YEAR	SUBJECT	CATALYST	RELATIONSHIP BETWEEN SUSTAINABILITY AND RESILIENCE		
				SUSTAINABILITY	RESILIENCE	OUTCOME
Cummings	2011	Landscape Ecology	Environmental Degradation	Spatial variation is fundamental to sustainability	Resilience, measured by quantifying a systems identity, uses a systems approach to vulnerabilities, robustness, and sustainability	Systems approach to sustainable management leads to spatial socio-ecology and spatial sustainability maintained through resilience
McLellan et al.	2012	Energy infrastructure	Technological natural disaster and subsequent human disaster	Sustainability preserving, enhancing, and balancing the triple bottom line of environment, economy, and society	Resilience includes alternative sustainability-related risks with the amount of change the system can undergo and still function, degree the system can self-organize, and the ability to build and increase capacity for learning and adaptation	Integrate energy-sustainability and resilience to achieve continuous, robust, independent. controllable, non-hazardous, matched to demand with centralized and decentralized renewable energy to contribute to sustainable development during normal operations and during disturbances

AUTHOR/	YEAR	SUBJECT	CATALYST	RELATIONSHIP BETWEEN SUSTAINABILITY AND RESILIENCE		
				SUSTAINABILITY	RESILIENCE	OUTCOME
Salat & Bourdic	2012	Comparing sustainability and resilience ecological terms	Fragility of modern cities is structural, exposing themselves to more risks due to their artificial nature	Sustainable structure of the urban system is a strong scale hierarchy ensuring system efficiency (connections whose intensity increases resilience by preventing rapid and catastrophic fluctuations from spreading quickly through the system and disorganizing it	An analysis of resilience has to be based on the forms, functions, and connections, "Theoretical underpinnings for sustainability and resilience is a conceptual framework, governed by fractal geometry for spatial planning, the power law for distributions, and leaf structures for connections" (p. 66)	Ensure enduring places that are sustainable and resilience through innovative tools based on fractal geometry and the science of complexity for spatial planning

AUTHOR/	YEAR	SUBJECT	CATALYST	RELATIONSHIP BETWEEN SUSTAINABILITY AND RESILIENCE		
				SUSTAINABILITY	RESILIENCE	OUTCOME
Ahren	2013	Landscape Ecology		Sustainability is challenged to build resilience through collaboration with landscape ecology	Resilience advances discourse of urban sustainability through the cities capacity to respond to change and disturbance	Adaptive planning through collaboration
Collier et al	2013	Environmental	Globalization	Resilience and sustainability planning require a diverse range of disciplines and perspectives	Resilience is a driver of urban policy, and uses sustainability of both production and consumption as a measure of resilience	More integrated, multi-disciplinary and open planning system

AUTHOR/	YEAR	SUBJECT	CATALYST	RELATIONSHIP BETWEEN SUSTAINABILITY AND RESILIENCE		
				SUSTAINABILITY	RESILIENCE	OUTCOME
Fiksel et al.	2014	Adapt to a new normal in the face of disaster	Natural disasters linked to climate change, rapid urbanization, resource depletion, and political conflicts	Sustainability is not a reachable end-state, but is characteristic of a dynamic, evolving system. Long-term sustainability will result in continuous adaptation to changing conditions	Resilience is the capacity of a system to absorb disturbances and reorganize, retaining essentially the same functions, structure, identity, and feedbacks. It is utilitarian in approach.	Transition to sustainable systems in economy, natural resources, and equity assurance for present and future generations by apply resilience principles to resist disturbance and thrive in an ever-changing world
Jun & Conroy	2014	Community sustainable development	Catastrophic environmental hazards, global climate change, sharp economic restructuring	Sustainability support the conceptualization of a resilient urban system by promoting a livable built environment. Sustainability dimensions include reproduction, balance, and linking local to global concerns.	Resilience is a result of and aid to sustainability. Resilience consists of redundancy and resourcefulness.	A livable built environment by linking sustainability and resilience in comprehensive planning

AUTHOR/	YEAR	SUBJECT	CATALYST	RELATIONSHIP BETWEEN SUSTAINABILITY AND RESILIENCE		
				SUSTAINABILITY	RESILIENCE	OUTCOME
Redman	2014	Combining resilience and sustainability to enhance social-ecological outcomes	Lack of science in determining best course of action in combining sustainability and resilience	The primary objective of a sustainability scientist is to identify specific, sustainable outcomes for the system and possible pathways to achieve these conditions	Resilience scientist focuses on building a system's adaptive capacity to favorably respond to shocks and stresses without predetermining the specific outcome of the actions	Adoption of distinct resilience and sustainability approaches, as well as combinations of the two, allowing each approach to contribute in ways that reflect its strengths
Schewenius, McPhearson & Elmqvist	2014	Sustainable ecosystems, urbanization and land use	Urban health and wellbeing	Sustainability and resilience best practices needed for support and enhancement of capacities of ecosystems	Resilience as a way to obtain sustainability	"Urban sustainable development fosters adaptive and transformative capabilities, and creates opportunities to maintain equitable, long-term prosperity and well-being in complex and interlinked social, economic, and ecological systems''

AUTHOR/	YEAR	SUBJECT	CATALYST	RELATIONSHIP BETWEEN SUSTAINABILITY AND RESILIENCE		
				SUSTAINABILITY	RESILIENCE	OUTCOME
Van Syk	2014	Sustainability and resilience disconnect	Man-made harm to many regions	Sustainability describes a desirable end-game for economic, social, and environmental outcomes, distilling an amorphous concept into three neat pillars, and is fundamentally growth-focused as it relates to the economy. It is flawed due to its steady-state assumption.	Resilience as the new paradigm replacing sustainability, popular now in political discourse and policy, possibly because it suggests strength and the actual experience of climate change impacts	Resilience to replace sustainability because resilient systems are able to survive, adapt, and grow in the face of uncertainty and unforeseen disruptions and its adaptive capacity which leads to new equilibria, a precondition for sustainability

AUTHOR/	YEAR	SUBJECT	CATALYST	RELATIONSHIP BETWEEN SUSTAINABILITY AND RESILIENCE		
				SUSTAINABILITY	RESILIENCE	OUTCOME
Sellberg, Wilkinson, & Peterson	2015	Cities and local government's interest in building resilience and the Resilience Assessment Workbook	Lack of concrete measures for a city's ability to cope with surprises such as financial shock, rising energy prices, and increased awareness of climate change impacts	Planning for sustainable development primarily occurs in two types of planning: strategic environmental planning and comprehensive planning, but the dynamics of complex systems are not included in mainstream sustainable development	Resilience is interlinked social-ecological systems; complex and adaptive systems; interact across scales and time	"Resilience assessment contributed to ongoing planning practices by addressing sustainability challenges that were not being addressed, building a bridge between longer-term sustainable development and shorter-term crisis management, allowing these two sectors to develop common strategies." (p 8)
Lew et al.	2016	Confusion over whether sustainability and resilience are the same or different concepts	Climate change and seeking a balance between humans and nature	Sustainability is the core conceptual framework for community development	Should something be in this space?	The ideal community is one that is both sustainable (the system) and resilient (how the system grows and changes)

AUTHOR/	YEAR	SUBJECT	CATALYST	RELATIONSHIP BETWEEN SUSTAINABILITY AND RESILIENCE		
				SUSTAINABILITY	RESILIENCE	OUTCOME
Elmqvist	2017	Sustainable Development	Policy documents use resilience and sustainability interchangeably	Sustainability goals are that of efficiency	Resilience is a property of a complex system featuring diversity and redundancy	Resiliency goals may run counter to the sustainability goals of efficiency
Brodnik & Brown	2018	Urban Water Systems	Climate uncertainties and population growth	Sustainability of resources with a long timeframe and resilience through operations	Resilience is the practice and sustainability is the outcome	Dynamic capacity building though collaboration
Haghighi	2018	Information systems	Lack of sustainability considerations in economic, environmental, and social factors when considering resilience	Sustainability involves economic, environmental, and social systems	Resilience as a supporting function of sustainability	Use resilience dimensions of self-organization, fault tolerance, flexibility, teamwork, learning culture, reporting culture, redundancy, preparedness, security, information exchange on economic, environmental, and social systems

AUTHOR/	YEAR	SUBJECT	CATALYST	RELATIONSHIP BETWEEN SUSTAINABILITY AND RESILIENCE		
				SUSTAINABILITY	RESILIENCE	OUTCOME
Lentz, et al.	2018	Land use through time	Increased complexity in urban development over time	Sustainability in resources over time - resistant to collapse	Sustainability is supported by applying the precepts of resilience for adaptability to changing circumstances	Adaptability to changing circumstances provides resilience that supports long-term sustainability
Tang et al.	2018	Urban Infrastructure	Vulnerability of urban power supply infrastructure	Sustainable development depends on conservation of urban critical infrastructure - defines sustainability using resilience properties	Resilience defined in terms of vulnerability	Use of vulnerability assessment framework for a unified study for sustainability and resilience of the power supply network
Davidson et al.	2019	Social-Ecological	Urbanization and heightened risk and vulnerabilities	Sustainability prioritizes outcomes; resilience prioritizes process	Resilience as a component of sustainability	Resilience in governance systems can be strengthened through social learning and adaptation to build policies for social-ecological resilience

AUTHOR/	YEAR	SUBJECT	CATALYST	RELATIONSHIP BETWEEN SUSTAINABILITY AND RESILIENCE		
				SUSTAINABILITY	RESILIENCE	OUTCOME
Heymans	2019	Urbanization and ecology affecting human wellbeing	Human actions causing climate change	Apply sustainability related to spatial settings	Resilience as a framework for sustainability	Integrated and holistic approaches to achieve harmonious relationship between urbanization and ecology
Leigh	2019	Urban Water Systems	Uncertainty and pressure to provide	Sustainability has a broader framework than resilience; physical and institutional practices that meet the needs of the present without compromising the future generations ability to their needs	Resilience is a growing state, while sustainability is a steady state. Objectives of resilience may conflict with that of sustainability because of their different scales.	Resolving and reconciling tensions generated between development priorities is required to achieve sustainability

AUTHOR/	YEAR	SUBJECT	CATALYST	RELATIONSHIP BETWEEN SUSTAINABILITY AND RESILIENCE		
				SUSTAINABILITY	RESILIENCE	OUTCOME
Marchese et al.	2018	Environmental Management	Environmental Threats - floods, droughts, storms, shortages, climate change	Sustainability defined through the triple-bottom-line (Balanced economic, environmental, and social sectors) and focuses of increasing QoL over time	Resilience is the ability of a system to prepare for threats, absorb impacts, recover and adapt following persistent stress or a disruptive event and focuses on the response of systems to extreme disturbance and persistent threats	Persistence of that system under normal operating procedures and during disturbances

AUTHOR/	YEAR	SUBJECT	CATALYST	RELATIONSHIP BETWEEN SUSTAINABILITY AND RESILIENCE		
				SUSTAINABILITY	RESILIENCE	OUTCOME
Meuman	2019	Sustainable development and the question of how resilience are the practices of planning	Resilience as the "flavor of the month." Current system of governance, markets, and politics not sustainable and are increasingly unstable	"Sustainability flavor of the moment is resilience" P.109	Resilience is a subset of sustainability and may hinder societies efforts to be more sustainable. Incrementalism of applying this is still "muddling through."	Adaptive capacity that is transformative offers a way forward, albeit slowly, but to obtain it in a timely manner, non-resilient governance needs redesigned or dismantled
Samuelsson et al.	2019	Social-ecological systems for urban dwellers' wellbeing	Urban dwellers and densification	Social-ecological urbanism emerging discourse within wider urban sustainability umbrella	Principles of social-ecological systems (sustainability), which concern systems that enhance resiliency; manage slow variables, maintain diversity manage connectivity	Using district definitions of resilience and sustainability principles to make sustainable strategies work to the benefit of social-ecological systems

AUTHOR/	YEAR	SUBJECT	CATALYST	RELATIONSHIP BETWEEN SUSTAINABILITY AND RESILIENCE		
				SUSTAINABILITY	RESILIENCE	OUTCOME
Sharifi	2019	Urban form to enhance resilience	Climate change and urbanization	Sustainability cities are facing a panoply of risks that threaten their sustainability and thus are dependent on resilience	Resilience used to enhance sustainability through connectivity	Sustainable neighborhoods are achieved by being relatively self-sustaining, with appropriate levels of density to facilitate low carbon, affordable and efficient access to resources and utilities, and homogeneously distributed open space to make them resilient

AUTHOR/	YEAR	SUBJECT	CATALYST	RELATIONSHIP BETWEEN SUSTAINABILITY AND RESILIENCE		
				SUSTAINABILITY	RESILIENCE	OUTCOME
Vogher & Buidice	2019	Sustainable and resilient planning and design of cities	Changing global scenarios	Sustainability is an objective and a principle of spatial and temporal equity and "an overarching goal that includes assumptions or preferences about which system states are desirable" [2] (p. 128)	Resilience describes the system, its functionality and its behavior after a shock with the main aspect of resilience as the ability to adapt or transform in unexpected cases of environmental and climate change, and to transform the systems in the attempt of overcoming social-ecological limits	Resilience as a possible way to conceptualize sustainability by describing its typical features

APPENDIX 2

SUSTAINABILITY AND RESILIENCE BY ORGANIZATION LEVEL

Categorization by Organization Level				Sustainability and Resilience Categories				
Level	Agencies	Document Reviewed	Content	Resilience as a Component of Sustainability	Sustainability as a Component of Resilience	Sustainability and Resilience Equally	Sustainability Alone	Resilience Alone
National	Whitehouse	Executive Order 13834: Efficient Federal Operations (2018)	It is the policy of the United States that agencies shall meet such statutory requirements in a manner that increases efficiency, optimizes performance, eliminates unnecessary use of resources, and protects the environment. In implementing this policy, each agency shall prioritize actions that reduce waste, cut costs, enhance the resilience of Federal infrastructure and operations, and enable more effective accomplishment of its mission. This EO rescinds EO 13693. (EO 2018)					1

Categorization by Organization Level				Sustainability and Resilience Categories				
Level	Agencies	Document Reviewed	Content	Resilience as a Component of Sustainability	Sustainability as a Component of Resilience	Sustainability and Resilience Equally	Sustainability Alone	Resilience Alone
	DOD	UFC 2-100-01-2012-C2	Sustainable planning leads to "lasting" development – meeting present mission requirements without compromising the ability of future generations to meet their needs. The goal of such development is to make the most effective use of limited resources, reduce fossil fuel use, and increase the use of alternative fuels, and to create more compact and sustainable communities that still meet security and safety requirements. (WBDG 2018)				1	
	DOD	Strategic Sustainability Plan (DOD 2014).	"...sensible and measured steps to mitigate the risk on operations posed by such climate change effects as flooding, surging sea levels, severe weather, and extreme temperatures…" (DOD 2014, ES7).					1

Categorization by Organization Level				Sustainability and Resilience Categories				
Level	Agencies	Document Reviewed	Content	Resilience as a Component of Sustainability	Sustainability as a Component of Resilience	Sustainability and Resilience Equally	Sustainability Alone	Resilience Alone
	Secretary of the Air Force	Installation Energy Plans Guidance	An integration of applicable installation- and higher-level strategic guidance, plans and policies into a holistic roadmap that enables the installation to work constructively toward its goals in energy efficiency, renewable energy, and energy resilience. (U.S. Air Force 2020)					1
	Secretary of the Army	Installation Energy and Water Plans Guidance	Working to increase efficiency, optimize performance, eliminate unnecessary use of resources, and protect the environment by reducing waste, cutting costs, enhancing infrastructure, and operational resilience. (U.S. Army 2020)			1		

Categorization by Organization Level				Sustainability and Resilience Categories				
Level	Agencies	Document Reviewed	Content	Resilience as a Component of Sustainability	Sustainability as a Component of Resilience	Sustainability and Resilience Equally	Sustainability Alone	Resilience Alone
	Secretary of the Army	Sustainability Plan	Sustainability "means to create and maintain conditions, under which humans and nature can exist in productive harmony, that permit fulfilling the social, economic, and other requirements of present and future generations." (U.S. Army 2011)				1	
	Federal Department of Energy	2019 Sustainability Report and Implementation Plan	Includes line items such as facility energy efficiency, renewable energy use, water efficiency, high–performance, sustainable buildings, transportation/fleet management, greenhouse gas emissions, and sustainable acquisition (USACE 2019b)				1	

Categorization by Organization Level				Sustainability and Resilience Categories				
Level	Agencies	Document Reviewed	Content	Resilience as a Component of Sustainability	Sustainability as a Component of Resilience	Sustainability and Resilience Equally	Sustainability Alone	Resilience Alone
	Office of Federal Sustainability Council on Environmental Quality - USACE-HQ	OMB Scorecard for Efficient Federal Operations/Management	Measurement criteria such as facility energy efficiency, renewable energy use, water efficiency, high-performance, sustainable buildings, transportation/fleet management, greenhouse gas emissions, and sustainable acquisition (USACE 2019a)				1	
	USACE-HQ	Policy and strategy statement	"USACE strives to protect, sustain, and improve the natural and man-made environment of our Nation, and is committed to compliance with applicable environmental and energy statutes, regulations, and EOs. Sustainability is not only a natural part of the USACE's decision processes; it is part of the culture (USACE 2020a)				1	

Categorization by Organization Level				Sustainability and Resilience Categories				
Level	Agencies	Document Reviewed	Content	Resilience as a Component of Sustainability	Sustainability as a Component of Resilience	Sustainability and Resilience Equally	Sustainability Alone	Resilience Alone
	USACE-HQ	Definition - Sustainability	"[Sustainability is] an umbrella concept that encompasses energy, climate change, and the environment to ensure today's actions do not negatively impact tomorrow." (USACE 2020a, para. 1)	1				
	USACE-HQ	Climate Preparedness and Resilience Community of Practice	"...implementing practical, nationally consistent, and cost-effective approaches and policies to reduce potential vulnerabilities to the Nation's water infrastructure resulting from climate change and variability" (USACE 2020b)					1
	USACE-HQ	Facts Sheet (USACE 2019c)	Sustainability has been a part of the USACE culture since the adoption of the Environmental Operating Principles in March 2002 (USACE 2019c) and addresses the triple-bottom-line plus of sustainability; mission, environment, community, and				1	

Categorization by Organization Level				Sustainability and Resilience Categories				
Level	Agencies	Document Reviewed	Content	Resilience as a Component of Sustainability	Sustainability as a Component of Resilience	Sustainability and Resilience Equally	Sustainability Alone	Resilience Alone
			economic benefit					
	USACE-HQ	Sustainability Plan's Roadmap	Reduce waste, cut costs, enhance the resilience of USACE infrastructure and operations, and enable more effective accomplishment of USACE mission (USACE 2019c).					1
	USACE-HQ	2016 USACE Resilience Initiative Roadmap	"...a concept to convey a holistic approach to addressing threats and uncertainty from threats, changing conditions from population shifts and climate change. Resilience represents a comprehensive, systems-based, life-cycle approach to both acute hazards and changes over time" (USACE 2016, 1).					1

Categorization by Organization Level				Sustainability and Resilience Categories				
Level	Agencies	Document Reviewed	Content	Resilience as a Component of Sustainability	Sustainability as a Component of Resilience	Sustainability and Resilience Equally	Sustainability Alone	Resilience Alone
National Level Count				**1**	**0**	**1**	**6**	**6**
Research and Development	ERDC	NetZero Planner	"...dedicated to helping solve our nation's most challenging problems in civil and military engineering, geospatial sciences, water resources, and environmental sciences of the Army, DOD, civil agencies and our Nation's public good (ERDC 2020a)				1	
	ERDC	Policy statement	"…the USACE is committed to ensuring that sustainability is not only a natural part of all our decision processes, but should also be part of our organizational culture We define sustainability as an umbrella concept that encompasses energy, climate change, and the environment to ensure that what we do today does not negatively impact tomorrow." (ERDC 2020a)	1				

Categorization by Organization Level				Sustainability and Resilience Categories				
Level	Agencies	Document Reviewed	Content	Resilience as a Component of Sustainability	Sustainability as a Component of Resilience	Sustainability and Resilience Equally	Sustainability Alone	Resilience Alone
	ERDC	Net Zero Planner - An Integrated Modeling Tool	Net 0 Planner integrates energy, water, and waste planning and engineering in a trade-off and optimization analysis at building and installation levels.(ERDC 2020a)				1	
	ERDC	People in the News	"Researchers receive patent for method to recycle composite material," and "Engineering with Nature initiative captures sustainability award for the Corps," (ERDC 2020c)				1	
	CERL	Mission Statement	"...directs its research efforts toward increasing the Army's ability to more efficiently design, construct, operate and maintain its installations and contingency bases and to ensure environmental quality and safety at a reduced life-cycle cost." (CERL 2020).				1	

Categorization by Organization Level				Sustainability and Resilience Categories				
Level	Agencies	Document Reviewed	Content	Resilience as a Component of Sustainability	Sustainability as a Component of Resilience	Sustainability and Resilience Equally	Sustainability Alone	Resilience Alone
	CERL	Military Climate Resilience Planning and Contemporary Urban Systems Thinking (Allen and Deal 2017)	Establishes the nexus of climate change adaptation with military resilience planning, reviews the military's use and definition of resilience as a concept, and explores what the military might learn from urban planning and nonmilitary versions of resilience. It also examines planners' focus on engineering resilience at the project level and at the system level. A gap in planning for resilience at the community (or regional) levels is recognized in the current military planning paradigm, and this work examines how planners can fill this gap and benefit by expanding the current resilience framework (Allen and Deal 2017)					1

Categorization by Organization Level				Sustainability and Resilience Categories				
Level	Agencies	Document Reviewed	Content	Resilience as a Component of Sustainability	Sustainability as a Component of Resilience	Sustainability and Resilience Equally	Sustainability Alone	Resilience Alone
	Center for the Advancement of Sustainability Innovations (CASI)	Purpose Statement	"...to achieve more sustainable facilities and operations" (ERDC 2020b)				1	
Research Level Count				**1**	**0**	**0**	**5**	**1**
Regional/ Enterprise	Air Force Civil Engineering Center - AFCEC	Planning & Integration Directorate Mission	"...actively manage encroachment, noise, Air Installation Compatibly Use Zones, and real property issues, engaging private, local, state, and federal agencies" (AFCEC 2020a).				1	
	AFCEC	Energy Directorate Mission	Identify, evaluate and help implement technologies and funding strategies to reduce Air Force energy consumption and costs to meet federal energy goals. (AFCEC 2013)	-				1

Categorization by Organization Level				Sustainability and Resilience Categories				
Level	Agencies	Document Reviewed	Content	Resilience as a Component of Sustainability	Sustainability as a Component of Resilience	Sustainability and Resilience Equally	Sustainability Alone	Resilience Alone
	AFCEC	Environmental Directorate	Manages the Air Force compliance, restoration, sustainability and National Environmental Policy Act program (AFCEC 2017			1		
	Regional Planning and Environmental Center - USACE-RPEC	Mission Statement	USACE strives to protect, sustain, and improve the natural and man-made environment of our Nation, and is committed to compliance with applicable environmental and energy statutes, regulation, and Executive Orders." (USACE 2020c)			1		

Categorization by Organization Level				Sustainability and Resilience Categories				
Level	Agencies	Document Reviewed	Content	Resilience as a Component of Sustainability	Sustainability as a Component of Resilience	Sustainability and Resilience Equally	Sustainability Alone	Resilience Alone
	Regional Planning and Environmental Center - USACE-RPEC	Master Planning Statement	"There is an unprecedented shift – driven by federal sustainability initiatives, NetZero mandates, and Base Realignment Closure Act (BRAC) initiatives – which demands a change in the established master planning mindset.…this requires an integrated master plan that focuses on resource conservation, energy efficiency, and quality of life for soldiers and their families – while remaining flexible so it can adapt to the Army's dynamic environment" (USACE 2020d).			1		

Categorization by Organization Level				Sustainability and Resilience Categories				
Level	Agencies	Document Reviewed	Content	Resilience as a Component of Sustainability	Sustainability as a Component of Resilience	Sustainability and Resilience Equally	Sustainability Alone	Resilience Alone
	Regional Planning and Environmental Center - USACE-RPEC	Scope of Work - JBSA IEWP	The purpose of the IEWP is to address requirements for energy and water security and resilience, including energy and water efficiency and conservation, renewable energy, alternative water, and alternative fuels policy goals. The IEWP must be developed in coordination with the energy and water needs outlined in components of the installation's holistic Master Plan.					1
	Regional Planning and Environmental Center - USACE-RPEC	Scope of Work - JBER IEP	The IEP will incorporate long-range plans for energy resilience capabilities to ensure available, reliable and quality power for each of the installation's critical missions.					1
Regional /Enterprise Level Count				**0**	**0**	**3**	**1**	**3**

Categorization by Organization Level				Sustainability and Resilience Categories				
Level	Agencies	Document Reviewed	Content	Resilience as a Component of Sustainability	Sustainability as a Component of Resilience	Sustainability and Resilience Equally	Sustainability Alone	Resilience Alone
Local	Joint Base San Antonio (JBSA)	Environmental Management System Policy Statement of 2018	Guidance for installation safety, energy-efficiency, pollution prevention, environmental conservation, and mission enhancement for personnel, facilities, and operations.			1		
	JBSA	JBSA Resource Page	Definition for resiliency "…the ability to withstand, adapt, recover, and/or grow in the face of challenges and demands" (JBSA 2020)					1
	JBSA	Draft IEWP Purpose Statement	Envisions a plan that addresses both energy and water and marries installation planning activities with mission assurance program, providing a roadmap for supporting Army installations in achieving increased security, resilience, readiness, and mission assurance.					1

Categorization by Organization Level				Sustainability and Resilience Categories				
Level	Agencies	Document Reviewed	Content	Resilience as a Component of Sustainability	Sustainability as a Component of Resilience	Sustainability and Resilience Equally	Sustainability Alone	Resilience Alone
	Joint Base Elmdorf-Richardon (JBER)	Mission Statement	"… to maintain the ability to operate into the future without decline – either in the mission or in the natural and manufactured systems that support it…. Sustainability is not an individual Departmental program; rather, it is an organizing paradigm that applies to all DOD mission and program areas" (JBER 2020).			1		

Categorization by Organization Level				Sustainability and Resilience Categories				
Level	Agencies	Document Reviewed	Content	Resilience as a Component of Sustainability	Sustainability as a Component of Resilience	Sustainability and Resilience Equally	Sustainability Alone	Resilience Alone
	JBER	Draft IEP Purpose Statement	Creates a decision-making framework to assist installations in achieving their energy goals and ensuring that energy and water resilience meet critical mission-assurance requirements. The IEP incorporates input from mission owners, installation planners, engineers, and other key stakeholders; includes long-range plans for energy resilience capabilities; ensures available and reliable utilities for each installation's critical missions; and defines energy requirements to maintain mission during power/water outage events					1
Local Level Count				**0**	**0**	**2**	**0**	**3**
Total Count				**2**	**0**	**6**	**12**	**13**

APPENDIX 3

INVITATION TO PARTICIPATE

To: Name

From: Rhonda Fields
Doctoral Student
University of Texas at Arlington
Arlington, Texas

Sir/Madam,

I am a doctoral student with the University of Texas at Arlington working on my PhD in Urban Planning and Public Policy, as well as a Community Planner with the Army Corps of Engineers. I am reaching out to you in hopes that you will consent to be interviewed via WebEx or Skype for my dissertation, whose topic is the evolution of sustainability and resilience planning for military installations. You were chosen based on your direct, professional involvement with military master planning with regard to sustainability and resilience.

The interview will take approximately 45 minutes and include seven (7) open ended questions, with follow-up questions as needed. These questions will focus on your understanding and experience with sustainability and resilience planning for military installation master planning, and how it has evolved since BRAC. Interviews will be digitally recorded and then transcribed using appropriate software for further analysis. To ensure anonymity, interviews and transcriptions will have a unique identifier not connected with your name, only with the organization for which you are attached. All records (electronic and paper) will be stored confidentially on site at UTA. There is no foreseeable risk or discomfort expected with this interview. All digital and transcribed material will be disposed of at the end of this research project.

Should you agree to the interview, please know that you can withdraw your inclusion in this research project at any time for any reason or no reason. If this should be the case, all interview material, whether recorded or transcribed, will be immediately disposed of and not used in any part of this research unless you approve otherwise in writing. Also, there is no compensation of any type will be provided to participate in this research project. This research will benefit the field of military master planning as it is expected to further the understanding of sustainability and resilience planning on military installations.

If you agree to this interview, please respond to this e-mail by filling out the informed consent form (attached) and let me know what dates and times are good for you, as well as a phone number where you can be reached. I sincerely look forward to speaking with you about this important subject.

Very Respectfully,

Rhonda Fields
817-975-8167
Rhonda.Fields2@mavs.uta.edu

APPENDIX 4

INFORMED CONSENT FORM

pdf

APPENDIX 5

INTERVIEW QUESTIONS

The following open-ended interviews will be conducted by telephone and digitally recorded. Respondents will be given an alphabetic code to protect their anonymity. The digital audio files will be transcribed using a transcription software. The interview transcriptions will be e-mailed to the interviewee to check for accuracy and ensure no sensitive or classified information was inadvertently given, and corrected where appropriate. The audio files containing interviews and the transcripts will be destroyed after the completion of the study.

1. Tell me a little about yourself and your connection to military master planning
2. How have you seen master planning on military installations changed over the past 30 years?
3. How do you define the term “sustainability?
    a. How have you seen sustainability being implemented on military installations?
4. How do you define the term “resilience?”
    a. How have you seen resilience being implemented on military installations?
5. How do you see sustainability and resilience as they relate to development on the installations?
    a. Do you see benefits or challenges in focusing on one or the other?
6. The IEWP is being created at ([JBSA], [JBER], [JBSA and JBER], as appropriate for the interviewee), what do you feel is the ultimate goal of implementing the IEWP (i.e. what do you perceive as being the outcome of implementing the IEWP?

7. Do you think the military has shifted one way or another (toward sustainability or toward resilience, or both?
    a. If so, what do you think is the cause of this shift?
    b. If not, do you think there should be a shift?
    c. How do you think this affects planning at the installation?