UNITED STATES ARMY WAR COLLEGE PRESS
Carlisle Barracks, PA
STRENGTH and WISDOM

MILITARY CONTINGENCIES IN MEGACITIES AND SUB-MEGACITIES

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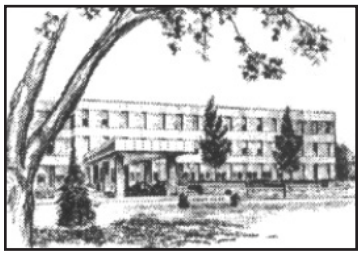

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December 2016

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Comments pertaining to this report are invited and should be forwarded to: Director, Strategic Studies Institute and U.S. Army War College Press, U.S. Army War College, 47 Ashburn Drive, Carlisle, PA 17013-5010.

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This manuscript was funded by the U.S. Army War College External Research Associates Program. Information on this program is available on our website, *www.StrategicStudies Institute.army.mil*, at the Opportunities tab.

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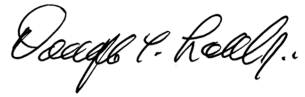
ISBN 1-58487-735-9

FOREWORD

The U.S. Army has to adapt to a constantly changing environment. One of the most important changes in this environment is urbanization—a process that is occurring rapidly and globally and is resulting in the advent of much larger cities—of over 10 or in some cases even 20 million people—as well as the growth of many more smaller cities. It is also resulting in different kinds of cities, ranging from smart cities, in which technology is fully integrated, to feral cities characterized by violence and disorder. In between these extremes are fragile cities that can tip in either direction. This has led to some discussion about the appropriate focus for the Army, but the authors of this study argue that the best way forward is to consider both megacities and (what they term) sub-megacities. The authors also respond to questions that have been raised about the conditions that might draw the Army into a military operation in a megacity or sub-megacity, identifying six different kinds of strategic considerations that might lead civilian decision-makers to determine the need to use military force in response to events, trends, and developments in a massive urban agglomeration. The authors take the view that although such a contingency would be a formidable undertaking, a better understanding of the urban environment and more effective preparations can enhance the prospects for success. They emphasize the need to understand the city as a complex living organism with its own flows, networks, and rhythms, and recommend a multi-level approach to intelligence preparation for and on the battlefield, ranging from the subterranean dimension to the cyber- and data-overlay that hovers above the city. Phil Williams and Werner Selle also

argue that it is important to minimize the disruption to the natural flows and rhythms of a city. This is followed by a practical and helpful discussion of how more selective recruitment, enhanced training, better equipment, and more effective tactics could enhance the prospects for success. The authors conclude that the U.S. Army—through a conceptual understanding of megacities and sub-megacities; an institutionally embedded system of intelligence collection and analysis for the urban battlefield; innovations in doctrine, equipment, and training; and an appreciation of likely scenarios and adversary actions—can be more prepared for the dense urban battlefield than ever before. Inherent and unforeseen challenges will remain, but the prospects for overcoming these challenges will be significantly enhanced.



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WERNER SELLE is a recent graduate of the Graduate School of Public and International Affairs (GSPIA) at the University of Pittsburgh, with particular interests in international security, strategic studies, and U.S. foreign policy. Before enrolling at the University of Pittsburgh, he worked for 2 years as a psychological operations specialist. Prior to that, he was a non-commissioned officer and infantryman with numerous combat deployments. He holds a master's degree in security and intelligence studies from GSPIA, and a bachelor's degree in political science from the University of Pittsburgh. Additionally, he served as a security and logistics contractor in both Iraq and in the United States. His research interests include major and emerging powers in "marginal areas" and the effective use of military forces in broad-spectrum operations. He is currently pursuing research projects in non-traditional operations for military forces, such as combating transnational crime, disaster relief, and humanitarian aid.

PHIL WILLIAMS holds the Wesley W. Posvar Chair in International Security Studies at the Graduate School of Public and International Affairs at the University of Pittsburgh, and is the Director of the University's Matthew B. Ridgway Center for International Security Studies. Dr. Williams has published extensively in the field of international security. During the last 22 years, his research has focused primarily on transnational organized crime, which he has written about in *Survival*, *Washington Quarterly*, *The Bulletin on Narcotics*, *Scientific American*, *Crime Law and Social Change,* and *International Peacekeeping*. In addition, Dr. Williams

was a founding editor of the journal *Transnational Organized Crime* and has edited several volumes on combating organized crime, Russian organized crime, and the trafficking of women. He has been a consultant to both the United Nations Office of Drugs and Crime and U.S. Government agencies and has also given congressional testimony on organized crime. In 2001 and 2002, Dr. Williams spent a sabbatical at Carnegie Mellon University's Computer Emergency Response Team, where he worked on intelligence analysis for cyberthreats and financial cybercrime. Dr. Williams has worked more recently on terrorist finances, ungoverned spaces, and drug trafficking throughout West Africa. In the academic years 2007-8 and 2008-9, he was a visiting research professor at the Strategic Studies Institute (SSI), U.S. Army War College (USAWC), where he wrote a monograph on *The New Dark Age: The Decline of the State and U.S. Strategy.* Another one of his monographs, published in August 2009, entitled *Criminals, Militias, and Insurgents: Organized Crime in Iraq*. Dr. Williams has contributed three chapters to *Fighting Back*, an edited volume on terrorism published by Stanford University Press; he has also published an article on Mexican drug violence in a special issue of *Terrorism and Political Violence* and a chapter on Nigerian organized crime in the *Oxford Handbook of Organized Crim*e. He is currently working on the crisis of governance in the northern triangle of Central America.

SUMMARY

Urbanization is one of the most important megatrends of the 21st century. Consequently, the possibility of U.S. military involvement in a megacity or sub-megacity is an eventuality that cannot be ignored. After elucidating the nature of urbanization and developing a typology in terms of smart, fragile, and feral cities, we give consideration to the kinds of contingencies that the U.S. military, especially the Army, needs to think about and prepare for.

Six kinds of contingencies have since been identified: humanitarian disaster relief; military support for civilian authorities in a restoration of order; intervention—for whatever reason—in a strategic city (also termed a critical or alpha city); military involvement in a city in the context of counter-insurgency; use of military force in a city in an interstate conflict; and containment or quarantine of an urban pandemic. Many debates arise concerning whether the appropriate focus should be predominantly on megacities or on smaller, but possibly more important, cities or perhaps on both. If the U.S. Army has the capacity to intervene militarily in a megacity, then it is likely that it could do the same in a smaller city. Consequently, the authors of this monograph focus on megacities and sub-megacities.

Whatever the contingency, understanding the city as a complex system or organism is critical and provides the basis for changes in intelligence, recruitment, training, equipment, operations, and tactics. In this monograph, we place emphasis on intelligence preparation for the battlefield in terms of 10 interconnected layers: the subterranean dimension, topography, cityscape, service infrastructure, inhabit-

ants, networks, flows, governance, rhythms, and the cyber dimension. This is followed by a discussion of what needs to be done to prepare for operations in megacities with the "concrete canyons" of modern business areas and the "sheet metal forests" found in massive slum areas. Consideration is given to equipment, personnel recruitment and training, the lessons that can be derived from past military experience as well as more recent law enforcement practices, and the need to work with (instead of against) the flows and rhythms of a city. Without such an approach, the results of military involvement in such a formidable environment would likely be disastrous; with it, the prospects for success would at least be enhanced.

The recommendations include the following:

- Megacities should become a distinct focus of analysis for intelligence. Cities have to be understood as a layered and interacting series of complex adaptive systems, outlined with a more refined intelligence of the battlefield. Operating in these cities requires an understanding of these systems and an ability to harness, rather than disrupt, their dynamics.
- The development of a repository of knowledge and understanding of cities is critical, and the U.S. Army should create both an Urban Analysis Center and a supporting network that provides a surge capability for crisis interventions.
- Greater interagency cooperation that transcends the military services and incorporates civilian departments and agencies (such as the Department of State, the U.S. Agency for International Development, and other Federal law enforcement agencies) is essential.

- U.S. forces will have to interact effectively with both the formal and informal mechanisms of governance within megacities and sub-megacities. This may involve cooperating with non-traditional stakeholders, such as criminal elements or other alternative governance actors.
- Conducting operations in megacities, as well as other urban areas, will require highly trained, quality personnel. The armed services will have to increase incentives to draw talented individuals to serve. It will also be necessary to incorporate recruits and affiliates with broader skill sets, especially those required for urban management and urban law enforcement. These initiatives should be complemented by in-house training for professional soldiers to prepare them more effectively for the demands of operating in these complex urban environments.
- Governments should recognize that there are synergies—and important economies of scale—between the skill sets required for operating in dense urban areas and those appropriate for stabilization operations.
- Finally, this monograph proposes two broad checklist-based acronyms, **URBAN** and **SMART,** which encapsulate many of the arguments and themes articulated in the preceding analysis. To fight effectively in a dense urban environment, the U.S. Army will have to meet the following requirements and approaches:
  - **U**nderstanding the megacity battlefield.
  - **R**esponding appropriately to the stringent demands of the urban battlefield.
  - **B**attle management that is accommodating to the city's rhythms, flows, and networks.

- **A**lliances that will go beyond government agencies and their usual partners.
- **N**ovel approaches that are essential to creating the smart urban soldier.

Moreover, within this urban approach, the smart soldier would exhibit the following qualities:

- **S**ophisticated understanding of the urban battlefield.
- **M**ultimedia and social media awareness.
- **A**bility to act as intelligence collectors and receivers.
- **R**apid responses both within the command system and in decentralized operations.
- **T**echnological knowledge and expertise.

Ultimately, fighting smart in an urban environment is the only feasible approach. This monograph offers some preliminary considerations of what this might mean, but, raises more questions than it answers. It is no more than an early—but hopefully useful—contribution to a debate that needs to be both broadened and refined. Only after such a debate will the United States be ready for future contingencies that are likely to be as challenging as they are inescapable.

MILITARY CONTINGENCIES IN MEGACITIES AND SUB-MEGACITIES

INTRODUCTION

Contemporary military operations in large cities are fraught with risk, particularly for conventional military forces fighting unconventional enemies. Indeed, cities are in some ways a great leveler in warfare, negating many of the advantages of high technology, constricting opportunities for maneuver operations, slowing the tempo of battle, and limiting the application of "shock and awe." Moreover, the United States does not have a particularly impressive record when it comes to urban combat. The path from the battle of Hue in 1968 to the second battle of Fallujah in 2004 seemed all too short as the United States progressed from destroying one city in order to save it in Vietnam to achieving the kind of victory it could not really afford in Iraq. As one study observed:

> cities possess great numbers of noncombatants, are dense with vital infrastructures and important sociopolitical institutions, and are usually cluttered three-dimensional spaces that pose significant logistical and navigational challenges. It suffices to say that these and other characteristics conspire to create a daunting environment for U.S. forces.[1]

In spite of the complex, highly cautionary nature of the urban environment for military forces, however, cities are becoming ever more important politically and economically. Historians examining the 21st century are likely to look back upon it as a century of massive and unparalleled urbanization. Indeed, some of the cities that will rise to prominence in the 21st century will likely become as important and distinc-

tive in their own way as Athens, Rome, and Constantinople at the height of their grandeur. Moreover, connectivity among many cities is growing. Although not all cities deserve to be characterized as global cities, more cities are becoming more connected to the global economy. In many respects, cities act as the hubs of a globalized world, providing the transportation and communications linkages that facilitate global flows of finance, commodities, and people. Saskia Sassen has argued that much of the global economic activity moves through a growing network of global cities: although there is a "disproportionate concentration in cities of the global North," such as New York, London, Tokyo, Frankfurt, Zurich, and Hong Kong, cities in the developing world, such as Sao Paulo, Mexico City, Johannesburg, and Shanghai, have also become a part of this network.[2] Moreover, during the next 2 decades, as the developing world becomes almost the sole engine of urbanization, its contribution to the network of global cities will grow significantly. To put it simply, global cities will increasingly become a global phenomenon. Therefore, it is also likely that cities will become more important strategically, and that the United States will find itself at some point in the not-too-distant future engaged in military contingencies in large cities.

Dimensions of Urbanization.

Unfortunately, the notion of an increasingly urban world is often repeated but rarely unpackaged beyond the observation that the majority of the world's population now lives in cities. In reality, urbanization has multiple dimensions, each of which poses its own set of challenges to the forces of governance and order and to the hopes for successful military action in urban areas.

- The advent of metacities. One of the most important developments in the trend toward urbanization is the emergence of a small but growing number of metacities, that is cities—or perhaps, more accurately, continuous urban agglomerations that often transcend the boundaries of any one city—with populations of over 20 million people. Although Tokyo was for some years the only city officially in this category, the figures provided by the Demographia website in January 2015 suggest that it has been joined by Jakarta, Delhi, Manila, Seoul-Incheon, Shanghai, Karachi, Beijing, the greater New York area, Guangzhou-Foshan, Sao Paulo, and Mexico City.[3] The sheer size of such cities will create major environmental hazards, generate immense law and order problems (especially in poorer areas), and strain infrastructures that are already over-stretched. In some cases, the stresses and strains could prove overwhelming.
- An increase in the number of megacities, that is, cities with populations in excess of 10 million people. In 1950, the only city of this kind was New York; by 1995, there were 14 such cities—most of which were in the developing world. It was anticipated that by 2015 there would be 23 megacities, with 19 of them in the developing world. In actuality, in 2015 there were 34 urban agglomerations with over 10 million people. Twenty-one of them had between 10 and 20 million inhabitants, and the other 13 had over 20 million people.[4] By 2016, two more cities had joined the ranks of megacities, bringing the total to 36.[5]
- A marked increase in the number of what might be termed emerging- or mini-megacities.

According to one observer writing in 2002, it was anticipated that by 2015 "the number of urban areas with populations between five and ten million will shoot from 7 to 37."[6] This has proved to be a slight underestimation, with the *Demographia* report of January 2015 identifying 41 cities in this category. The United Nations (UN) put the figure slightly higher, at 43, and noted that these cities have over 300 million inhabitants. It also noted that "the number of such cities is expected to grow to 63 by 2030 and house more than 400 million people, representing close to 9 percent of the global urban population."[7]

- The continued growth in the number of cities with populations between 1 and 5 million inhabitants. By 2015, there were 419 cities in this category.[8] The importance of such cities is difficult to overestimate. If megacities are the heavyweights of urbanization, and mini-megacities are the light heavyweights, these cities are the middle weights—and there are lots of them.
- A large increase in the number of smaller cities with populations less than 500,000 people. According to the UN in 2014, almost one-half of the world's urban population lived in settlements with fewer than 500,000 inhabitants.[9] "While this proportion is projected to shrink over time, by 2030 these small cities and towns will still be home to around 45 percent of urban dwellers."[10] Although such centers are a less compelling focus of attention compared to the larger cities, they cannot be ignored, because there are so many of them.

The most notable feature of this distribution is that it resembles a power law with a long tail: there are relatively few megacities, while there are many smaller—but still large—cities. As the population metric decreases, the number of cities in that category increases significantly. The implication of this for the U.S. Army is that, while the megacity scenario has to be factored into contingency planning as a worst case, the odds of U.S. involvement in the various subsets of smaller cities (5 to 10 million, 2 to 5 million, 1 to 2 million, and 500,000 to 1 million) probably increase as the size goes down. Accordingly, the analysis here includes both megacities and what, for convenience, are termed sub-megacities.

The issue of what size cities the U.S. military should focus upon has become a bone of contention among military scholars and analysts. The focus coming from the Army Chief of Staff has been on megacities, which was encapsulated in the U.S. Army's June 2014 publication of *Megacities and the United States Army: Preparing for a Complex and Uncertain Future.* This report was an explicit recognition that rapid and often uncontrolled urbanization has significantly changed the international security environment in which U.S. military forces have to operate. It was also a tacit acknowledgement that the U.S. Army is more likely to have to operate within dense urban environments in which tactical maneuvers are constrained and the superiority of firepower is more easily neutralized than on traditional large, open, and fluid battlefields—and that, therefore, it should prepare much more systematically than in the past for such contingencies. Yet, not all the responses to this have been favorable. Michael Evans, in particular, has argued that the focus on megacities is based on "a selective interpretation

of the highly complex process of 21st century global urbanization."[11] A major component of his critique is that:

> megacities are not necessarily the principal urban areas in which American forces may be called upon to fight in the future. Rather, middleweight and smaller cities remain just as likely to provide important operational environments in the years ahead.[12]

In some ways, this conclusion is reinforced by the trends discussed above and the relative number of cities in each of the categories. Given the power law distribution of a few extremely large (and many much smaller) cities, it is more likely that the United States will become involved in a sub-megacity than in a megacity or metacity. At the same time, this does not preclude a military contingency in a massive urban space. Indeed, the problem with Evan's critique, as with many other discussions of strategy and security, is that it presents what is in effect a false dichotomy. It argues that the focus should be on smaller, rather than larger, cities, when, in fact, the United States needs to think about military contingencies both in megacities and in sub-megacities.

A second component of Evans' critique is that:

> megacities are not sui generis; they do not represent a novel military phenomenon. The military processes of operating in any city are drawn from fundamentals of urban warfare tried and tested by land forces since at least the middle of the twentieth century. Future technological developments notwithstanding, most fundamentals of urban warfare are likely to remain relevant for general-purpose forces even in a conglomeration on the scale of a megacity.[13]

There is something to this argument, but it ignores the possibility that a difference in scale can at some point become a difference in kind. A megacity, for example, could swallow up a military division in a way that a city of a million people could not. Moreover, it can be argued that by preparing for the worst-case contingency in a megacity, the United States would be better able to deal with lesser contingencies in submegacities. The converse, however, is not necessarily true. While the principles of strategy and warfare apply in both small and large cities, and the challenges of operating in an urban environment remain very similar, scale cannot be dismissed. Preparing for a Category 5 hurricane while hoping that it will not happen is a much more sensible approach than basing contingency plans on wishful thinking about the low probability of such an event and preparing only for a Category 3 hurricane. Given the challenges that will face the U.S. Army in any urban environment, planning and training to operate in a megacity should provide capabilities and skills that could also be used for operations in smaller cities.

At the same time, it has to be recognized that urbanization not only has multiple dimensions, but that it also takes on different forms in different countries and regions. Moreover, although urbanization is one of the most important megatrends of the 21st century, it cannot be seen in isolation. Urbanization interacts with other powerful drivers of change, such as globalization and neo-liberalism, continued population growth, global climate change, and technological advancement; the impact of these interactions can be as profound as the individual drivers themselves. Indeed, the nature of these interactions can be positive or negative and can intensify or ameliorate the

adverse consequences of urbanization. This helps to explain the disconnect between the broad consensus about the growing importance of cities in the 21st century, and the starkly divergent assessments as to whether cities are likely to be positive or negative in their impact on global prosperity, global security, and global order. While there are often particular nuances in individual studies, it is possible to identify several distinct schools of thought regarding cities—what are termed here for convenience—urban optimists, urban pessimists, and urban pragmatists. Inevitably, this is a gross simplification of the debate, which in many respects is as diverse as the cities themselves. Comparing Moscow with Mogadishu, Tokyo with Tegucigalpa, or London with Lagos is not very helpful, except for the way it highlights the vast gulf between not only large and small, or developed and developing cities, but also between the orderly and the chaotic. In part, the empirical diversity helps to explain the highly divergent assessments, and yet, other factors are also at work. Many aid and development scholars, for example, see enormous potential in cities with their economies of scale in service provision, concentrations of labor, and opportunities for entrepreneurship and creativity. Equally appropriately, security specialists focus on urban violence, disorder, and the growing threats to national and global security that can emanate from cities. In effect, judgments about the costs and benefits of urbanization depend in large part on the analytic framework one starts from and the specific focus one adopts within it.

Urbanization Optimists.

On the one hand, cities are widely and in many cases appropriately seen as engines of economic growth; repositories of wealth, power, and entrepreneurship; and centers of culture, scholarship, and innovation. They provide economies of scale in service delivery and a wide variety of many employment opportunities. They facilitate high levels of social and economic creativity.[14] Cities also provide many of the key nodes in a globalized world, acting as major hubs and transmission belts for the flows of goods, people, and capital associated with globalization. This vision was encapsulated in the UN-Habitat Report, *State of the World's Cities 2012/13*. Although the report acknowledged that prosperity was not always evenly distributed within cities, it described the city as:

> the home of prosperity. It is the place where human beings find satisfaction of basic needs and essential public and private goods, where commodities can be found in sufficiency and their utility enjoyed. Cities are where material and immaterial aspects of life are realized, providing contentment and happiness and increasing the prospects of individual and collective well-being.[15]

The same report noted that urban areas are "becoming not just the dominant form of habitat for humankind, but also the engine-rooms of human development as a whole."[16] In effect, the report argued, cities are continuing to play—albeit on a larger scale than ever before—their time-honored role as centers of prosperity: "in the 21st as in much earlier centuries, people congregate in cities to realize aspirations and dreams, fulfill needs and turn ideas into realities."[17]

Such observations reflect a tendency toward a form of urban triumphalism that is captured in the work of Edward Glaeser, who argued that cities have been:

> engines of innovation since Plato and Socrates bickered in an Athenian marketplace. The streets of Florence gave us the Renaissance, and the streets of Birmingham gave us the Industrial Revolution. The great prosperity of contemporary London and Bangalore and Tokyo comes from their ability to produce new thinking. Wandering these cities . . . is to study nothing less than human progress.[18]

Moreover, Glaeser argues, cities in the developed world:

> have survived the tumultuous end of the industrial age and are now wealthier, healthier, and more alluring than ever. In the world's poorer places, cities are expanding enormously because urban density provides the clearest path from poverty to prosperity.[19]

Highlighting these arguments is not to suggest that Glaeser ignores either the problems brought about by rapid and unplanned urbanization or the challenges stemming from the marginalization and exclusion of large segments of the urban population. Nevertheless, there is an assumption that these problems and challenges will be met in the future as they were in the past: that in the same way that the London described by Charles Dickens was transformed into the vibrant cosmopolitan London of today, so will the Lagos of today be transformed into the vibrant well-functioning metropolis of tomorrow. In this view, the march of progress is inexorable.

A subset of the urban optimists blends the promise of cities with the promise of technology. This has resulted in the emergence of the concept of smart cities—that is, cities that are not only environmentally friendly, but also integrate and exploit high technology to control power, flows, and the delivery of services and goods. Closely linked to the notion of smart cities is the Internet of Things, which is also likely to be largely urban in character, or at the very least, most powerful and pervasive where there are large concentrations of people, homes, and businesses. There is, of course, the possibility that even smart cities might have their own dystopian underside where dense connectivity and transparency become intrusion, surveillance, and oppression. Yet, it is also clear that smart cities are most likely to be efficient, well-functioning, and, for the most part, able to provide high levels of security and safety to their citizens. The marriage of urbanization and technology offers multiple opportunities for synergy: scale and efficiency; social networks and technological networks; and concentrations of wealth, entrepreneurship, and innovation that are connected with similar concentrations elsewhere. The smart city of the near future will not have the Medici family, but will have an elite group of high-technology specialists sensitive to environmental needs and highly responsive to citizens adept in using social media to articulate concerns and aggregate policy preferences. If the image of the smart city feeds into a vision of utopian urbanization, however, this vision is not universally shared. At the opposite end of the spectrum are scholars who identify and elucidate the dark side of urbanization.

Urbanization Pessimists.

Among those whose expectations about future cities contrast most dramatically with the urbanization optimists are R.H. Liotta and James Minkel, Richard Norton, and David Kilcullen. All of these authors present variations on the theme of dystopian urbanization that are powerful, haunting, and compelling. At the very least, these visions of current and future trends in urbanization capture an emerging, inescapable reality for large cohorts of people, particularly in the developing world. Perhaps for every smart city, there will be dozens of dysfunctional cities, with widespread slums; high levels of crime, violence, and instability; congestion, environmental degradation, and a large informal economy that serves as an indispensable coping mechanism. "Grinding poverty, environmental degradation, income inequalities, historical socio-economic inequalities, marginalization and various forms of exclusion" are just some of the problems facing rapidly expanding cities in the 21st century.[20] When they are interrelated with drugs, weapons, and the youth bulge, these problems and challenges become even more formidable.

There are several reasons urbanization in the developing world has a very significant downside.First is the sheer speed of population growth in many cities in the developing world. While it is clear that many large cities in the developed world also grew in a relatively short period, the growth was neither as large nor as dramatic and sustained as the way cities have grown—and are continuing to grow—in the developing world. Liotta and Miskel, for example, compare the 30-percent increase in the growth of New York between 1950 and 2015 with Dhaka's population increase

of more than 5,400 percent during the same period.[21] The authors also note that although London grew by sevenfold in the 19th century, Kinshasa's growth between 1950 and 2015 approached a factor of 50, and Lagos, a factor of 25.[22]

The speed of population growth in cities is related to what might be termed "sequencing." Cities in the developed world generally had infrastructure and basic amenities in place prior to—or at least in tandem with—the expansion of their populations. In effect, the expansion of cities in the global north reflected the logic in a popular movie about a baseball stadium—build it and they will come. The population surge into the cities of the global south, however, preceded the building, while also revealing that the aphorism cannot be easily reversed. Much of the surging population came before it was built, and in many cases, it has still not been built. The massive influx of population swamped the existing infrastructure and capacity for service provision—whether in terms of water, sanitation, power, or adequate road systems—and even where there have been efforts to extend infrastructure and services, these efforts have been wholly inadequate to the needs of the new urban migrants. A massive growth of slums and informal settlements has been the most obvious result. Moreover, as Liotta and Miskel point out:

> first world megacities expanded at a more manageable pace and . . . did so after their parent nation-states—and their governing structures—had been firmly established and the population had more or less settled on a common national identity. Further, past megacities took shape before the communications revolution raised their residents' expectations and before globalization integrated them as deeply into the international economy as Cairo, Rio, and Lagos today.[23]

Closely linked to the sequencing is the fact that much of the urbanization in the developing world can be described as spontaneous rather than planned. The lack of planning is closely connected to issues of land and property ownership. Many of those who come to the expanding cities of the developing world live in homes within urban settlements, and neither the individual homes nor the community settlement has a legal basis, something that adds a degree of precariousness to lives that are already full of hardship. Irregular land occupation—and the vulnerability that goes with it—is a serious problem for many city dwellers in the developing world. Wherever they occur, these illegal settlements are also a problem for city planners and managers intent on ensuring the efficient functioning of the city. At the same time, they feed into the prospects for long-term instability in the event that either state or city authorities seek to reclaim land that, in their view, has been illegally occupied, or, those who have occupied land demand that their de facto ownership becomes de jure. This has important implications for stability and order in emerging and rapidly expanding cities.

It is clear from all this that the challenges of urban management in the 21st century are formidable. Yet, in many cases, there appear to be little capacity to manage these challenges. As Liotta and Miskel note:

> with the rise of massive urban centers in Africa and Asia, cities that will matter most in the twenty-first century are located in less-developed, struggling states. A number of these huge megalopolises—whether Lagos or Karachi, Dhaka or Kinshasa—reside in states often unable or simply unwilling to manage the challenges that their vast and growing urban populations pose. There are no signs that their governments will prove more capable in the future.[24]

Yet, the issue is not simply one of capacity, but also one of will. In this connection, Mike Davis famously noted that in much of the developing world:

> the idea of an interventionist state strongly committed to social housing and job development seems either a hallucination or a bad joke, because governments long ago abdicated any serious effort to combat slums and redress urban marginality.[25]

He also argued that the minimalist role of national government was reinforced by neoliberal economic orthodoxy and the structural adjustment policies imposed by the World Bank and the International Monetary Fund. If anything, however, the impact of neoliberalism has become even more pronounced as, in many countries, it has encouraged and legitimized state abdication of responsibility to its citizens.

Many of these problems have been most explicitly articulated by Norton, who coined the term "feral cities" to describe concentrated urban spaces that can be regarded either as "failed," "collapsing," or "collapsed."[26] Kilcullen has offered a similar assessment, arguing that:

> rapid urban growth in coastal, underdeveloped areas is overloading economic, social, and governance systems, straining city infrastructure, and overburdening the carrying capacity of cities designed for much smaller populations. This is likely to make the most vulnerable cities less and less able to meet the challenges of population growth, coastal urbanization, and connectedness. The implications for future conflict are profound, with more people competing for scarcer resources in crowded, underserviced, and under governed urban areas.[27]

From this perspective, cities are likely to be a major driver of instability and insecurity in the 21st century.

Unfortunately, the traditional focus of attention on states in international relations has contributed to a neglect of cities. What makes this neglect all the more problematic is that in some cases, city failure could be a major contributor to state failure. This is particularly likely when the city in question is a capital city and has an inordinate share of the state's population and wealth. In some developing countries, for example, the state does not have much of a presence outside the capital. In such cases, the failure of the city to continue functioning as a viable entity—because of the gradual accumulation of problems such as crime, environmental decay, and a growing gap between the need for services and governance on the one side and the provision of these on the other—could have a profound impact on the state as a whole.

The difficulty, of course, is that city collapse is not easily predictable. One reason is that cities are highly complex entities, which almost invariably contain a mixture of functional and dysfunctional elements. As such, they can often continue to operate on the edge of chaos or collapse, without actually tipping over. In some cases, the tipping point could result from a natural disaster such as an earthquake—something to which Mexico City, for example, is particularly vulnerable. In other instances, small changes could have major effects, moving the city into failure or collapse. City collapse, in turn, could contribute to state collapse; sometimes the two could be synonymous. This is most likely in developing economies based on a hub and spoke model, in which commercial activities are directed from the capital. In these circumstances, any major disruption in the capital would have significant

cascading effects through the national economy. In other words, the symbiosis of cities and states is something that will be increasingly difficult to ignore in the future.

The difficulty is that both optimists and pessimists can find examples to bolster their argument and the cases that confound them. Moreover, the reality of many cities—with many if not most cities having both well-ordered localities and spaces, and poorly governed and dangerous spaces—is far messier than this neat and dichotomous typology suggests. The mixture of the smart and the dysfunctional described above is likely to exist within cities as much as between them. Observers who can most accurately be characterized as "urbanization pragmatists" best capture this.

Urbanization Pragmatists.

Robert Muggah, in a very astute analysis, has encapsulated these competing assessments in what he termed the "urban dilemma"—a dilemma that, in his view, is:

> exemplified by the paradoxical effects of urbanization in the twenty first century: as a force for unparalleled development on the one hand, and as a risk for insecurity amongst the urban poor on the other.[28]

Muggah and John De Boer have played a major role in articulating the notion of "fragile cities," contrasting the notion of fragility with that of resilience.[29] De Boer and Muggah recognize that the notion of a fragile city is not easily and simply defined. Drawing on their pioneering work, however, a fragile city can best be understood as one where there is a mix of order and chaos; where both governance and service provi-

sion exist, but are patchy and uneven; where levels of violence range from high to low across different zones or localities within the city; and where there is both wealth and poverty, most often segregated and distant from one another, but sometimes juxtaposed in uncomfortable proximity.

Urbanization pragmatists see both promise and peril in the growing importance of cities in global economics and politics. They see cities as economic dynamos and as having the potential to contribute significantly to development. At the same time, they recognize, in Muggah's words, that:

> all cities are fragile. The intensity of their fragility, however, varies considerably across time and space. Some cities—Aleppo, Caracas, Kabul, or Mogadishu—are affected by acute fragility and are close to collapse. Others—Abuja, Baltimore, Dhaka, and San Salvador—are also at risk, albeit to a lesser degree. Even cities like Amsterdam, London, New York, Paris, and Tokyo are not immune.[30]

The key point about a fragile city, however, is that it can tip both positively and negatively. A fragile city, with the right leadership, some careful management, and some luck, can become a smart and resilient city. As Muggah acknowledges:

> city fragility is not permanent. There are remarkable examples of once dangerous cities turning things around. How do they do this? They start with enlightened leadership, especially successive mayors that make a plan and stick to it. The best cases involve evidence-based and targeted approaches to mitigating risks. Cities that purposefully build inclusive public spaces, support predictable transport, invest in hotspot policing, create meaningful opportunities for

> young people, and plan carefully to mitigate natural disasters are the most likely to shift from fragility to resilience.[31]

In this connection, London over 150 years has moved from a largely feral city toward becoming a smart city with global influence. Ironically, Dickens would not recognize the London of the early-21st century, but he would be fairly familiar with the deprivations of the *favelas* (shantytowns) of Rio de Janeiro or the slums of Lagos, in spite of their cultural contrasts with 19th-century London. Similarly, the New York of 2015 is very different from the New York of the 1970s, when violence was much more pervasive and citizens far more fearful than they are today. Those cities that fail to do what London and New York have done, however, are likely to move from being fragile to feral, where areas of order, wealth, security and safety, and upward social and economic mobility are surrounded by and ultimately eclipsed by "red zones" of violence, disorder, poverty, and despair.

In other words, cities are highly dynamic and can move from one of the categories identified in Table 1 to another. Urban blight and urban gentrification can be understood as two sides of the dynamic nature of cities, simply representing movement in opposite directions. Indeed, when examining the notion of a fragile city, complexity and paradox come to the fore. Both smart cities and feral cities, in effect, are ideal types—one of promise, one of peril—and are at opposite ends of a continuum, whereas fragile cities are located in the middle, with enormous potential for both advance and decay. The major characteristics of the three types of city are summarized in Table 1.

Smart Cities—Townsend	Fragile Cities—Muggah and De Boer	Feral Cities - Norton
Well ordered	Emphasis on both the positive and negative effects of urbanization as something that can promote economic development and create insecurity	Urban spaces that can be regarded either as "failed," "collapsing," or "collapsed"
Low levels of violence	Rapid urban population growth Income inequalities result in higher levels of violence Zones of order and security plus zones of violence that sometimes spills over	High levels of violence Dickensian-dystopian Disorderly and chaotic
Technology integrated with infrastructure	Enclaves of technology and capital along with enclaves of exclusion and expulsion Gated communities and slums	Low levels of technology except for feature phones that give access to Internet
Effective and efficient service provision	Service provision uneven and patchy	Absence of state or municipal services Coping mechanisms, and informal and illicit economies
Formal Governance Mechanisms	Mixed/Competing/ Collaborative Governance Mechanisms Governance varies from one part of the city to another	Alternative Governance Mechanisms dominate The formal authorities (state and city) have lost control

Table 1. Characteristics of Smart, Fragile, and Feral Cities.

The implication of the distinctions between smart, fragile, and feral cities for military contingencies in megacities and sub-megacities is that size is not the only important differentiator. The challenges that the U.S. Army would face in the event of some kind of intervention in a megacity or sub-megacity could differ considerably depending on whether the city was smart or feral, or where it stood and in which direction it was moving within the fragile category. The other consideration that could have massive implications for the probability of success or failure would be the way the strategic purpose for such involvement is designed.

THE RATIONALES FOR MILITARY CONTINGENCIES IN MEGACITIES AND SUB-MEGACITIES

The dangers associated with military operations in urban terrain are very well understood: military contingencies in megacities and sub-megacities are unlikely to be high on the U.S. Army's list of things it would eagerly do. Indeed, in *Megacities and the United States Army* referred to above, the authors acknowledge that the question of relevance often arises. Their response is that this might be a matter of strategic necessity rather than strategic choice. They note that neither Pearl Harbor nor 9/11 were "predicted by decision makers of the time," yet "led to unanticipated military commitments."[32] As well as the possibility of a military intervention in a megacity resulting from some kind of strategic shock, they also note an assessment of national interests that considers how megacities could become:

> magnets for international attention and demand military intervention will aid military planners in avoiding future strategic surprises. This is an important distinction; it is less of a question of why the U.S. Army would go than a question of what conditions would draw the Army into a megacity.[33]

This monograph seeks at least a preliminary answer to this question and identifies six different kinds of strategic considerations that might lead civilian decision-makers to determine the need for the use of military force with regard to events, trends, and developments relating to a particular megacity.

Humanitarian Disaster Relief.

The first is that the United States will provide some kind of humanitarian assistance in the aftermath of a natural disaster. Many of the world's major cities are vulnerable to earthquakes or flooding, or in some cases to both. San Francisco, Los Angeles, Tokyo, Mexico City, Jakarta, Tehran, Istanbul, and Manila are among the world's leading cities in earthquake zones. Many other cities are vulnerable to major flooding. Such risks have always been present, but as cities grow, the risks also grow. For example, a World Bank study noted that "in a rapidly urbanizing developing world, the growth of population and economic assets in cities will lead to a rapidly increasing concentration of hazard risk in urban areas."[34] It goes on to note that the "population in large cities exposed to cyclones is estimated to increase from 310 to 680 million between 2000 and 2050," while "urban population exposed in areas with a significant probability of a major earthquake increases from 370 million in 2000 to 870 million in 2050."[35] Other studies have observed that cities

in the developed world typically have a high degree of resilience in the face of such disasters. In the cities in developing countries, however, resilience and the capacity to absorb the impact of a disaster will be much lower. Moreover, where urbanization is largely unplanned, building codes and standards are low, and overcrowding is the norm, those living in poor urban areas are particularly vulnerable. The probability of such disasters is likely to increase as global climate change makes extreme weather events more frequent. In the context of climate change, Kilcullen's argument about the increasing importance of littoral cities becomes even more pertinent. Many large coastal cities are increasingly vulnerable in the medium and long term to rising sea levels resulting from global climate change. According to one study, which assessed the top 20 cities in terms of the number of people exposed to coastal flooding now and projected figures for 2070, the situation is likely to become increasingly dire. Nowhere is this more obvious than in South Asia. Kolkata currently has nearly 2 million people exposed, but this is expected to increase to over 14 million by 2070.[36] Mumbai will jump from under 3 million currently to over 11.4 million.[37] Other cities at risk include Ho Chi Minh City, Shanghai, Bangkok, Rangoon, Alexandria, Lagos, Tokyo, and Jakarta, while both Miami and New York are also on this list.[38] Perhaps nowhere is as vulnerable as Bangladesh, which has three cities—Dhaka, Khulna, and Chittagong—on the list and is expected to have over 70 million people exposed to coastal flooding by 2070.[39] Dhaka alone currently has under a million people vulnerable to coastal flooding, but will have over 11 million vulnerable people by 2070.[40] The irony is that Dhaka itself has become a refuge for Bangladeshi victims of monsoon flooding. As one commentary observed, the majority of migrants coming into Dhaka:

> hail from coastal areas that are already experiencing rising sea levels, increased salinity, destructive floods and cyclones. At least 400,000 people move to Dhaka every year, according to the World Bank, while the International Organization for Migration (IOM) estimates that 70% of Dhaka's slum-dwellers moved there fleeing some sort of environmental shock.[41]

The irony, as the author notes, is that the people seeking safety in the short term by moving to coastal cities might actually be putting themselves at greater risk in the long term, given the vulnerability of these cities to storm surges and rising sea levels.

There is an added irony from the perspective of U.S. military planners: a major natural disaster could actually change the categorization of a particular city, rendering a smart city fragile, and precipitating the collapse of a fragile city into a feral one. One only has to look at the experience of New Orleans under the impact of Katrina to see how a city can rapidly degenerate into anomie and anarchy, with the normal rules and norms of urban life abruptly jettisoned. This has important implications. Insofar as the U.S. Army had made particular contingency plans for a specific city, these would be complicated if not attenuated by the disaster. At the very least, the restoration of order and stability would have to accompany if not precede major disaster relief operations. This effort could also create opposition.

Under many circumstances, a United States-led humanitarian intervention for disaster mitigation and a vulnerable and exposed population, ready for any source of assistance, would welcome recovery. Yet, it is not inconceivable that, even in these circumstances, not everyone will be happy to see U.S. forces in their city, and pockets of protest and resistance could

quickly develop. Even if they do not, the designation of the contingency as a humanitarian assistance mission does not mean that the forces would be immune to hostile action. It is conceivable that terrorist and rebel groups that are very hostile toward the United States would see U.S. forces in a megacity as a more convenient and easier target set than the continental United States. For those with limited capabilities who are intent on attacking the United States, attacks on U.S. forces involved in a humanitarian mission might be a very attractive alternative. Those engaging in such attacks might well see the chaos and complexity of the post-disaster environment as an opportunity to engage in asymmetric warfare, using the disaster-torn city to avoid direct confrontations with U.S. forces. Depending on the scale and scope of the attacks on U.S. forces, at best they could divert attention and resources away from rescue missions and efforts to provide basic provisions and restore services. Moreover, U.S. defensive measures could be portrayed as aggressive, undermining much of the goodwill that would otherwise be created. At worst, such attacks could transform the nature of the intervention, not through mission creep but through rapid mission transformation. Even the most innocuous involvement in a megacity or sub-megacity, therefore, has the potential for going badly wrong.

Military Support for Civilian Authorities in a Restoration of Order.

One of the most striking aspects of the continued evolution of violence in recent years has been the growing overlap between high-level criminality and low-level warfare. Just to underline this, in 2010, more

people (15,273) were victims of homicides in Mexico than were killed in Iraq and Afghanistan combined.[42] The Iraq Body Count organization recorded 4,038 civilian deaths from violence in 2010, while in Afghanistan, in 2010, military and civilian deaths were around 3,500.[43] Moreover, even controlling for population differences, Mexican homicide rates in 2010 were not very different from—and were probably slightly higher than—those in the two war zones. Although drug-related killings in Mexico appear to have declined in recent years, there has been a significant increase in homicides in the Northern Triangle countries of Central America—Honduras, El Salvador, and Guatemala. According to some observers, current and recent levels of violence in El Salvador and Guatemala exceed those of the brutal civil wars these countries fought into the 1990s. Much of the violence emanates from drug trafficking organizations competing for control of particular routes and from gang wars between and within the two major *maras* (gangs), Mara Salvatrucha 13 and Barrio 18. Perhaps even more important for the analysis here, much of the violence is concentrated in cities. For several years, San Pedro Sula in Honduras had the unenviable distinction of the highest homicide rate of any city in the world, although it now appears to have been overtaken by San Salvador.

The implication of all this is that many cities in the developing world, especially but not exclusively in Latin America and the Caribbean, have to confront levels of violence that could at some point become overwhelming. While concerns over sovereignty and some lingering distrust of the United States are likely to inhibit requests for assistance by governments in Latin America, the possibility that, at some point, such a request might be made cannot be excluded. The

inhibitions on the part of the United States to responding with military support are likely to be as strong if not stronger. Nevertheless, if an allied country in Latin America were facing chaos and intense levels of violence in one of its major cities, some kind of intervention to restore order might be seen as preferable to another migrant crisis involving not only unaccompanied minors but also a much broader segment of the population fleeing from violence. Obviously much would depend on the circumstances, but to rule out such a contingency could be a mistake. Is it highly probable? Absolutely not. However, neither is it impossible.

Military Intervention in a Strategic City.

One of the reasons a military intervention in Latin America is deemed so unlikely is that, despite proximity, it is rarely regarded by the United States as a region of primary geopolitical, strategic, or economic importance. Yet, there are other cities around the world—some related to the continued conflict with extremist groups such as the Islamic State of Iraq and Syria (ISIS) and the Taliban—that could be endowed with such importance, not in the least because they are related to ongoing military operations elsewhere. Karachi, for example, has been critical in resupplying U.S. forces in Afghanistan; if extremist elements were to initiate large-scale attacks on supply lines and the attendant support structures, it is not clear that the United States would accept the resulting disruption without some kind of response. Moreover, as the world becomes increasingly urbanized, the strategic significance of at least some cities is likely to grow considerably. The critique by Evans of *Megacities and the United States*

Army did not question the growing strategic importance of cities as such; rather, it was about which cities fell into the category of high importance, something that, he argued, was not determined exclusively by size.[44] For Evans, some smaller cities might have more strategic importance than some megacities and, therefore, might require U.S. military involvement. Liotta and Miskel use the term "alpha cities"—a term they recognize is not widely used—to describe cities like Mumbai, which are critical nodes in the global economic system.[45] As they note, "with more cell phones per capita of any city on the subcontinent, Mumbai generates more than one-sixth of India's GDP."[46] Mumbai also represents an important trend in which a growing number of cities in developing countries are developing a trajectory that will move them into the category of global cities (as defined by Sassen). Some cities are important, not only economically, but also in terms of their political significance. Liotta and Miskel, for example, describe Cairo as a "critical city."[47] They note that in spite of—and perhaps even because of—the unrest in Egypt itself and in the Middle East writ large, Cairo:

> remains crucial to the United States in the Middle East. Second, Cairo is a city in which national governance heavily invests. The Egyptian government recognizes that disorder in Cairo threatens the stability of the entire state and, for that matter, the entire region.[48]

Recognizing the strategic significance of a city does not mean that the United States would necessarily be willing to deploy military forces to that city. Nevertheless, as strategic calculation catches up with the intrinsic importance of key cities in a globalized but highly fractious world, then the kind of considerations

outlined in *Megacities and the United States Army,* and extended to a broader range of cities, could become even more compelling. Consequently, an intervention in an "alpha" or "critical" city with major strategic significance that is either intrinsically important (such as a global financial and communications hub) or has become important to the implementation of U.S. strategy in a particular region and the continued viability of a regional ally might well be on the list of policy options.

Military Involvement in a City in the Context of Counterinsurgency.

Closely related to the idea of a strategic intervention in a city, but in a narrower context, is that the United States—when involved in another counterinsurgency campaign (and distasteful as this might be, it cannot be ruled out)—will find as it did in Iraq that a specific city becomes endowed with a great deal of symbolic and strategic significance. In the current conflict between ISIS on the one side and the Syrian and Iraqi governments with their respective patrons and supporters on the other, Mosul clearly falls into such a category. The city's fall to ISIS was a massive victory for the extremist insurgency and provided unprecedented access to massive resources extracted through taxation and coercion. Indeed, the conquest of Mosul gave important impetus to the declaration of the Caliphate, while also providing credibility and a sense of empowerment to the declaration. Indeed, the seizure of the city was critical to the momentum that ISIS obtained in 2014, and that will not be fully reversed until Mosul is retaken, thereby depriving ISIS of both its highly symbolic victory and a vital component of its resource base. The extent to which the United

States will go beyond air support to assist forces on the ground trying to retake Mosul remains uncertain. Part of that, however, is a result of the formal withdrawal from Iraq by the United States and continuing concerns about being dragged back into a quagmire with allies who are weak and unreliable. It is certainly conceivable that in a future counterinsurgency campaign, the United States will be less risk averse and less constrained.

The Use of Military Force in a City in the Context of a Conflict between States.

The parallel to involvement in urban warfare as part of a counterinsurgency campaign is either defense of or an offense against a city that is an important strategic prize in a more traditional military conflict, albeit one that is in the so-called gray zone. In the event that geopolitical competition with Russia increases in intensity and that Russian President Vladimir Putin, either as a result of desperation (losing political support at home) or ambition (restoring some semblance of the Soviet empire), moves directly or indirectly against one or more of the Baltic states, the United States could find itself helping in the defense of Riga, Tallinn, or Vilnius. In a speech in Tallinn, Estonia, in September 2014, U.S. President Barack Obama reassured the North Atlantic Treaty Organization's (NATO's) Baltic members that they would not again lose their independence to Moscow as they had done after World War II. As the President emphasized:

> we will defend our NATO allies, and that means every ally. . . . In this alliance, there are no old members or new members, no junior partners or senior partners. They're just allies, pure and simple.[49]

This commitment has been buttressed by the decision to spend more defense money in the region, to preposition more equipment stockpiles, and to deploy a combat brigade on a rotating basis at different locations in the region. There is always a danger with a commitment of this kind, that, although primarily symbolic, it does entangle the United States in a potential conflict. Symbols can have enormous strategic significance, as was evident with U.S. troops stationed in West Berlin during the Cold War. Given the location of West Berlin and the problems of resupply from a U.S. and NATO perspective, the city was indefensible in the event of a Soviet effort to capture it. As Thomas Schelling famously noted, the one thing U.S. troops could do there was to die.[50] In other words, the forces were deployed as a tripwire, as a manifestation of the U.S. commitment to its European allies and as part of extended nuclear deterrence, which depended on what Bernard Brodie called the "marvelous clarity of choice between non war and destruction."[51] Yet, West Berlin also had a special status that dated back to the 1948 crisis and the Berlin Airlift. It is far from clear that the U.S. commitment to the Baltic States and their capital cities is as strong. Moreover, the current relationship between the United States and Russia is far less clear-cut than that between the two superpowers during the Cold War. In adversarial relationships in which lines and commitments are not clearly demarcated, the potential for mischief, misunderstanding, and miscalculation is much greater. The implication is that the United States could find itself having to defend one or more of the Baltic capital cities in an area where it has long supply lines and other geographic disadvantages. These are not megacities, but they have been endowed with some strategic significance.

In addition, if the commitment is to be credible, then there has to be at least a readiness and some preparation to operate in these urban environments.

Containment or Quarantine of an Urban Pandemic.

The other kind of urban contingency that could arise for the U.S. Army stems from the possibility of a megacity or sub-megacity becoming an incubator for some kind of infectious disease. In the event of an urban outbreak of some kind of contagion that could take on the qualities of a pandemic, it is not inconceivable that there might be an attempt to quarantine the city. Drastic as this might appear, if the mortality rate of the outbreak was sufficiently high, and there were no obvious countermeasures to the disease, then enforced isolation might be the only feasible response. The difficulty here, of course, is that people would want to escape from the city and, in some cases, would pay organized criminals to facilitate their exit. Consequently, a quarantine would require some kind of coercive power to back it up—and only military forces would be capable of imposing this, and even they would find it difficult. Obviously much would depend on the city and country involved, whether or not there was an indigenous capacity for enforcement, and if there was a willingness to invite external forces to assist in the containment process. Again, it is a low-probability contingency; however, as Nassim Taleb has very persuasively shown, "black swan" events (that is, events with low probability but high impact) occur more frequently than we like to acknowledge.[52]

Implications.

All of these contingencies have a low probability. Yet, as discussed above, the events and decisions that might require some kind of military deployment to or around a city are neither particularly novel nor without either some kind of precedent or strategic logic. Yet, in some ways, the problems of urban military engagements are even more formidable than the preoccupation with megacities suggests. By using one category such as a megacity—formidable as it might be—there is a danger of oversimplifying the problem. The authors of *Megacities and the United States Army* take pains to emphasize that megacities vary considerably from one another in so many different ways that there is no one-size-fits-all response. The analysis here, however, suggests that the problem is in some ways greater than that. Each kind of contingency has its own specific requirements, while the size of the city adds another important set of variables, as does its character—smart, fragile, or feral. In other words, there is a mix-and-match quality that gives a wide variety of permutations.

Yet, the categories help both to bind and to think through the implications of different kinds of interventions in different size cities that are either smart, fragile, or feral. The purpose of any operation would do a great deal to determine its scale, scope, duration, and manageability. The size of the city would likely be an important determinant of the force level the United States would deploy. All cities would require a common core of competencies, skills, and capabilities. Yet, the character of the city (smart, fragile or feral) would also require particular subtleties of approach, distinctive operational techniques, and different

levels of technology. In other words, the permutations are many, but the three components (mission, size of the city, and character of the city) provide important boundaries within which planners and policymakers could determine force levels, deployment strategies, intelligence requirements, and the like.

More generally, as megacities and sub-megacities take on increasing salience and importance in the next few decades, they should become a distinct focus of attention and analysis not only for military planners but also for intelligence agencies. Understanding and anticipating developments and events in megacities and sub-megacities will need to become a central responsibility of the United States intelligence community, supplementing, and at times even surpassing, both the traditional focus on states and the more recent focus on transnational actors. An important prerequisite for enhanced performance at almost every level of intelligence, however, is better thinking about what a city is, how it works, and what kinds of constraints and opportunities it provides for the operations of military forces. Although the focus has to be on the strategic implications and requirements for military operations, it is essential nonetheless to ask fundamental questions about how cities can best be conceptualized. Accordingly, the next section deals initially with concepts for approaching and understanding cities, and then uses them as a basis for a holistic, multi-level approach to intelligence requirements for urban military contingencies.

CONCEPTUAL THINKING AND LAYERED INTELLIGENCE FOR URBAN MILITARY CONTINGENCIES

In the preceding discussion, cities have been distinguished from one another in terms of size and character. Yet, there is a more fundamental question that has not yet been asked: what is a city? The question is much easier than the answer. Moreover, the answer has changed over time as conceptualizations of the city have become more utilitarian. As one study noted:

> the notion of urban remains fleeting, changing from time to time, differing across political boundaries, and being modified depending upon the purpose that the definition of urban would serve. At times, urban populations are defined in terms of administrative boundaries, at times in terms of functional boundaries, and at times they are defined in terms of ecological factors such as density and population size.[53]

In a sense, definitions have been politicized. They have also become increasingly sophisticated over time. Even the early answers, however, have captured important dimensions of the city.

One of the first notions of the city involves the city as a place with certain attributes in terms of population size, density, and heterogeneity. Sociologist Louis Wirth, for example, writing in the late-1930s, delineated a city in terms of four characteristics: a relative permanence; large population size; concentration of people in a limited space, i.e., high population density; and social heterogeneity.[54] To this, one could add an agglomeration of physical structures that provide places of work, business, economic production, and often places of worship and leisure.

The economic dimension of the city became the basis for what has been described as "the functional definition of urban," a definition rooted in economic geography.[55] This approach emphasizes that the city has become a retail market center for broader regional distribution. Other scholars have developed this argument, highlighting:

> the variety of economic functions that take place in an urban center includes various types of production, but also educational, political, administrative and socially related economic activities which tend to employ a diversely orientated labor force. An important related concept is that of 'agglomerative economies,' which are a concentration of economic functions that operate external to a particular firm but make it advantageous for a firm to locate there. For instance, other firms, banking, credit, transportation and storage facilities tend to exist in and around urban centers.[56]

This concentration of economic functions in turn attracts more people, increasing population density.[57]

The city, as both a place and a set of economic functions, conveys important elements of its reality. A very different conception of the city has been that it resembles a living organism. Within this, some have even discussed the metabolism of cities. Drawn from biology, the concept of metabolism:

> refers to physiological processes within living things that provide the energy and nutrients required by an organism as the conditions of life itself. These processes can be described in terms of the transformation of inputs (sunlight, chemical energy, nutrients, water, and air) into biomass and waste products. . . . Just as living things require the inputs mentioned above, so do cities. That is, cities cannot exist without those inputs—urbanites require clean air, water, food, fuel,

> and construction goods to subsist while urban industries need materials for production purposes.[58]

While this is particularly useful in terms of assessing the relationship between the city and the environment, the broader notion of any city as a living organism is particularly compelling. It is also particularly useful in delineating intelligence needs for military contingencies in megacities and sub-megacities. This is evident in Table 2, which highlights the parallels between humans and the city as as an organism.

Human Entity	City as an Organism
Skeleton	Physical infrastructure
Core and Periphery	Center and peri-urban
Neural networks	Social networks
Metabolism	Flows
Blood flow	Pulse or rhythm
Brain functions	Governance
Survival instincts: fight-or-flight mechanisms	Coping mechanisms: informal or illegal economies
Immune system: antibodies	Resistance to external intervention

Table 2. Comparison of a Human to a City as an Organism.

There are, of course, limits to such an analogy. Kevin Lynch, one of the doyens of urban planning, has noted that:

> cities are not organisms, any more than they are machines, and perhaps even less so. They do not grow or change of themselves, or reproduce or repair themselves. They are not autonomous entities, nor do they run through life cycles, or become infected.[59]

Such criticisms and caveats notwithstanding, treating the city as an organism helps to bound the intelligence process and identify key elements, such as social networks, flows, governance, the rhythm of cities, and the likely response to external intervention, even when it might be benign. The idea of the city as an organism has also become important in understanding some of the results of the increased size of cities. The work of Geoffrey B. West, Luís M. A. Bettencourt, and their colleagues has shown that there are:

> systematic scaling laws which explicitly show that cities are more than the linear sum of their individual components. For example, economic productivity (value-added in manufacturing, GDP, wages, personal income, etc.) increases systematically on a per capita basis by 15% with every doubling of a city's population, regardless of a city's initial size (whether from, say, 50,000 to 100,000, or from 5,000,000 to 10,000,000). Remarkably, these general increasing returns to population size manifest, on average, the same statistical relationship (the 15% rule) across an extraordinarily broad range of metrics, regardless of nation or time. Similar increases apply to almost every socioeconomic quantity, from innovation rates and rhythms of human behavior to incidence of crime and infectious diseases. They express a continuous and systematic acceleration of socioeconomic processes with increasing numbers of people, so that larger cities produce and spend wealth faster, create new ideas more frequently and suffer from greater incidence of crime all approximately to the same degree.[60]

The work done by these authors at the Santa Fe Institute also uses the idea of cities as complex emergent systems. Bettincourt, for example, has emphasized the importance of networks, arguing that:

> cities are first and foremost large social networks. In this sense, cities are not just large collections of people, they are agglomerations of social links. Space, time and infrastructure play a fundamental role in enabling social interactions to form and persist, and in allowing them to become open-ended in terms of increased connectivity and sustainable from the point of view of energy use and human effort.[61]

Networks are also an important part of what Michael Batty has described as "the new science of cities."[62] One of:

> the central ideas of this new science is that locations are really the nodes that define the points where processes of interaction begin and end . . . instead of thinking of cities as sets of spaces, places, [and] locations, we need to think of them as sets of actions, interactions, and transactions that define their rationale and relate to the way scale economies generate wealth in social and economic terms.[63]

Cities have to be understood as a layered and interacting series of complex adaptive systems involving actions, interactions, and transactions. This also requires multiple streams of intelligence: information on network and power structures could be obtained and updated from the intelligence community; infrastructure mapping, breakdowns from satellite data, and considerable social, economic, and political intelligence could be obtained from non-governmental organizations. All of this would lead to an enhanced understanding of urban dynamics, including patterns of flows and networks of relationships.[64] Operating effectively in megacities and sub-megacities requires an understanding of these flows and networks and an ability to determine when to exploit rather than

disrupt their dynamics. This focus and approach can be extended to facilitate the understanding of governance patterns and governance processes in urban areas. Indeed, the following discussion of intelligence preparation of and on the urban battlefield looks at 10 different layers of the city, recognizing that these are not independent from one another, but are constantly interacting. In complex systems, all variables are interdependent. Indeed, there are clearly multiple sets of vertical connectors between the various layers, both direct and indirect. Some of these connectors will have readily predictable consequences, while others will be much harder to assess. Nevertheless, by treating these as a series of layers, it should be possible to elucidate the need for a comprehensive (if daunting) approach to intelligence in megacities and sub-megacities. The key point, however, is that there are multiple connections among and across the layers that also need to be considered, even though they make the intelligence task even more formidable.

In thinking about intelligence for military contingencies in urban areas, it is important to consider it as a dynamic interactive process. Intelligence preparation of the battlefield will be vital prior to action; intelligence preparation on the battlefield will be a continued and even more stringent requirement throughout the duration of the contingency. As Chad Serena and Colin P. Clarke noted:

> the U.S. military will have to be able to effectively piece together a comprehensive and actionable intelligence picture, and under enormously challenging circumstances. This will require, at a minimum, an ability to persistently monitor, collect, and interpret—in near real-time—the millions of bits of data associated with cellphone communications, social media post-

> ings, financial transactions, and the operational movements of these actors. The challenges associated with doing so—exposed in Grozny, Sadr City and now Raqqa—will likely require the U.S. military to increase the number of intelligence platforms it employs and to develop the ability to manage and interpret in a timely fashion the unending stream of data. Failure to do so will exacerbate the difficulties associated with operating in megacities, prolong conflicts therein, and create circumstances in which hostile groups can exploit physical and virtual sanctuaries largely unobserved by U.S. forces.[65]

Against this requirement, the levels or slices of the intelligence challenge are identified in Table 3.

Level 1	Subterranean
Level 2	Topography—roads, chokepoints, etc.
Level 3	The Cityscape—the buildings
Level 4	The Service Infrastructure
Level 5	The People—human terrain
Level 6	The Networks—social or criminal capital
Level 7	The Flows—people and things
Level 8	Forms and Spaces of Governance
Level 9	The Rhythm of the City
Level 10	The Cyber and Electronic Layer

Table 3. Levels of Intelligence Challenges.

Inevitably, there are elements of artificiality in such a framework, in that none of the categories is hermetically sealed. Indeed, the problem—as the writings of Batty noted above have emphasized—is that the city is an emerging complex system, and it is the key interactions among the people, places, flows, and

networks that make the city function the way it does. Cities—like all complex systems—are much more than the sum of their parts. Consequently, an additive approach is wholly inadequate. Kilcullen's colleagues at Caerus have made a very similar point, noting that cities are:

> complex, adaptive systems due to their connectedness; their unique terrain; and the diversity of territorial controllers. These qualities lead to a high density of interaction between the population, infrastructure, and the physical terrain, which overwhelms traditional reductive analysis.[66]

The implication for the intelligence preparation for the urban battlefield (IPB) approach articulated here is that the notion of distinct levels of analysis or slices of the intelligence challenge is a starting point, but that there are important connections and interactions among these levels that are complex and that sometimes create not only unexpected consequences but also, on occasion, surprising developments that can have strategic significance.

For the sake of clarity of presentation, the dimensions of IPB are presented separately. They will be followed, however, by a discussion of how the various levels might intersect and interact with one another, thereby adding a more holistic approach to the intelligence enterprise. It is also worth emphasizing that the primary focus in what follows is on understanding the city as organism. Understanding the enemy is also vitally important; but that is something U.S. military forces do all the time and is not discussed at length in what follows. The emphasis here is on understanding the city as a dynamic emergent organism with various characteristics—some of which are universal,

while others are idiosyncratic. The deeper the understanding of the city, the more likely it is that military units can act in ways that are copacetic with the dynamics of the city. Under some circumstances, U.S. forces that act in this way will have a competitive advantage over adversary forces that lack a similar depth of understanding.

IPB Level 1: The Subterranean Dimension of Cities.

The subterranean parts of cities generally receive little attention. Yet, some cities such as Toronto, Beijing, Rome, and London have extensive subterranean passages and pathways. Toronto, in large part because of the climate, has a system known as PATH, which has been described as "a network of underground pedestrian tunnels, elevated walkways, and at-grade walkways connecting the office towers of Downtown Toronto."[67] The PATH system is reportedly about 19 miles long and encompasses a massive underground shopping complex. Rome not only has its catacombs, but the contemporary above-ground structures typically sit on earlier structures as successive generations simply built on the buildings beneath. London has a massive underground system that goes well beyond its subway system; much the same seems to be true in Moscow. Beijing also has an underground city that might have been used by government forces during the Tiananmen Square massacre. Moreover, even those cities that have grown up more recently have some kind of underground complex of drainage and sewage systems, pipelines, and infrastructure that could be exploited against U.S. forces in a military contingency in a megacity or sub-megacity. As the Marine Corps student handout on fighting in cities noted:

> subterranean systems are easily overlooked but can be important to the outcome of operations. These areas may be substantial and include subways, sewers, cellars, and utility systems. . . . The city of Los Angeles alone has more than 200 miles of storm sewers located under the city streets. Both attacker and defender can use subterranean avenues to maneuver to the rear or the flanks of an enemy. These avenues also facilitate the conduct of ambushes, counterattacks, and infiltrations.[68]

Although the Marine Corps focus is largely operational and tactical, it is only necessary to think about the tunnel system in Vietnam to recognize that the subterranean dimension of a conflict can sometimes take on strategic significance. This was equally true in the very different context of the Balkan wars of the early-1990s. During the Serbian siege of Sarajevo in 1993, the tunnel under the airport took on enormous strategic significance. The tunnel linked two Bosnian communities and enabled the besieged Bosnians to maintain their resistance, with "an average of 4,000 people and 20 tons of material" moving through the tunnel daily.[69] Without the continued flow of supplies, the outcome would have been very different. In this instance, it helped the population and forces defending the city. Movement underground, however, can also be used offensively. It is likely to be less vulnerable to detection and, therefore, might enhance the capacity for surprise, at least at the tactical level.[70]

The implication of all this is that if the U.S. military, for one reason or another, has to intervene in a megacity or sub-megacity, it needs to know the extent of the subterranean networks, the extent to which they could be exploited by either an adversary or the

intervening forces themselves, and the ways these networks might be blocked or countered. One study by military officers at the Naval Postgraduate School even suggested that "subterranean" be regarded as an operational environment.[71] The same study noted that "subterranean infrastructure includes: ventilation, power supply, water supply, waste discharge, transportation, and communications," and that these can have multiple entry and exit points.[72]

It is important, therefore, to identify access points to this subterranean infrastructure as well as to assess the capacity to move people and things through the underground systems. Here again, the authors noted:

> *mobility* within a subterranean passage typically coincides with the largest item that can be conveyed through or housed within the functional workspace. Mobility within the subterranean environment in terms of the maneuverability of ground forces will ultimately determine the tactics employed. The specific assessment of mobility refers to the dimensions of the access portal or entrance, as well as that of the entrance tunnel. . . . The mobility attributes are defined as restricted, semi-restricted, permissive, and unrestricted.[73]

The challenge is that such systems do not readily show up on Google maps or even more sophisticated satellite reconnaissance. Moreover, prior knowledge might be difficult to obtain, particularly if the city is in a country where the United States is unable to deploy more than very limited intelligence assets. This could put U.S. forces at a significant disadvantage. In this connection, it is worth noting a point made by Lirio Gutierrez about the gangs in Honduras. She argued that one reason the government forces had little

impact on the *maras* was that the gang members had a much higher level of territorial knowledge than did the government.[74] For an outside intervention force in a city that it has never been in before, the lack of local knowledge is an enormous disadvantage. As the forces seek to mobilize and exploit friendly residents with such local knowledge, finding people who can be trusted and who are knowledgeable about the urban subterranean world is vital.

IPB Level 2: The Topography of Cities.

Topography is typically defined as "the arrangement of the natural and artificial physical features of an area."[75] In a city, the most important of these physical features are man-made. As Michael Desch noted:

> urbanization changes the physical geography of an area by increasing the density of settlement and producing built-up areas of closely spaced buildings and tight networks of roads and rail lines.[76]

Yet, the underlying natural features provide both opportunities and constraints for these buildings and transportation systems. Moreover, as Max Neiman pointed out:

> the topography and natural surroundings (rivers, mountains, or beaches, for example) are included in the built form of individual cities and urban settings since they establish the contours on which and within which structural forms occur.[77]

This emphasizes once again the enormous variations in cities and raises important questions: Are the cities on flat terrain where the built elements can be construct-

ed easily and widely? Is the city nestled within mountains and hills, where the natural topography can be an important differentiator among different communities with different socio-economic attributes? Certain kinds of ridge and ravine formations within cities in Latin America, for example, have provided spaces for shantytowns or informal settlements that have grown up spontaneously as economic migrants moved to the cities because of network opportunities, or as political refugees fled into the cities to escape rural violence. One example is the settlement known as La Limonada within Guatemala City, where an estimated 60,000 people have settled on land that most would consider uninhabitable.[78] This has become the largest slum in Central America. Even more striking are the *favelas* of Rio de Janeiro; many are built on mountainsides that are so steep they can be accessed only on foot, through narrow alleys that are the perfect places for traffickers and gangs to ambush the incoming forces. This has imposed serious limitations on security forces as they have sought to pacify the *favelas* and contain the drug trafficking and gang violence within them.

Similarly, if a city is littoral, what are the advantages and risks of that? Is it generally good for trade, both licit and illicit? At the same time, there are risks of extreme weather events that can create a humanitarian disaster. Some coastal cities might also offer attractive targets for terrorists because of the easy access by sea. In 2008, for example, the Lashkar-e-Taiba terrorists came into Mumbai by sea—and were ignored as they came ashore because they were believed to be contraband smugglers.[79] From the U.S. perspective too, it is worth considering both the benefits and the risks stemming from the coastal nature of a city. The coastal component would likely be an asset for U.S.

forces in terms of the initial entry into the city as well facilitating a relatively easy exit strategy. At the same time, once U.S. forces are securely in place, would it make efforts to control and manage the city, in accordance with the overall mission, more or less difficult?

If the previous discussion emphasizes some of the major differences among cities, some scholars have developed a narrow but systematic approach to urban spatial structures that could be useful if integrated into IPB as part of a macro-level understanding of the city. Shlomo Angel in particular has identified five discrete attributes of every urban spatial structure that he argued could be measured and analyzed systematically in all cities and countries. First:

> urban land cover, or urban extent, is typically measured by the total built-up area (or impervious surface) of cities, sometimes including the open spaces captured by their built-up areas and the open spaces on the urban fringe affected by urban development.[80]

Second:

> average urban population density is typically measured as the ratio of the total population of the city and the total built-up area it occupies.[81]

Third:

> centrality concerns the relative proportion of the city population that lives in close proximity to its center rather than in its suburban periphery.[82]

Fourth:

> fragmentation, or scattered development, is typically measured by the relative amount and the spatial structure of the open spaces that are fragmented by the

> noncontiguous expansion of cities into the surrounding countryside.

A fifth attribute in Angel's typology is "compactness, or the degree to which the city footprint approximates a circle rather than a tentacle-like shape." This is important because it impacts on "accessibility—the more circular the city, the closer its locations are to its center and to one another."[83] This notion of spatial structure is an important dimension of urban topography.

A broad understanding of urban spatial structures of this kind has to be supplemented by knowledge that is more detailed at what might be termed the district level. As suggested in the introduction of this monograph, there are massive variations in density, with the highest density of people to spaces in areas that are deprived socially and economically, and the lowest density among the social elites. In other words, the average urban density can be a useful first approximation, but can also be misleading. One way to approach this—at least as a first approximation—is to consider the city in terms of concentric rings radiating outward from the city center, to the peri-urban zones that mix urban and rural elements while sometimes acting as a focal point where new entrants to the city congregate—often in informal settlements. Operations in areas of low density might differ in important ways from operations in high-density urban areas.

Another approach to urban spatial structures has been enunciated in a research paper by several scholars steeped in a complexity science approach to cities. In their view:

> the complexity of human movements has redefined the usage of urban space and the arrangement of resources. People, as physical carriers, motivate the

> transfer of materials, money, people, and information between areas in urban space.[84]

This approach leads to an emphasis on three elements of urban spatial structure: hubs, centers, and borders. Hubs refer to the most significant areas that connect spaces between which urban stocks are transferred. These act within the urban structure as spatial bridges between different neighborhoods. Centers refer to the most relevant areas that accumulate urban stocks, which can differ from hubs but are very often the same.[85] Borders refer to socioeconomic boundaries that are generated by aggregated travel location choices, which subdivide a city into small neighborhoods or communities.[86]

Using a quantitative approach with data drawn from the use of public transport systems in Singapore, the authors identified important trends and changes in the city, including the move toward a "more polycentric urban form."[87]

Singapore, of course, is a relatively smart city with lots of readily available data. It also has highly efficient transportation systems that facilitate easy movement. In other cities, however, conditions might be different, with the topography and transportation systems imposing constraints rather than facilitating mobility. In considering roads in cities in the developing world, for example, it is reasonable to expect that many of them are narrow, with low-quality construction and limited carrying capacity. After the 2015 earthquake in Nepal, for example, the flow of aid and assistance was stifled by both the limited capacity of Kathmandu Airport and by the poor transportation into the city, let alone to the rest of the country. Poor roads might also be a hindrance to military operations, especially

when there is a need for rapid response to requests for assistance either from the civilian population or from military units. In addition, it is critical that U.S. forces operating in a city have a clear understanding of the major chokepoints and how they can be avoided when operations require mobility, and how they might be exploited when the United States is seeking to constrain the mobility of adversaries.

IPB Level 3: Cityscapes.

Closely related to the topography, and often considered part of it, is what might be termed the "cityscape"—the buildings that are created as places to live, learn, work, play, engage in commerce, or govern. These have their own distinctive features that have to be identified by intelligence and taken into account in operations. As one study noted:

> urban terrain, being a man-made environment, is composed of angular forms, the like of which occurs only rarely in non-urban terrain. Not only are these forms angular in planimetric pattern (as a grid street pattern), but in the third dimension as well. Verticality becomes of great importance, for this not only creates extremely difficult barriers to assault, but provides the defense with a man-made form of 'high-ground.' A large city provides several planes of 'urban high ground' and, in many instances, a subterranean level.[88]

Before U.S. forces move into a city, therefore, they need to identify particular buildings that would provide good defensive positions as well as high buildings that would provide advantageous "terrain" for sniping, ambushes, or other forms of attack on U.S. forces. Commanders will need to know where to

locate the "high ground" in the city, and how easy this location will be to access, take, and maintain control over.

The other elements of the cityscape to consider are whether particular buildings are endowed with political, religious, or symbolic significance. After this has been determined, it is important to develop a policy and strategy for dealing with significant buildings. Are certain kinds of buildings, for example, to be regarded as no-go areas for U.S. forces? However, if they are treated as such, and then exploited for offensive operations by an adversary or adversaries, what does this do to the initial determination? Does U.S. occupation of certain buildings or operations in certain parts of the city alienate the population? Conversely, if a troop presence provides a degree of order and stability for the local population, is it then welcomed?

IPB might also consider the possibility that buildings that are contiguous will be used as a form of manufactured tunnels, with forces operating through them to maintain cover and avoid surveillance. During the Battle of Nablus in 2002, the Israeli Defense Forces (IDF) used this approach to target high-value Palestinian military leaders. The commander of the Paratrooper Brigade articulated the approach in terms of multiple perspectives on urban space and architecture:

> We interpreted the alley as a place forbidden to walk through and the door as a place forbidden to pass through, and the window as a place forbidden to look through, because a weapon awaits us in the alley, and a booby trap awaits us behind the doors. This is because the enemy interprets space in a traditional, classical manner, and I do not want to obey this interpretation and fall into his traps. . . . I want to

> surprise him! This is the essence of war. . . . This is why that we opted for the methodology of moving through walls. . . . Like a worm that eats its way forward, emerging at points and then disappearing.[89]

The result was that:

> during the battle soldiers moved within the city across hundreds of meters of 'over ground tunnels' carved out through a dense and contiguous urban structure . . . . Furthermore, they used none of the city's streets, roads, alleys or courtyards, or any of the external doors, internal stairwells and windows, but moved horizontally through walls and vertically through holes blasted in ceilings and floors. This form of movement, described by the military as 'infestation,' seeks to redefine inside as outside, and domestic interiors as thoroughfares. The IDF's strategy of 'walking through walls' involves a conception of the city as not just the site but also the very medium of warfare—a flexible, almost liquid medium that is forever contingent and in flux.[90]

It is not coincidental that Israeli military training and thinking is influenced by philosophy and architecture as well as more traditional military texts.

IPB Level 4: The Service Infrastructure.

Conceiving the city as an organism suggests that, like human beings, cities have certain needs or requirements in order to function effectively. As one scholar noted, "Cities require fresh water to exist. These supplies fill a number of functions, such as human and domestic needs, commercial and industrial purposes, street flushing, and firefighting."[91] In cities in many developing countries, however, clean water is not readily available:

> The lack of adequate water and sanitation facilities leads to health issues such as diarrhea, malaria and cholera outbreaks. Though water supply and sanitation coverage increased between 1990 and 2008, the growth of the world's urban populations jeopardizes those results. While between 1990 and 2008 1052 million urban dwellers gained access to improved drinking water and 813 million to improved sanitation, the urban population in that period grew by 1089 million people.[92]

Depending on the contingency, one of the most urgent challenges for U.S. forces in a megacity might be to provide enough uncontaminated water to keep people alive.

Before U.S. forces engage in any kind of contingency in a megacity or sub-megacity it is essential that they understand the infrastructure, defined broadly rather than narrowly. Infrastructure tends to be seen in terms of abstract forms such as power lines, water pipes, and sewerage systems, but these have to be managed and maintained. Indeed, services themselves require servicing and support or they break down, or at the very least are subject to interruption. In other words, the conception of infrastructure in traditional terms is not only overly narrow—it is dangerously misleading. Services—and they can differ significantly in scope and scale between cities in the developed world and those in the developing world—ultimately have to be provided by organizations and people. Knowing where these organizations are located and how they operate, as well as where and when they operate, is as important as tracing the underlying physical means of delivery.

The implication of all this is that:

> the information demands . . . will be staggering. There are certain areas you will always need to understand when entering an urban area—with the purpose of then controlling it and the population. These are the building layout and composition, transportation, electrical, sewage and water, and natural gas systems and the locations/status of key subcomponents—bridges, gas stations, power stations, high tension power lines, neighborhood substations/transformers, underground sewage canals, water purification plants, gas lines and their depth under roads (so they aren't crushed by your tanks).[93]

The more that is known prior to deployment, the better.

If the U.S. military is dealing with the aftermath of a natural disaster (hurricane or earthquake), then many services will be degraded, destroyed, or disrupted, and the priority task, along with the provision of relief supplies, will be to get them working again.

If the military is involved in a combat role, then it should at least know where the key centers of power and service provision are located so that it can try to avoid collateral destruction and damage. Disruptions of power, if they are frequent or sustained, significantly erode political legitimacy—as the United States found to its cost in Iraq. Maintaining, protecting, or restoring a functioning infrastructure, therefore, will be essential in any intervention in a megacity or submegacity. In short, military forces need to know what services are provided: by whom and to whom, the points of origin and the places of distribution, and via what routes and methods.

IPB Level 5: The Inhabitants of Cities.

So far, the emphasis has been on the city as sets of structures and services. Focusing on these, however, does not mean that the inhabitants can be ignored. In effect, cities are concentrated forms of human interaction as well as interactions between people and places. Max Neiman has highlighted the importance of both dimensions:

> The social meaning of urban places refers to those cultural features of cities and urban places that reflect the values, social perceptions, and interactions of inhabitants with regard both to the city and to one another. Urban places that hold special religious or historical meaning are likely to affect combatants in ways that cities without such intensely held symbolic or nationalistic implications are not. Additionally, the levels of social harmony or discord with respect to class conflict, ethnic antagonisms, or religious strife can affect the unity and capacity of inhabitants to work together effectively. Just as importantly, these characteristics might greatly complicate the post-combat, pacification, and occupation periods. Beirut, Belfast, and the cities in Bosnia or Kosovo are examples of how these issues can affect combat missions in unique ways.[94]

Indeed, when it comes to the inhabitants of the city, it is critical to have an understanding of the extent to which the city is cosmopolitan and integrated on the one hand, and factionalized and segregated on the other. Generally, a city will have very obvious class and socio-economic differentiations that are easy to determine. The elites live in less crowded areas, often in gated and secure communities, where violence is low; there are neighborhoods that are not wealthy but are a reflection of economic achievement and

social status; there are mixed neighborhoods that are home to lower-middle and working-class segments of the population; there are poor neighborhoods; and there are areas inhabited by those who have been marginalized and excluded or expelled from the formal economy. People in the last two groups often have little choice but to work in the informal economy and live in informal settlements where they have no legal title to their houses. Any intervention in a megacity or sub-megacity in the developing world will have to deal with the challenge of large slums with appalling living conditions. Indeed, it is worth noting that the UN-Habitat Report, *State of the World's Cities, 2006/7,* noted that slums could be the "emerging human settlements of the 21st century."[95] The report also noted that "urbanization has become virtually synonymous with slum growth, especially in sub-Saharan Africa, Western Asia, and Southern Asia."[96] Characterized by the lack of durable housing, sufficient living area, access to water and sanitation, and security against eviction, slums can be understood best in terms of Castell's notion of social exclusion.[97] They are generally areas where the state, at best, is minimalist in the provision of services; more often than not it is completely absent. Many of the people coming from rural areas in search of economic opportunity will find that they have merely traded a life of rural poverty for one of urban destitution.

In addition to the class divisions there can be divisions based on identity politics. These divisions sometimes spillover into what is described as communal conflict or civic conflict.[98] As Stephen Graham has noted, "like other facets of global social change, political violence is, in a sense, being urbanized."[99] There are several dimensions of this urbanization of violence,

one of which is the growing way in which "insurgent and guerilla groups, rather than seeking shelter within rural proletarian groups, are colonizing the world's burgeoning urban spaces."[100] Another dimension concerns the tendency of clashes between rival sectarian or religious groups to erupt or magnify in cities. In 1992, for example, an attack by Hindu militants on a mosque in a small town called Ayodhya sparked off inter-communal violence in many of India's biggest cities. "Rather than spreading through the nearby countryside, the hatred exploded hundreds of kilometers away in Mumbai, Calcutta, Ahmedabad, and New Delhi," with the result that 95% of all those killed were city dwellers.[101] Similarly in Nigeria, in February 2006, the protests against the Danish cartoons of the Prophet Mohammed sparked riots and violent clashes between Muslim and Christian mobs in several Nigerian cities.[102] In January 2007, Hezbollah supporters brought Beirut to a halt with strikes and protests that sparked violent clashes not only between Muslim and Muslim, but also between Christian groups that supported rival political factions. In other words, cities provide a concentration of everything, including animosities, rivalries, and tensions among political and ethnic groups and factions.

Sectarian divisions between Shia and Sunni, or between Protestants and Catholics, can also create tensions and conflicts. A key dimension is the extent to which such communities are intermingled. In some cities, tensions are latent rather than overt, although there is always a potential for some kind of spark to intensify these antagonisms in ways that result in violence. The danger is that military intervention is rarely neutral. As became evident in Iraq, when external intervention changes the internal power structure, those who have suddenly become disadvantaged seek to

restore the status quo ante, while those who have gone from a position of subordination to primacy want to exploit their newfound power for retribution against those who previously held power. The result was a period of sectarian cleansing in Baghdad that resulted in the number of residential quarters that mixed Sunni and Shia residents dropping from 56 in 2006 to 21 in 2007.[103] During the same period, 14 Sunni neighborhoods increased to 23, and the number of Shia residential quarters—reflecting the effectiveness of the Mahdi Army operations—went from 17 to 41.[104]

In other words, U.S. military involvement in a megacity or sub-megacity almost invariably has the potential for sparking a tinderbox. Prior to intervention, therefore, it is important to understand what the cleavages or potential cleavages might be, as well as how different factions or groups might perceive the intervention. It is also critical to send in soldiers and support workers with appropriate language skills; the complexity of the language challenge should not be underestimated. As Jeff Watson noted, "megacities are largely multilingual. While this can be said of large cities in general, the scale of multilingualism in megacities magnifies its effects."[105] In New York City:

> nine foreign languages are spoken by communities of one hundred thousand or larger. Language also plays a role in determining one's identity and the larger language community in which one decides to live.[106]

The problem is intensified by local dialects and regional languages within countries. In India—a country of ethnolinguistic states—Hindi and English are accompanied by many ethno-regional languages that people bring from the countryside into the major cities. It is vital to understand such nuances prior to deployment to a megacity or sub-megacity:

> Understanding the regional languages within a megacity will have practical implications for creating appropriate pre-deployment language and culture familiarization training, identifying reach-back capabilities, and building an effective military and host-nation interpreter cadre.[107]

Such skills will also be important during the deployment:

> A clear understanding of the multilingual information flows within a megacity will help military decision makers better understand how language communities prefer to receive and share information. These data will provide insight into how to most effectively communicate with friendly forces or interrupt and manipulate the communication of enemy forces.[108]

By adding both depth and subtlety of understanding, an enhanced linguistic capability will greatly enhance all aspects of intelligence and operations in megacities and sub-megacities, including the understanding of governance.

IPB Level 6: Networks.

Language skills are indispensable in a military contingency in a megacity or sub-megacity because they facilitate the identification of all kinds of social, political, economic, family, tribal, or ethnic networks. Indeed, networks come in all varieties, differing in size, shape, membership, cohesion, and purpose. They can vary from small-truncated localized networks that can be important only within the confines of a small district within the city, to some with citywide reach and importance, to those with a national and even transna-

tional reach. Networks can also be centrally directed or highly decentralized, they can have amorphous or specific objectives, and they can be restricted or open in their membership. They can operate through face-to-face meetings or—because of technology—can be much more dispersed, but still effective. Networks facilitate flows of information, knowledge, and communication as well as more tangible commodities.

Consequently, it is important for U.S. forces coming into a megacity or sub-megacity to have some idea about the most important networks and the underlying affiliations that give them a high degree of trust and cohesion. Who are the most important policymakers in the city? How much of their influence depends on social and business connections? How are the policymakers integrated in the broader political and economic elite? Are they part of larger family, kinship, tribal, or ethnic networks? How do these networks overlap and intersect? If there are distinct networks, to what extent do these networks cooperate or compete with one another? How powerful are these networks, and what is their ability to mobilize forces either to work with or against the U.S. military forces that have been deployed to the city?

A second level of questions about networks moves from the general understanding of the network size, shape, structure, and influence to more specific and focused questions about the key nodes and connections within the network. Nodes that are highly trusted and, therefore, particularly influential in shaping opinion will need to be co-opted where possible by U.S. forces. In addition, the contingency force will need to be particularly sensitive to and careful in dealing with networks that have a particular historical, cultural, or religious significance. Failure by the

Coalition Provisional Authority (CPA) to appreciate the status of the al-Sadr family in Baghdad and to treat Muqtada al-Sadr as an important network node in the Shia community in the city and, therefore, as an important stakeholder in post-invasion Iraq, proved to be very costly. By marginalizing al-Sadr, the CPA needlessly created an additional adversary. In effect, al-Sadr and his movement became an illicit power structure, albeit one that continued to be an important social movement and welfare provider.

In addition to the formal networks, there are also likely to be a series of shadow networks in the city: the fixers, the arms dealers, the smugglers, the organized crime figures, as well as political extremists. Indeed, the underworld networks might be as important as those that operate in the open. It is important, therefore, to identify those nodes within the network that are particularly important—either because they provide leadership, they offer particular skills that are indispensable to the organization, or they are boundary spanners and key connectors with the licit world. Moreover, it is necessary to determine the extent to which the continued operation of these networks is compatible with the mission of U.S. military forces in the city. If there is broad compatibility, then a strategy of co-option might be more effective than a strategy of confrontation. Attempting to disrupt and degrade a criminal network could prove to be highly disruptive for the city and, therefore, counterproductive to the attainment of the mission objectives.

The other kinds of networks that are important in cities are spatial networks, and recent scholarship on cities has given these networks a far more prominent place than in the past. Batty, for example, one of the most prominent scholars in the uses of complexity sci-

ence as a way to understand cities, treats networks as a core element in his work. As one assessment noted:

> Complexity theory . . . rejects the top-down, comprehensive, and structural approaches of traditional planning practice. Instead, there is a focus on bottom-up, organically structured activities that shape and influence urban systems. Complexity theory also rejects steady state assumptions about cities in place of a non-equilibrium perspective.[109]

Building on these premises, Batty regards networks as the "physical containers whose capacity constrains flows of energy and information, manifested as materials, people, or ideas."[110] Moreover, those energy flows provide another, closely interlinked, focus for IPB.

IPB Level 7: The Flows.

Scholars such as David Held, one of the major theorists of globalization, have emphasized that one of the most salient features of globalization is the vast flow of people, money, commodities, information, messages, digital signals, and services around the world.[111] What Manuel Castells termed the "space of flows" has become a global space.[112] Cities too have become spaces of flows. Global cities in particular are often defined by the flows of money and information to other cities. Yet, even cities that do not have this status have all sorts of flows. Some of the flows differ in intensity at different times, but such things as food, water, commodities, people, money, vehicles, information, and services all flow constantly. There are flows into the city, flows around the city, flows through the city, and flows out of the city. Moreover, there are licit and highly benefi-

cial flows that are important to maintain and protect, but there are also illicit flows of guns, drugs, contraband, and even trafficked people that it is important to block or interdict. One of the priorities for the IPB in relation to military contingencies in megacities and sub-megacities is to map and understand these flows. This includes points of origin, length, duration, intensity, direction, and route, as well as pulses within the flows. Those attributes of the city that facilitate flows and those that constrict or inhibit them must also be considered.

At a very mundane level, one of the most important of these flows is transportation. Movement of people through the city is often very congested, especially during certain peak hours. As one study noted:

> the streets of the city serve a wide variety of interrelated purposes: as axes for the movement of people, goods, and vehicles; as public areas separating enclosed private spaces and providing the essential spatial frame of reference for the city as a whole; as areas for recreation, social interaction, the diffusion of information, waiting, resting . . . and as locations for economic activities. . . . Within the functional complexity of the street environment, the street occupations are both strongly influenced by changes in other environmental factors, and also contributors to general environmental conditions. Thus, for example, street-traders and small-scale transporters depend upon the direction, density, velocity, and flexibility of potential customers' movements, and are immediately affected by changes in traffic flows and consumer behavior. At the same time, they influence patterns of movement and overall levels of congestion . . .[113]

This description highlights two interrelated aspects of flows: the first is their complexity and their interaction with both people and places; the second is that

disruption or even abrupt changes in flows can have significant consequences in terms of businesses and livelihoods. The second aspect in particular needs to be factored into any intelligence products about any megacity or sub-megacity that the United States might find itself operating within. Even if the United States goes in with a high degree of legitimacy, actions that are poorly thought out in relation to flows can rapidly create disaffection and disillusion among the populace in ways that could make the operational environment much more difficult for the United States.

There is a conundrum here—although the extent of it depends in large part on the nature of the contingency. One of the challenges of dealing with illicit flows is that they are often deeply embedded within licit flows. The issue, therefore, is how to detect and interdict flows such as arms or drugs without seriously disrupting the normal legitimate flows. There is an inescapable tradeoff here. Nevertheless, it is important that the costs and benefits be weighed prior to any major action that might interrupt normal flows that are a natural part of the functioning of the city. One way to think about the issue is that the military force in the city should operate, if not as an "invisible hand," then at least as a facilitator of city flows and functions, rather than as an inhibitor of or impediment to these flows.

The other important element in relation to flows is the need to maintain and protect them. This is true whether it is flows of services and power, of people, or of goods and vehicles. It is important, therefore, to identify points of vulnerability in flows. One clear point of vulnerability—and a very attractive target for attack—is a transportation hub, particularly one in which different kinds of flows converge; another is

at the final distribution point. The number of terrorist attacks in Baghdad that occur at markets is indicative of the importance of the distribution point. Not only are such attacks relatively easy to mount, but they also kill innocent civilians and strike at the flows of daily necessities.

If the intervention in the city is an effort at disaster management, then the issue will be one of restoring the flows. Once the immediate search and rescue operations are complete and a degree of order restored, priority has to be given to the restoration of flows. Even if these are initially partial, incomplete, and at significantly lower levels than prior to the disaster, getting them reignited will be an important step on the road back to recovery and normality.

IPB Level 8: Governance in Cities.

Governance in cities is responsible for maintaining flows and networks of goods, services, people, traffic, information, and communication that are indispensable for the continued health and well-being of the city—as poor as these might be. Governance provides a superstructure that in effect facilitates the natural functions and flows of the city. It is also concerned about the control of violence and maintenance of order. Unfortunately, much of the literature on urban governance is really about governance in a select set of cities in North America, Europe, and Japan that are increasingly likely to fall into the smart city category. One scholar, for example, identified four different ideal types of approaches to urban governance: the managerial, corporatist, pro-growth, and welfare models.[114] Yet, for both fragile and feral states, the issue is less likely to be about the type of governance

and more about the paucity of governance. In many cities in the developing world, there are both capacity gaps and functional holes, with the state and the city government failing to provide either social control mechanisms or even basic services. Moreover, city governance, like state governance, is often corrupt, ineffective, and patchy at best. It is not surprising, therefore, that bottom-up or organic governance mechanisms emerge as a substitute for state governance.[115] This is both positive and negative. It is positive in that it provides some degree of order, limited but real economic opportunities, and some rudimentary services; it is negative in that the providers are often criminal organizations, which use paternalism as a means of enhancing their own security and aggrandizement. This phenomenon is visible in the Cape Flats in South Africa, where, as André Standing has noted, "the criminal economy delivers employment and goods to thousands of individuals who are socially excluded," while the "criminal elite provides . . . 'governance from below' . . . by performing functions traditionally associated with the state."[116] These functions include dispute settlement, a degree of social protection, and even private philanthropy, which is at least a partial substitute for the state provision of welfare.[117] If anything, the phenomenon is equally if not more striking in the slums of Kingston, Jamaica, where the "dons" provide employment, services, and protection. The provision of these collective goods, of course, results not from altruism but self-interest as criminals seek to mobilize public support and thereby enhance their own legitimacy and security. Even so, criminal paternalism has provided benefits to communities long ignored by the state, and at times this informal governance has become more important than formal gov-

ernance. Sometimes there might even be tacit agreement whereby the state provides some services while criminals or other violent armed groups provide other services. This results in a form of mixed or hybrid governance, well described by Enrique Desmond Arias in his study of the *favelas* of Rio de Janeiro.[118]

Even though violent armed groups—militias, criminals, insurgents, terrorists, revolutionaries—might provide alternative forms of governance, they also tend to be in competition with one another for territorial control, and for the control of markets, both licit and illicit. At times spaces within the city are bitterly contested as rival groups vie for supremacy; at other times or in other parts of the city the struggle is between the forces of the state and these violent armed groups, resulting in confrontational spaces. Given this diversity, one way to think about spaces within the city is in terms of governance and conflict. Prior to U.S. military involvement in a megacity or sub-megacity, it would be extremely useful to identify differing elements of both governance and conflict. This could actually be done in terms as indicated in the following matrix using the dimensions of governance and its providers, and conflict and who the belligerents are. Table 4 yields the following typology of spaces within cities.

Formally Governed Spaces—where the state is dominant	**Hybrid Governed Spaces—**by mix of both state and armed groups	**Alternatively Governed Spaces—**where an armed group dominates
Confrontational Spaces—between the state and violent armed groups	**Multilayered Conflict Spaces—**that are both confrontational and contested	**Contested Spaces—**among violent armed groups

Table 4. Types of Spaces within Cities.

Although this might appear rather abstract—and certainly has qualities of an ideal type—it does facilitate an understanding of the variety of urban (and for that matter non-urban) spaces that the United States is likely to encounter in any operation in a megacity or sub-megacity. Some areas of major cities in the Northern Triangle of Central America, for example, are under the control of government forces (i.e., the police and military); some are under the control of a particular gang (such as MS-13 or Barrio 18); some "enjoy" the benefits of a mixed form of governance, in which a gang and government forces tacitly share responsibility; some are the scene of direct confrontation between the state and gangs over control; others are the venue for contests between MS-13 and Barrio 18, each of whom seeks exclusive control; and some are the subject of a three-way (or more) conflict in which gangs are fighting one another while also fighting the state.

There is an added twist to all this. If urban areas have a range of actors vying for limited resources and providing varying levels of governance, military operations in such areas become, de facto, an additional and novel level of governance. At a minimum, therefore, understanding the existing patterns of governance and the networks that provide them is essential

to the success of contingency operations in megacities and sub-megacities. It is equally important to develop procedures for intersecting smoothly and effectively with these networks, both formal and informal, thereby supplementing rather than superseding or disrupting them. There will be occasions, however, when the external military force will be seen as a threat and an additional player in an already multilayered conflict. In these circumstances, it will have no choice but to resort to violence.

IPB Level 9: The Rhythms of Cities.

One dimension that has been given little attention with regard to the possibility of a military intervention in a megacity is the relationship between space and time. Almost every movie or television series set within a large city gives attention to what is sometimes described as the "pulse of the city," a recognition that the city is constantly transforming and reconstituting itself each day with inward and outward flows of traffic, people, commodities, etc. However, the notion goes beyond this: time is related to business interactions and social engagements in the city, and even has a bearing on safety. The question of who controls the city at night, for example, is a manifestation of the time-space relationship, and the imposition of a curfew is no more than an emphatic, if occasionally overly dramatic, acknowledgement of the critical interplay between time, space, and certain kinds of activities. The Swedish scholar Torsten Hägestrand even developed a concept of time geography that sought to link place and time in terms of the interweaving of people's lives. Although some urban scholars see Hägestrand's work as an early attempt to link place

and time, the pioneer of rhythm analysis is widely regarded as Henri Lefebvre, who enunciated ideas related to the rhythm of life—including the rhythm of the city. While some of the concepts and language of the time-space relationship take on an abstract or metaphysical quality, the notion is ultimately very simple: it is necessary to think about time and space together rather than in isolation from one another. As Lefebvre noted:

> concrete times have rhythms, or rather are rhythms—and all rhythms imply the relation of a time to a space, a localized time, or, if one prefers, a temporalized space. Rhythm is always linked to such and such a place, to its place, be that the heart, the fluttering of the eyelids, the movement of a street or the tempo of a waltz.[119]

As one scholar noted, the great strength of this perspective is to avoid "the conception of place as static, for rhythms are essentially dynamic, part of the multiplicity of flows that emanate from, pass through and center upon place, and contribute to its situated dynamics."[120] Instead, it offers a "temporal understanding of place and space."[121] One aspect of these rhythms is that there is often repetition in both time and space—daily rush hours, for example—but not identical repetition. As Lefebvre acknowledged, "there is always something new and unforeseen that introduces itself into the repetitive."[122] This recognizes that cities are complex emergent systems, constantly changing and adapting. Indeed, as one scholar observed:

> rhythm analysis can help explore notions that places are always in a process of becoming, seething with emergent properties, but usually stabilized by regu-

> lar patterns of flow that possess particular rhythmic qualities whether steady, intermittent, volatile or surging.[123]

Rhythms are in large part about the timing of flows, the speed with which they pass through particular locations. Yet, they are also about routines and intersections. As one scholar noted:

> familiar places are the unquestioned settings for daily tasks, pleasures and rhythmically apprehended routines, with regular patterns of walking, driving, shopping and other routinized practices as part of familiar spatio-temporal experience. These patterns are marked by regular paths and points of spatial and temporal intersection which routinize action in space and collectively constitute the time-geographies . . . within which people's trajectories separate and cross in regular ways. Shops, bars, cafes, garages and so forth are meeting points at which individual paths congregate, providing geographies of communality and continuity within which social activities are co-coordinated and synchronized. This ongoing mapping of space through repetitive, collective choreographies of congregation, interaction, rest and relaxation produce situated rhythms through which time and space are stitched together to produce what Seamon (1980) calls 'place ballets.'[124]

One task of IPB is to understand these "choreographies of congregation," especially when they might represent or produce not communality and continuity but violence and dislocation. Another is to consider how accepted rhythms might be disrupted, either deliberately by those who want to bring about change or inadvertently by actions of U.S. forces that are based on an inadequate understanding of the dominant rhythms of the city they are operating in. Indeed,

Lefebvre discussed the creation of arrhythmia. To go back to commuting, minor cases of arrhythmia could result from minor accidents that block traffic and extend the length of rush hour far beyond the norm. More serious cases could result from deliberate sabotage or blocking of transportation arteries, especially bridges or roads, or from military operations by an intervening force that are badly timed and block the normal flows. Moreover, within megacities there will almost certainly be groups and individuals "who are often spatially segregated, and marginal to the life and dominant rhythms of the city."[125] Sometimes they simply want to opt out. There are also instances that they become so alienated that they seek revenge or recompense. Some of the *maras* in the major cities of Honduras, El Salvador, and Guatemala have sought to make money and exert power by extorting transportation companies and drivers, and at times by violent attacks on buses. In effect, they are seeking to exercise power through the creation of arrhythmia.

The other dimension of rhythm that has particular relevance to military contingencies in megacities is the difference between the rhythms of the day and those of the night. For any contingency force, controlling the rhythms of the night (at least in key areas) will be highly desirable, if somewhat difficult. U.S. military forces, however, can also seek to exploit the different rhythms of the night, taking actions with impunity that, in daytime, might create arrhythmia. Understanding the rhythms of the city, synchronizing with these rhythms and moving in the direction of the prevailing flows rather than against them, limits the footprint of the contingency force, minimizes disruption, and reduces the prospects of alienating large segments of the urban population.

IPB Layer 10: The Cyber Dimension.

Treating cyberspace as an additional target of intelligence is relatively novel; yet, cyberspace has to be included in a comprehensive approach to IPB for megacities and sub-megacities. Cyberspace and what Jeff Boleng and Colin Clarke term the "New 'Net" have become both an extension of the battlefield and a window on the battlefield. Nowhere is this more relevant than in urban military contingencies. Although cyberspace is sometimes regarded as a fifth operational domain of warfare, it is more. It permeates society, economics, politics, culture, and increasingly, warfare. It is part of the context within which military operations have to be conducted, yet also provides insights into both conditions in a megacity and the adversaries operating there. As one study noted, "megacities function at the intersection of the physical, social and cyber spaces"[126] and, therefore, should be treated as information hubs.

Other research that has been done completely outside the military context makes a very similar point, focusing on what is termed the "data city" and developing "methods and tools to collect, analyze, and represent time-based geo-located social media data at the urban scale."[127]

This concept of the data city builds on the earlier work of scholars who developed concepts such as "mediascape" or "informational landscape," and "offered descriptions that combine traditional city representations with new informational membranes hovering above urban fabrics."[128] Indeed:

> the underlying idea of these approaches is to view the urban experience as tied to the multiple, fragmented, and temporary layers of data and information generated by human-place interactions. This is what we define as the data city. These data can be produced either collectively or by the individual; they can be aggregated or discrete, open or protected. They constitute observation points that allow the interpretation and description of behavioral patterns within specific temporal and spatial coordinates.[129]

The data city "presents itself with an unprecedented quantity of information in the form of geo-located comments from Twitter" and other social media.[130]

> This fragmented proliferation of information generated by urban inhabitants offers potential benefits both for the research community and urban decision-makers, who can use the data to generate broad and analytical visions of the uses of urban space.[131]

The basic notion is that citizens with smartphones have become mobile sensors, reporting on events in the city with tweets, photos, messages, and the like.

> This transforms human beings into potential 'sensors' that not only have the ability to process and interpret what they feel and think but also to geographically localize the information (sometimes involuntarily) and spread it globally through the Internet, thus drawing people-generated landscapes.[132]

This notion of "the informational membrane hovering above urban fabrics"[133] is particularly useful and emphasizes how the data city can feed directly into IPB.

There are, of course, differences between smart cities of the developed world and fragile or feral cities

in the global south. In cities in the developed world, much of the reporting includes geolocation and timestamps, thereby providing unprecedented opportunities for time geography. Even without analyzing the content, the volume and intensity of tweets and messages can provide insights on the "choreographies of congregation" described above in the discussion of the rhythm of cities. Moreover, Paolo Ciuccarelli, Giorgia Lupi, and Luca Simeone also provide a series of:

> spatial aggregations based on social media. Areas were defined and colored according to the time period of the day with the highest level of contributions from the users. We compared weekdays, weekends, and a special week [with a major event].[134]

The results were striking examples of time geography, highlighting the rhythm of the city at different times and on different days of the week.

Cities in the developing world are also very rich information environments, although sometimes with less geolocation data, since the predominant mobile phones are feature phones rather than smartphones. This might change in the future as developers seek to give feature phones at least some of the capabilities of smartphones. Even without this, however, the "information membrane" hovering above cities in the developing world offers both challenges and opportunities. The challenges, according to Boleng and Clarke, stem in part from the fact that:

> the data content produced, consumed, and exchanged in this new network will be largely voice, images, and video. Significant content will also be exchanged as traditional text via SMS, but it will be multi-lingual slang and leetspeak.[135]

The sheer volume of unstructured data adds further complications, as does:

> the transient nature of the network itself, both in terms of connectivity and participation. Reliance on battery power and the difficulty of recharging phones in slums where infrastructure is fragile, expensive, and often non-existent have created an environment where users power off phones when not in use. This creates a highly dynamic network with mobile devices disappearing from one location and reappearing in another.[136]

Such problems notwithstanding, this remains a rich environment that provides opportunities for understanding cities and their dynamics.

This point has been emphasized by Robert Dixon, who sees the urban environment as extremely rich for intelligence gathering and analysis, by new as well as traditional means. Dixon has argued, though, that "the Army's current approach to learning about this environment is to seek the diamonds scattered amidst this clutter," when in fact:

> the clutter itself is the jewel. Enormous amounts of readily available data can reveal more about a city, its population, and the nefarious actors residing there than we could have imagined before. To truly understand this environment the Army must fundamentally change its approach to understanding the environment: It must adopt a holistic approach enabled by big data analytics.[137]

This would offer an opportunity to do a deep analysis of correlated and anomalous data, and discover what people actually do, thereby developing "previously

unimaginable insight into modern urban ecology."[138] Dixon has also noted, "the Army currently lacks the resources, expertise, approaches, or seemingly even the desire to investigate and exploit the reservoir of information available in modern cities. This must change."[139] Certainly, the use of big data needs to be fully integrated into institutional learning. This should go hand in hand with a complexity approach that avoids "one-dimensional thinking and reductive hypotheses."[140] Such approaches are indispensable. Nevertheless, it is important not to oversell them and ignore the possibility that there might still be problems with noise and clutter, as well as adversary denial and deception.

The other problem when dealing with cyberspace in relation to megacity contingencies is that adversaries can exploit the almost automatic transparency that it creates—both to show U.S. forces in a bad light and their own actions very positively. Consequently, part of IPB prior to any action in a megacity or sub-megacity must be to identify the service providers for both telecommunications and the Internet. It is also important to identify online opinion-makers who could have a major impact in any controversy over U.S. military intervention.

Implications.

These 10 layers have been presented here in linear fashion and as separate and distinct categories. In reality, however, they are interdependent, characterized by all sorts of interactions and intersections, many of which are difficult to predict or prepare for. The idea of a city as an evolving and emerging complex system that is far more than the sum of its parts encapsulates

the notion of these interactions. Change in one area, for example, can create all sorts of feedback loops, some of which act as amplifiers and others as dampeners. The problem with amplifiers in particular is that they can create consequences that cascade through the system, often with a highly disruptive impact. This is why small changes in complex systems can have large consequences, which sometimes create unexpected tipping points.

Given all this, it is critical that the U.S. Army create some kind of center or institutional forum for urban intelligence and analysis. For the sake of convenience, it is described here as an Urban Analysis Center. The exact form will depend on available resources and the depth and endurance of the commitment to prepare for contingencies in megacities and sub-megacities. Nevertheless, the center should be guided by several principles.

The first is that a carefully selected and relatively small core of military officers, urban scholars, and intelligence analysts should be designated with the responsibility to provide a sense of vision, central leadership, continuity, and an ever-expanding repository of knowledge about urbanization in general, and specific megacities and sub-megacities in particular. An inter-disciplinary mix is critical; it should include urban planners, architects, and structural engineers as well as military officers and intelligence specialists.

Second, rather than the Urban Analysis Center having a large permanent staff, it should be run as a network designed to have a powerful surge capability when required. In other words, the core leadership could identify scholars, urban planners, and journalists with particular specialties and country and city expertise to become part of a constantly adapting and

pulsating network with a high degree of adaptation and agility. There is a reasonably good model for this. Over the last decade or so, the intelligence community has created an outreach program in which people outside the community were designated originally as National Intelligence Council Associates, and more recently as Intelligence Community Associates. The intelligence community could then call on the associates for conference participation, analytic papers, and the like. The scheme did not require security clearances, because most of the work could be completed with open-source analysis. Since most of the information about cities would also be in the unclassified domain, this could operate on the same principle. The Urban Analysis Center, by bringing the associates together in periodic conferences with specific goals—ranging from enhanced understanding of urban dynamics to accumulating in-depth knowledge about a specific city—could create over time a sense of community and trust that would greatly strengthen the network and increase its value to the Center and to the Army.

The third principle is that provision be made for crisis management and direct communications with military units in the event of a military contingency in a megacity. Not only should the Urban Analysis Center have a communications capability allowing direct support for operations in any urban environment, but also a capacity for increased staffing and support in a crisis. Indeed, the Center could bring in particular outside experts with specific expertise related to the target city or particular elements within it, such as terrain, flows, and networks. There would then be a capacity for the operating units to reach back to the Center for technical expertise (on such matters as infrastructure), political analysis (relating to the networks of influence

within the city), or criminological assessments (dealing, for example, with the major criminal organizations and criminal markets). The request could also go the other way, with Center personnel requesting information—that could be in multi-media form—that could assist in sense making and result in feedback to units in the city that would enhance situational awareness.

The fourth principle is that the Center becomes a focus of institutional learning and adaptation. It would take the lead in compiling the lessons learned after any contingency and turn these into a set of best practices. Moreover, this could be done as a living document constantly being updated and refined. In fact, there could be both a formal version and one that is treated as a "Wiki" and open to contributions from military personnel with experience in urban combat as well as academics and urban planners. An open-source approach of this kind would offer some exciting new possibilities and could prove to be extremely creative and rewarding.

In other words, the Center would have a wide range of tasks and responsibilities, ranging from long-term strategic assessments of particular cities, to short-term operational and tactical support to the battlefield level. It would be engaged in IPB and intelligence provision on the battlefield; it would also make great use of Google Earth and particular software packages that allow systematic monitoring of geolocated social media. The information membrane discussed above as part of the cyber-layer could be a particularly rich source of information not simply for mining, but also for informing decision-making at all levels—from the battlefield to the highest political and military leadership. In short, the Urban Analysis Center would be

an invaluable asset in any military contingency in a megacity or sub-megacity. Indeed, to engage in such a contingency without this kind of support center would be reckless.

PREPARING FOR MEGACITY OPERATIONS

The U.S. military has had a variety of experiences in various urban environments, some successful, some not. These have ranged from full-intensity conflicts such as World War II or, more recently, Fallujah and Sadr City, all the way to operations other than conflict, such as the Los Angeles riots of 1992 or the deployment of National Guard troops to Ferguson, Missouri, in August 2014. In addition, military forces have been deployed in response to hurricanes in New Orleans in 2005 and New York City in 2012. The lessons from these experiences have been invaluable, and they provide a solid foundation for future contingencies. Nevertheless, military involvement in megacities and sub-megacities will present new and extremely formidable challenges and problems. Success will require unique and innovative solutions, rather than simply scaled-up versions of traditional tactics and methods. Consequently, equipment, personnel, tactics, and doctrine must be developed in ways that provide the U.S. Army with effective military capabilities and with discrete options that are tailored to the environment and can be executed with minimal damage and disruption (see Figure 1).

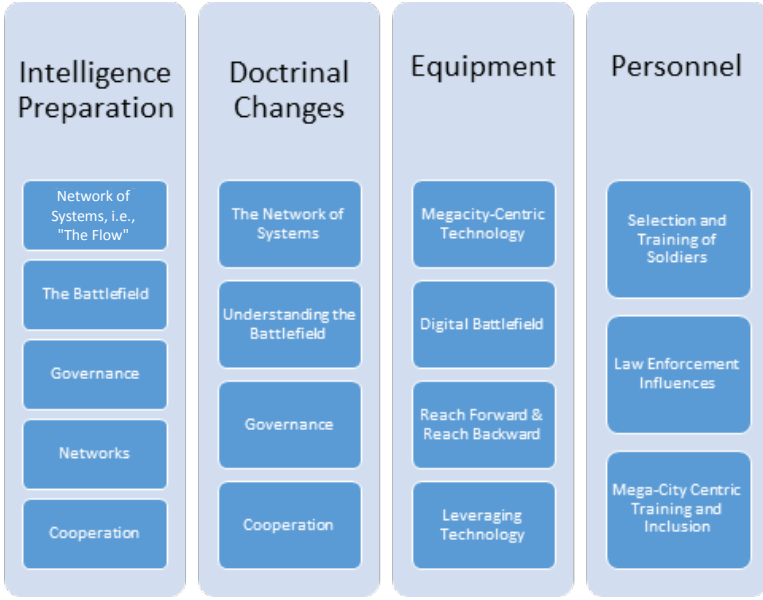

Figure 1. Developments Needed for Military Involvement in Megacities and Sub-Megacities.

Military operations in dense urban terrain require new mindsets. While the Army has already highlighted the role of the individual infantryman in an urban environment, and his or her ability as a front-line intelligence gatherer or as an extension of American diplomacy, more will be required. Not only are the unique difficulties of urban terrain likely to increase dramatically in a megacity, but also they will require significant changes in the organizational structure and operating doctrines of the Army. Moreover, they necessitate going beyond rules of engagement for the use of force, to the development and understanding of rules of interaction. Winning respect will be achieved as much through friendly encounters with the civilian population as through hostile encounters with

enemy combatants. Against this background, Figure 2 outlines the framework for operating in a megacity environment. The pre-kinetic mindset includes understanding the battlefield, doctrinal changes, and the overall mission scope. The kinetic battlefield is covered later within the tactical considerations. Finally, the post-kinetic is essentially the re-establishment of effective governance and the prevention of a regression to the kinetic phase of combat. Figure 2 illustrates this mindset.

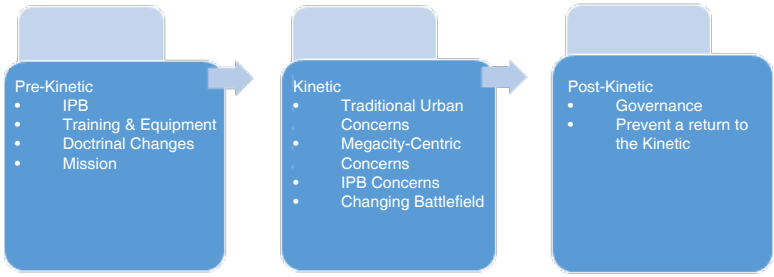

Figure 2. The Pre-Kinetic, Kinetic, and Post-Kinetic Battlefield.

Highlighting the Network of Systems.

It is clear from the preceding discussion that cities are highly variegated entities that almost invariably contain a mixture of functional and dysfunctional elements; formal, informal, and mixed governance mechanisms; and areas of low and high violence. Moreover, each city has its own unique fingerprint or genetic coding that needs to be identified and understood. A military intervention in a city—for whatever rea-

son—adds an additional layer of turbulence and complexity. At the same time, military operations in such areas become, de facto, an additional and novel level of governance. At a minimum, therefore, understanding the existing patterns of governance and the networks that provide them is essential to the success of contingency operations in megacities and sub-megacities. Just as it is essential to understand networks of influence, it is equally important to understand networks of governance and develop procedures to intersect smoothly and effectively with these networks, in effect, supplementing rather than superseding them. One way to think about this is the notion of a military force in the city operating, if not as an "invisible hand," then at least as a facilitator of city functions rather than as an inhibitor or impediment to these functions. If the intervention in the city is an effort at disaster management then the role will be much more active and visible, but will still need to display some of the same sensitivities.

Other governance concerns during both the prekinetic and the kinetic phase include the complex nature of operating in an urban area in which a myriad of actors and agents with overlapping responsibilities compete for limited resources. As Russell Glenn concisely stated:

> A coalition operating in such a region would find itself coordinating with hundreds of administrative jurisdictions: political, fire, law enforcement, transportation, and health to touch on a few, this regardless of whether the mission at hand involves armed force or not. Nor would opposing force's evacuation of an urban area guarantee relief. Removal of what might well have been coercive authorities too typical of the Third World removes the lid from a simmering pot; looting,

> surging criminality, and latent sectarianism could be only three of the . . . rewards for assuming responsibility.[141]

In other words, the military forces have to be prepared for surprises of all kinds and, in response, have to be highly adaptive in developing effective mitigation strategies.

Understanding the Battlefield.

Urban Terrain as an Operational Minefield.

Operating in dense urban terrain is similar to operating in an extensive minefield. A minefield is of concern to a battlefield commander because it slows operational tempo and funnels forces, thereby increasing vulnerability to an adversary exploiting such developments. Yet, a minefield also affects not only local commerce and governance but also the surrounding populace. Operating in or near a minefield is rife with hazards, and the solutions to clearing a minefield range from the very destructive—with attendant drawbacks, such as making the land unusable for commerce or agriculture—to a methodical approach using specialized equipment and personnel with an understanding of both the dynamics and the impact of the action. Similarly, a megacity or sub-megacity is an inhospitable environment that not only reduces operational tempo, but also is rife with the possibility of unintended consequences and catastrophic mistakes. As such, it requires specialized equipment, highly trained soldiers and specialists, flexible doctrines, and adaptive operations. Just as military formations and other institutions must adapt to operating in a minefield, so must the Army and civilian institutions adapt for expeditionary urban operations.

Throughout the last century, military forces frequently engaged in urban combat, albeit often reluctantly, viewing it as an unwelcome deviation from more critical maneuver-orientated missions. Yet, armies maneuvering in the field cannot overcome the fact that urban areas are often the center of gravity for enemy forces, whether standing armies or sophisticated terrorist networks. Of greater concern is the acceleration of urbanization, especially in the developing world, which not only increases the likelihood of military operations being conducted in urban terrain, but also ensures that the battlefield will be densely populated. Civilians will no longer be mere bystanders able to be circumvented or avoided, but an integral component of the battlefield. Consequently, whether facing sophisticated armies and air forces or smaller, highly-mobile, non-traditional enemies, urban terrain dictates not only a shift in traditional utilization of military resources but also a greater understanding of those factors likely to impact military operations. In this connection, the urban environment has physical, social, and political attributes that impact military operations and, therefore, need to be examined.

Physical.

Urban terrain reduces the advantage for the attackers while providing significant benefits for the defenders. As the Russians discovered in Grozny, maneuvering in urban terrain—even with massive firepower superiority and modern equipment—can lead to ambushes that inflict considerable losses.[142] Cover and concealment is readily available to the defender, negating the advantages of long-range weaponry by precluding the use of many ground-based line-of-sight

systems. In addition, most modern cities, including some megacities and sub-megacities, have extensive sewer systems or subway systems that can be utilized in conjunction with travel within buildings to maneuver out of sight of the attacker or occupying forces.[143]

Consequently, most battles take place at close range, rendering air power and artillery far less relevant. Moreover, some opponents will intentionally "hug" friendly units or civilians to prevent or inhibit the utilization of heavier firepower.[144] Traditional reliance on air power is also difficult, as low-flying aircraft are highly vulnerable to man-portable air defense systems (MANPADS), which can be easily concealed within a large urban environment. In light of this, many of the advantages usually enjoyed by the U.S. military, such as high-tech long-range weaponry, are likely to be negated in dense urban environments.

The physical geography of urban terrain necessitates centralized planning but decentralized execution.[145] Lower-level noncommissioned officers and lower enlisted troops play a critical role in relaying the senior commander's intent and objectives, especially in military operations on urban terrain (MOUT)—operations in which units are widely scattered and require devolved leadership.[146] However, having such decentralized command structures inhibits the concentration of forces when needed, and can also lead to a loss of discipline. This in turn increases the chance of actions that might be counterproductive to the operation. The Mahmudiyah killings in Iraq—in which American soldiers from the 502nd regiment of the U.S. Army gang-raped and killed a 14-year-old girl and murdered her family—are a case in point.[147]

In the final analysis, the physical layout of urban terrain, in conjunction with its benefits to the enemy,

has far-reaching implications for contingency forces. Securing lines of communication and maintaining supply routes can be particularly difficult in urban terrain, requiring careful planning by personnel familiar not only with military considerations but also with the subtleties of urban planning and the management of systems ranging from transportation to sewerage. The combat potential and operational tempo of a maneuver force can be constrained by simple traffic jams, markets, and other day-to-day activities of an urban area. Enemy interdiction of supply lines is to be expected and, as recent combat experience in Iraq and Afghanistan suggests, can be quite effective in determining battlefield initiative and success.

Megacities are often Slum Cities.

In a megacity, physical factors often become physical barriers. Most megacities have a significant number of large slums. Such areas, sometimes termed sheet metal forests, are feral, squalid, underserviced, and incredibly difficult both to traverse and to penetrate for information. As depicted by Davis in *Planet of Slums*, life within these slums is often nasty, brutish, and short. Potable water is nearly nonexistent, communicable diseases are often rampant, and raw sewage as well as garbage is not only strewn about but accumulates at a dramatic rate.[148] Indeed, slums such as Kibera in Kenya, only three miles from the center of Nairobi, or Madanpur Khadar, on the outskirts of Delhi, have effectively been abandoned by governments. The result is a surplus of unemployed males with little to do but join gangs or engage in crime as a source of income. Joining extremist or terrorist organizations might also appear attractive as a way out.

At the very least, in the event of some kind of conflict, these young men would provide a pool of potential recruits for those opposing the United States. In short, slums would be an inordinately difficult battlefield.[149] They would add an additional constraint, challenging many of the traditional techniques of urban combat. The use of heavy firepower and of tactical air support—already difficult in cities—would be reduced even further due to population density and the flimsy nature of slum dwellings. Ironically, given that slums provide few of the defenses of more robust and traditional urban buildings, they could give an adversary an even greater defensive edge.

Yet, they are also Digital Cities.

The traditional focus on urban combat has been primarily on the terrain, with some focus on the population. However, most modern urban areas, even those in the least developed countries, are "information rich" in terms of open-source data about the movement of goods, people, and the infrastructure. In a megacity, such information is drastically greater, due to the size and density of the population and the extent of the urban area. The sheer size and volume of this data-rich environment could become overwhelming, leading to data overload or potential "stove piping" of information as the only way to manage it.[150]

Furthermore, the implications of social media and the rapid spread of information (and disinformation) in a highly digital city can be profound. For example, in June 2009, a woman was shot while attempting to peacefully demonstrate against the outcome of the Iranian presidential elections in Tehran.[151] A video surfaced of the incident in which she was allegedly shot

by a member of the pro-regime Basij militia.[152] Within hours, this video became viral, inflaming tensions and spurring 10 days of violent protests.[153] Similarly, here in the United States, the release of videos showing killings by police has led to significant protests and political movements. When the battle of Mogadishu occurred, the American public was aghast as American casualties were publicly paraded; yet, the video quality was poor and the dissemination of the footage was rather limited. With the rapid proliferation of mobile technology, dwellers of even the most underdeveloped megacity would be broadcasting a similar scenario in high definition and this would be globally disseminated within hours, if not minutes. Consequently, any mission within a megacity environment must consider the potential benefits and pitfalls of a digital environment that gives military activities an unprecedented degree of transparency.

The Human Terrain.

In thinking about military contingencies in megacities and sub-megacities, the most obvious issue is the terrain; yet, it is equally important to understand the people—not least because they are densely packed into a massive but still finite space.[154] Operating in a hostile city is enormously difficult, as the opportunities for ambushes, improvised explosive devices (IEDs), sabotage, the exploitation of "flash mobs," riots and demonstrations, and media events are infinite. If the support of the population is a key element in insurgency and counterinsurgency, it is even more critical in urban operations. To some extent this will depend on the extent to which economic and social life are respected and facilitated or disrupted and hindered.

In this connection, one aim of the contingency force (and this will obviously depend on the circumstances that have led to the insertion of military forces into the city) must be to minimize disruption on the functioning of the social and economic life of the city. Thinking systematically beforehand about how this can best be done is essential.

The "Mega Minefield."

Not only do megacities compound the familiar problems with conducting MOUT, but they also have a higher potential for instability than smaller cities. Therefore, problems such as civil unrest, basic infrastructure corrosion, and disease transmission will plague the governance of such cities and play significant roles in the military operations conducted within them. Furthermore, the extensive civilian population can significantly bolster adversary manpower reserves, and be quickly mobilized by nonstate actors to challenge governance of the city.[155]

The usual decentralization of MOUT operations would increase dramatically in a megacity. Large geographical distances and a teeming population would require a higher degree of decentralization in the case of stability operations. Moreover, difficulties in traditional MOUT would be compounded by the sheer distance and increased demands on a force attempting military operations within a megacity or large submegacity. Maintaining secure lines of communication and supply would be enormously difficult: not only would underdeveloped infrastructure slow resupply or casualty evacuation, but also the immense congestion experienced in these cities could bring such efforts to a crawl. Enemy interdiction of supply lines would

not only create the need for specialized equipment and dedicated combat power, but might also cause significant panic and spontaneous efforts at evacuation by the citizens.

Governance as a Nightmare as Well as Potential Savior.

The sheer scale and density of megacities and submegacities ensure that such urban environments are highly dependent on both effective governance and access to resources not found within the confines of the city. This has led some to compare the megacity to the un-consumable elephant, in which addressing the needs of the population and providing effective governance are beyond the means of any coalition or intervention force, at least for any protracted intervention.[156] The past decade has been replete with examples of the U.S. Army and its partners failing to provide the necessary resources for effective governance. These have ranged from New Orleans during Katrina, to Kandahar, Falluja, and Baghdad in Operations ENDURING FREEDOM and IRAQI FREEDOM. Consequently, additional urban and megacity-specific doctrine plans should be articulated, in which greater thought is given to the logistical and governance nightmares presented by large dense urban environments.

However, even in the least developed of megacities, there is a glimmer of hope for a savior. The population and host government themselves can often mitigate if not prevent greater calamities. A perfect example is during the Ebola crisis, when an Ebola-infected Liberian man named Patrick Sawyer collapsed upon arrival in Lagos, Nigeria.[157] Lagos, one of the world's

largest megacities and often characterized as underdeveloped, fragile, and borderline feral was able to not only get in touch with all 891 individuals potentially exposed, but also, with aid from the Bill and Melinda Gates Foundation, was able react quickly.[158] This was accomplished despite the fact that the doctors of the city were on strike. It was only possible because of the unique nature of a megacity. As the primary economic, political, and cultural driver of a region, a megacity is also the epicenter of many resources. Even in Nigeria, a doctor (not on strike) was able to recognize the patient's symptoms, impose a quarantine, and apply proper medical precautions.[159] The response reduced the infected to only 20 individuals, with only eight deaths in a city of 30.6 million.[160]

Thus, while megacities are often portrayed as significant hurdles to any military contingency operations, they also have invaluable assets that could assist in making what appears to be an overwhelming problem seem far more manageable.[161]

Increased Cooperation (Inter-Service and Inter-Agency).

More focus should also be given to operating in megacities and sub-megacities in a "whole of government" manner. At the very least, this requires greater cooperation with other military services and agencies. Considering that many megacities and sub-megacities are littoral, greater cooperation between the Army, Navy, and Marine Corps will become increasingly important. Understanding the capabilities, needs, and doctrine of naval operations will be crucial, therefore, in any future operations in megacities. The inter-agency process, however, will need to go well beyond this

and include a multitude of civilian agencies, which can bring to bear complementary expertise and a broader set of competences than the military acting alone.

Intelligence.

Megacities and sub-megacities should become a distinct focus of analysis for intelligence agencies. Understanding and anticipating developments and events in megacities and sub-megacities will need to become a central responsibility of the U.S. intelligence community, supplementing and at times even surpassing both the traditional focus on states and the more recent focus on transnational actors. At the same time, a comprehensive picture will require multiple streams of information going beyond formal intelligence sources. While information on network and power structures could be obtained and updated by the intelligence community, with infrastructure mapping and breakdowns provided by satellite data, much social, economic, and political insight, understanding, and even situational awareness could be obtained from non-governmental organizations. All of this would lead to an enhanced appreciation of urban dynamics, including patterns of flows and networks of relationships.[162] Operating effectively in megacities and sub-megacities requires an understanding of these flows and networks and an ability to determine when to exploit rather than disrupt their dynamics.

As discussed in the previous section, such a repository of knowledge and understanding will be essential for intelligence preparation of the battlefield in megacity and sub-megacity military contingencies. Moreover, this is not something that can be improvised for particular contingencies without a depth of

background knowledge and constant monitoring. At the same time, once the United States is involved in a megacity or sub-megacity contingency, then it should make extensive use of drones, sensors (including those inadvertently provided by citizens and adversaries), human intelligence, and big data to provide a more comprehensive understanding of the battle space. Given the ubiquity of cell phones even throughout much of the developing world, as well as the growing potential for exploiting drones and sensors, most megacities are likely to be target rich environments for technical intelligence. Indeed, intelligence could be collected at such a high volume that big-data processing would be both appropriate and necessary to determine hidden patterns and anomalies. Big data, however, would still need to be supplemented by human intelligence. Drones, no matter how technically complex and full of sensors, will have great difficulty gathering intelligence within a vast urban area in which adversaries will most certainly meet indoors. Human intelligence assets will be able to offer far greater insight on adversaries because of their ability to capture emotions and relationships—things that will long remain outside the purview of even the most sophisticated drones.

Private and Public Partnerships.

Numerous private organizations already conduct business within megacities. Many of these private firms conduct threat assessments and intelligence gathering. Furthermore, the necessities of conducting business force these organizations to evaluate topics relevant to military operations, such as crime, infrastructure, and local governance, as well as the potential for political and social unrest. In a similar fashion,

utilizing the large American academic community, and to some extent the global one, could assist in obtaining data concerning key megacities. Many academics already focus on issues such as urban planning and management, human security, and economic development—all of which are relevant to megacities and sub-megacities. Tapping into this vast pool of research could not only reduce costs by requiring fewer government employees, but would also increase efficiency by preventing public entities from spending limited resources to explore topics already thoroughly researched by academics.

Consequently, in light of the increasing constrained funding environment for the Armed Forces, more fully developed partnerships between private organizations and the Army can usefully be fostered. Such partnerships, however, should be clearly defined and structured so as to ensure that national interests as well as the Army's mission prevail over private interests. These partnerships will also need to include—at least tacitly and under careful guidelines—what might be described as non-traditional partners, such as the criminal organizations that have enormous knowledge of cities and how they function and would be better to have working with U.S. forces than against them.

Regionally Aligned Forces (RAF) and Partnerships.

RAF should become a cornerstone of both the Armed Forces and the foreign policy community. In an era of limited resources tasked with a multitude of missions and threats, prudence would dictate an emphasis on enhanced cooperation with regional partners. In this regard, the current focus on RAF could be

quite beneficial. Additionally, efforts should be made to highlight such cooperation among the media, academics, and other policymakers. Doing so would both create a greater understanding of cooperation among the U.S. Army and allied forces, as well as foster creative and novel ideas from a broad spectrum of contributors. Increased integration and cooperation with regional partners and collective security organizations should also be prioritized. Whether through existing arrangements or organizations, or through the advent of a new organization, the U.S. military should push for greater integration with regional partners whose interests are convergent with those of the United States.[163]

The "Equipment."

Enhancing the combat power and intelligence capabilities of smaller squad elements should be a key focus for conducting operations within megacities and sub-megacities. Not only would this reduce dependence on fire support or air power, but also it would aid the centralized command in creating a coherent picture of the battlefield. In a similar fashion, increased and self-contained combat power and reduced logistical needs should be pursued. If smaller elements are able to operate independently with greater potency and little reliance on a logistical system, then operating within megacities becomes a lot more feasible. In the same way, larger maneuver elements should develop capacities to deal with the myriad of problems associated with operating in a megacity and sub-megacity environment. Consequently, either new equipment must be procured or current equipment should be modified for use in megacities. This

equipment is divided into five sections: Command, Control, Communication, and Computers (C4); Force Protection and Projection; Intelligence, Surveillance and Reconnaissance (ISR); Logistics; and Maneuver equipment.[164]

Command, Control, Communication, and Computers (C4).

Overcoming the difficulties in operating in a mega-city or sub-megacity will require significant command and control communicated in real time through highly integrated computerized networks. Therefore, highly reliable and secure access to communications and the global network will be a large factor in determining success. Equipment should be designed to ensure intra-unit and inter-echelon communication under all conditions, with the focus on real-time access to needed information such as tactical intelligence and position location. Operations in Iraq and Afghanistan demonstrated that reliable C4 is a combat multiplier, but that much equipment is outdated or requires significant maintenance. Accordingly, any future procured equipment or modifications of current equipment should focus on decreasing the weight, ensuring reliability, and reducing the logistical requirements, whether through longer battery life or lower dependence on other power supplies. Miniaturization of sensors and drones, and, indeed, combinations of these, could be particularly important here. Additionally, such command and control equipment should be protected against disruption by increasingly technologically capable foes.

Intelligence, Surveillance, and Reconnaissance (ISR).

Successful operations within megacities and submegacities will require real-time tactical information and intelligence. Soldiers and battle commanders will not only require information, but also equipment to detect and track events and entities of interest. In conjunction with equipment that allows for actionable intelligence, soldiers and battle commanders will not only have a greater understanding of the battlefield, but will be able to impact events decisively on the ground. Increased focus on biometric technology to identify personnel and combine that information with actionable intelligence could pay great dividends. Similarly, investments in language translation equipment will most certainly pay large dividends, allowing for not only enhanced ISR but also greater C4. Finally, equipment creating an enhanced battle picture through multi-variable mapping of the political and socio-economic planes and levels of infrastructure will greatly enhance the capabilities and sustainability of smaller elements and provide for the best allocation of limited assets.

Reaching Forward and Backward.

As emphasized above, operations within megacities will require accurate, timely, and actionable intelligence. The military has previously attempted programs such as the land warrior system and instilling a sense of each individual soldier as an intelligence asset (so called "eyes and ears"). The benefits of such systems create both a "reach forward" and a "reach backward" capability. This reaching is only possible with greater integration and synergy between both

different command elements and numerous mega-city-centric actors. Reaching forward means that individual soldiers and their accompanying equipment (drones, GoPro cameras, land warrior-like systems) allow battlefield commanders, urban planners, and intelligence analysts a first-hand look onto the battlefield. For example, a soldier might not realize the significance of graffiti located on a wall, but an analyst seeing such footage in real time will be able not only to notify the soldier of its significance but also to compile a more accurate assessment of the situation on the ground. Similarly, an example of reaching backward would be a soldier requesting the services of a structural engineer to assess the structural weakness of a building in the kinetic phase of combat, or to help find a structural entry during a natural disaster scenario. A shortage of interpreters, to at least some degree, could also be overcome via reach-back sessions employing Skype or Facetime connections with remote language speakers.[165] While some of these technologies are readily available, at this time they are costly and cumbersome. Further research on the utility of such technology is likely to have substantial benefits.

Force Protection and Projection.

Equipment that provides protection from a range of enemy attacks, whether in an asymmetric or a conventional urban battlefield, is critical. Defeating the hazards of explosives should be a major focus, with increased attention on the detection of buried objects at standoff, out of direct line-of-sight, and over-the-horizon distances. Continued improvements in counter-rocket, artillery, and mortar (C-RAM), as well as personal protective equipment with an emphasis on

lightweight designs are vital. Counter sniper technology should also be pursued, as sniping might be a preferred tactic amongst adversaries across a broad spectrum of operations.

Technology enhancing the reliability of munitions as well as the capabilities for close fire support such as mortars should be pursued. Direct line-of-fire weaponry as well as Counter Defilade Target Engagement (CDTE) systems such as the XM25[166] should continue to be procured. The advantages of such weapons systems in denying adversaries the use of cover while minimizing collateral damage will be key in large complex environments such as megacities or sub-megacities.

Additionally, as the battle of Sadr City in 2008 demonstrated, heavy armored units have utility in urban operations.[167] Surprisingly, such heavily armored units cause less collateral damage than other means of fire support.[168] Additionally, such vehicles are survivable and lethal, and greatly enhance the combat power of units.[169] Therefore, innovation in armored vehicles should continue not only for maneuver warfare, but also with urban warfare in mind. Recent modifications to existing vehicles and newer armored vehicles such the Russian tank support combat vehicle Object 199 "*Ramka*"[170] and the IDF armored personnel carrier "*Achzarit*,"[171] were designed from first-hand combat experience in urban terrain. The U.S. Army should also modify existing vehicles or design an armored vehicle for the express purpose of operating in megacities and sub-megacities.

Logistics.

Operational sustainment in a megacity or sub-megacity will be intensive, requiring significant investment in technology and equipment that will enable the Army to outpace rapidly changing operational scenarios.[172] Munitions that increase combat capabilities but reduce the logistical weight of the maneuver elements should be a major technological investment area.[173] Considering the limited infrastructure in many megacities, bridging solutions (such as modular lightweight bridges) and the trade-offs between tracked and wheeled must be taken into consideration. Finally, greater priority should be given to water purification, fuel supply, and maintenance. This is critical, because any mission within a megacity or sub-megacity will have significant logistical requirements, whether due to scale, terrain, or enemy action.

Maneuver.

Equipment and technological innovation should also focus on increasing survivability and enhancing maneuverability of key systems and units in a megacity environment. Emphasis should be placed on increasing the capabilities and reliability of autonomous systems, thus reducing the exposure of personnel to enemy action. Additionally, considering both lack of infrastructure and high levels of congestion, fuel-efficiency-enabling technologies for Army tactical and off-road vehicles should be explored.

Furthermore, the density of many megacity environments means that vertical insertion may be the most efficient means of entry and egress.[174] As Dawn Morrison and Collin Wood argue, the vertical nature

of many cities offers man-made high ground.[175] Benefits of such high ground include much needed standoff distance, overwatch, greater potential access to clear communication channels, and the potential for rapid insertion and egress, all with minimal impact on the population.[176] Therefore, investing or examining technology to maximize the benefits of such man-made high ground will prove quite beneficial and might even restore some semblance of maneuver in usually very constricted environments.

The "Personnel."

Megacity and urban operations require intelligent and talented personnel capable not only of comprehending and complying with senior leaders' objectives, but also of gathering intelligence and understanding the dynamic relationships at play within an urban environment. Recruiting and retaining such quality infantrymen might be more expensive and increasingly difficult in light of the general lack of interest in military service by many talented individuals—especially given the attractions of more lucrative, yet safer, professions. Lawmakers and policymakers should understand that conducting effective military operations in urban areas requires high-quality personnel, and as such will require increased incentives for recruitment. With many private firms offering college tuition in addition to higher wages than the military, a new incentive structure must be created and maintained if the military is to train and sustain the high-quality personnel needed on 21st-century urban battlefields.

Attaining such a high-quality level of personnel will not only require more intensive use of traditional recruiting methods, but will also demand a revision in

recruitment, training, and retention practices. However, as the "Pentathlete" concept and the Special Forces Assessment and Selection system have demonstrated, recruiting and retaining higher-quality soldiers is feasible. Furthermore, by utilizing the accrued knowledge of numerous law enforcement agencies (domestically and internationally), the U.S. Army can greatly enhance its success in the non-kinetic battlefield environment. Although there might be criticism of such a proposal, especially in the face of increased costs and training duration, the benefits will be significant.

Selection and Training of Soldiers.

Former Chief of Staff of the Army General Peter Schoomaker frequently championed the concept of the "pentathlete leader," in which an officer is equipped with problem-solving capabilities and confidence to respond to any situation on the battlefield.[177] Similarly, former Secretary of the Army Dr. Francis J. Harvey identified the pentathlete as "a multi-skilled leader that personifies the warrior ethos in all aspects, from warfighting to statesmanship to enterprise management."[178] Consequently, the concept of a pentathlete leader has been incorporated into formal Army leadership instruction at numerous levels.[179] Such a concept should not only continue to be fostered, but megacity-centric skills should be explicitly taught at both the officer and enlisted levels (at least of the non-commissioned officers), so as to meet the exceptional challenges faced within the megacity and submegacity environments.

At first, such a task might seem incredibly difficult; yet a foundation already exists in current programs. The first is within the Special Forces Qualification Course (SFQC). In order to be given the opportunity to

try the course, candidates must have already achieved high scores on both the general technical and combat operations sections of the Armed Services Vocational Aptitude Battery (ASVAB) test.[180] Consequently, even before training, soldiers with a higher potential (insofar as the testing can indicate) are selected. Furthermore, in conjunction with comprehensive training and language instruction, Army Special Forces are able to develop formidable soldiers with multiple skills.

Given the complex nature of future conflicts, especially those within megacities, similar requirements should be imposed on most other soldiers. All military occupation specialties (MOS) would potentially gain from this initial pentathlete training and the more stringent requirements it imposes. If the Army were to choose to limit the program due to fiscal or other restraints, however, the emphasis should be on combat MOS. They would benefit most and would be better prepared, not only for current stabilization operations, but also for the even-more-demanding conditions likely to prevail in future megacity operations.[181]

Despite technological innovations, urban combat is ultimately the domain of the infantry.[182] Therefore, it requires highly trained and capable infantrymen, who are able to operate in an environment that is not only multi-dimensional, but one in which the opponent might have numerous advantages in cover, concealment, and intelligence. In at least some megacities, the adversary will have far larger manpower reserves than Army forces.[183] Yet, recruiting and maintaining a large infantry force is expensive, especially given legacy costs such as health and medical benefits. However, as the special forces community has demonstrated, smaller, better trained units with greater access to resources are just as effective as—if

not more effective than—larger forces with regard to post-kinetic missions, such as winning the hearts and minds of populations.

Law Enforcement Influences.

For many, the mention of megacity combat and law enforcement conjures up the dystopian image of the fictional character Judge Dredd.[184] While lacking the fictional power of such a figure, many law enforcement officials already tackle difficult problems facing megacities, such as the aftermath of an earthquake in Tokyo, or the search and seizure of a terrorist cell in London or more recently in Paris. Many of the military contingencies outlined in this monograph have been similar to contingencies confronting law enforcement agencies. However, while there might be some convergence within some of the roles and operations conducted by both, the two professions are significantly different, especially with regard to the battlefield. Yet, soldiers might find themselves in situations in which law enforcement personnel have had a great deal more experience and training. Joint training, with its opportunities for insight into the types of coercion and compliance that work at the community level, as well as other techniques used by law enforcement agencies, could be enormously beneficial.[185]

Furthermore, numerous studies have shown that law enforcement officers with a greater education (such as college degrees) are better at handling a large array of different situations than their counterparts without such qualifications.[186] The implication is that as the modern battlefield becomes more complex, especially in a potential megacity, there are significant benefits to imposing higher educational standards on

those specialized soldiers who will play increasingly complex roles.

Megacity-Centric Training and Inclusion.

In addition to infantry, other personnel, such as low-density but high-demand specialized units like civil affairs, military police, and transportation units should be involved in the conduct of MOUT operations. Such personnel should have backgrounds in engineering, infrastructure reconstruction, medicine, urban planning and design, law enforcement, and working with big data. These personnel will be able to tackle the less understood aspects of MOUT operations, providing basic needs and reconstruction efforts for the civilian population. A successful MOUT operation most certainly requires security, but having significant development and human security related operations, in conjunction with military security, increases the likelihood of a successful outcome. As the battle for Sadr City in 2008 demonstrated, the expertise of such personnel can have a major impact on the battlefield by easing the hold on the population of adversaries or by creating conditions for enhanced governance and subsequent civilian support.[187]

Additionally, megacity-centric training areas will be critical. As Kevin Felix and Frederick Wong noted, the U.S. Army simply does not possess the live-training areas that replicate the scale required to train for a megacity.[188] They argue that while the Joint Readiness Center's Shughart-Gordon complex is quite useful for squad level training, it lacks the multi-dimensional requirements for training in a megacity.[189] Given the tough budgetary constraints it faces, the Army should consider funding appropriate facilities through vari-

ous other means, whether those are from public or private ventures, or from collaboration with other interested parties.[190] Such a training area would enhance the capabilities of not only the Army but also other federal, state, and local agencies that would provide potential partners. Finally, other actors, primarily those concerned with governance and stabilization efforts, could also use such training facilities. Such actors could include law enforcement, urban planners, aid-delivery agencies, or even potential foreign partners or host nations. Conducting training in such an environment would greatly enhance the cooperation and potential lessons to be learned before conducting a mission within a megacity.

As Evans argued, "[the military planners conducting such training must in effect] assume much of the mindset of an urban planning executive."[191] Consequently, the training conducted on such a site should reflect the difficulties faced by many megacities and sub-megacities. Army forces conducting stabilization efforts have actually faced such difficulties numerous times. These difficulties include but are not limited to: providing electricity, sanitation, infrastructure maintenance, and other facets of everyday city governance. As Evans observed, "if city operations are to be a common future environment for American and allied forces, then an urban strategic lens must be developed . . ."[192] The discussion in this monograph is intended to contribute toward the development of such a lens.

OPERATING ON THE MEGACITY BATTLEFIELD

U.S. Armed Forces and their coalition partners, engaged in urban combat in a dense urban area, face far greater challenges today than in previous interven-

tions in already complicated and dense urban environments. As emphasized throughout this analysis, the megacity environment is highly complex and networked, and will require the Armed Forces to adapt and operate in ways that have a high degree of accord with the urban environment. Congruence rather than dissonance is essential.

The urban battlefield—like all terrain in which military operations occur—is not static, uniform, or monolithic. Moreover, as noted above, the occupants of a dense urban area are a major part of the terrain. Yet, this population and any opposition combatants will almost certainly attempt to leverage the complex characteristics of urban areas. This section first summarizes the characteristics of urban combat, drawing on past experiences and lessons learned from historical cases. Then we elaborate on what is termed the "contradiction of security." This is followed by a discussion of potential enemy actions, as well as of the unforeseen consequences and surprising developments that are an inevitable concomitant of military operations in a dense and massive urban environment. This section concludes with some future considerations.

Urban warfare has been a facet of war since humanity started to congregate into larger settlements. Consequently, throughout most of human history, urban combat has actually been more the rule rather than the exception.[193] From the ancient siege of Tyre (332 BC) by Alexander the Great, to the battle of Hue (1968) during the Vietnam War, urban conflict has not only provided significant challenges, but has at times also been a key to successful outcomes of many military operations. Consequently, the dense urban battlefield already has basic characteristics that define and constrain the combatants. These include ter-

rain, which highly favors the defense by restricting movement and creating funneled approaches for any would-be attacker. This terrain, as previously noted, is 360 degrees in scope, with subterranean, street level, and elevated buildings. Furthermore, the persistent threat of ambushes, in conjunction with the high potential for casualties and the high expenditure of ammunition, creates significant command and logistical difficulties. A brief look at past and potential urban operations will help bring understanding to the inherent difficulties of operating in such a complex battle environment.

Traditional State-on-State War.

The battles of Stalingrad (1942) and Berlin (1945) provide vivid examples of state-on-state warfare for major dense urban areas, both of which lead to extremely high casualties for all combatants. In the case of Stalingrad, the defensive phase lasted 126 days and resulted in 644,000 total Russian casualties and over 600,000 Russian refugees.[194] Both of these battles ultimately resulted in the utter destruction of the dense urban areas. A more modern scenario, which although unlikely is by no means inconceivable, could involve a battle in Seoul, in the Republic of Korea. In some ways, such a scenario exemplifies the potential for a contemporary Battle of Stalingrad. The greater Seoul metropolitan area contains over 23 million people, provides an incredibly dense metropolitan environment that has many elements of a smart city, and is critical to the economy of South Korea. This megacity, which faces an aggressive and unpredictable North Korea, is only 30 miles from the demilitarized zone and, in the event of hostilities on the peninsula, would likely

be an immediate target of North Korean conventional forces. The United States, bound by the Treaty to the Republic of Korea, would be obligated to come to its assistance. One of the advantages the United States would have in such a contingency would be access to detailed local knowledge of the city, its transportation routes and networks, its flows, and its rhythms. In this kind of traditional military conflict, such advantages might be less important than in other contingencies involving megacities. Whether they would be enough to offset North Korea's advantages in conventional forces, therefore, remains uncertain. The more U.S. military forces are educated, trained, and equipped for a dense urban conflict, the more likely the numerical advantage of North Korea would not prove nearly as decisive as Pyongyang might anticipate.

State vs. Nontraditional Actors.

In Mogadishu (1993) and Grozny (1995), the U.S. Army and Russian Federation Army respectively underestimated non-traditional actors.[195] In the case of Mogadishu, what was intended as a quick high-value target-capture mission instead resulted in a 17-hour firefight, in which a large city militia attacked American forces.[196] In the case of Grozny, the Russian forces utilized deep urban penetration tactics in the hope of seizing key infrastructure targets, but they were cut-off and destroyed. Both instances show how things can go awry and how those entities with deeply embedded knowledge of the city and an ability to mobilize their members can offset forces that possess conventional superiority.

The Contradictions of Security.

Any military force embroiled within a dense urban area must take into account the complexity of networks, flows, and rhythms. The population typically works within the familiar framework these create, establishing everyday norms and routines. If the framework is seriously disrupted, over the long-term it can adapt, creating new, if perhaps more constrained, rhythms. In the short term, however, serious disruptions of networks, flows, and rhythms—especially if man-made rather than the result of a natural disaster—will create considerable antipathy in the population toward those deemed responsible.

This creates an inevitable tension—what is described here as the contradictions of security— in that efforts to enhance security through measures such as erecting barriers or restricting movement would actually disrupt the flows, networks, and rhythms within the city. In effect, the defensive measures could create forms of arrhythmia so disruptive that significant segments of the population would be deeply alienated and even hostile. Far from making the urban landscape safer, such efforts could actually increase the hostility toward the intervention forces, whatever the initial mission. Glenn noted how this might occur:

> The commander drawing militarily-typical unit boundaries along physical features such as roads, rivers, and the like will find those boundaries become self-inflicted wounds should they not be realigned once combat operations recede. Savvy leaders can instead minimize liaison, communications equipment, and other demands by realigning boundaries with existing administrative jurisdictions. It is a lesson unfortunately repeatedly learned and forgotten, two of

> the most recent instances being during the Los Angeles 1992 riots and in 2003 Baghdad. Recognizing the importance of identifying administrative delineations, then providing them to operational planners could preclude yet another recurrence.[197]

The implication of Glenn's analysis is that even if military necessity requires actions that create dissonance and disruption in the city in the short term, these impediments to the normal flows and rhythm—whether control points or administrative hassles—should be eliminated as soon as possible.

In addition to inadvertent arrhythmia, however, it is also possible to conceive of the creation of arrhythmia as a deliberate strategy. Enemy forces might well decide that causing arrhythmia in the city could actually provide numerous tactical and strategic benefits—especially if the disruption could be specifically targeted against intervening forces—and even more if it can be somehow blamed on these forces or even their very presence. It is not hard to conceive, for example, of an armed group developing a blocking strategy that uses a coordinated approach of blocking roads through abandoning large numbers of vehicles in the streets that prevents access to and exits from the U.S. military headquarters in the city. A well-coordinated initiative of this type would create enormous difficulties for U.S. forces, especially if some of the vehicles contained booby traps or IEDs. Even if only a few of the vehicles contained IEDs, as long as they were located among the first to be cleared, this would ensure the whole clearance operation becomes much more painstaking—and far more protracted. If such a scenario seems far-fetched, it is worth noting that in 2011, the Zetas Organization, a Mexican criminal organization, attacked an Army base in Monterrey,

and they also blocked roads to ensure that reinforcements could not quickly come to assist the soldiers in the base. There is a risk, however, for armed groups in such a strategy, as they could be held responsible for disrupting the city—thereby losing considerable support. Nevertheless, this might be a risk worth taking.

Much the same is true for U.S. Armed Forces. The worst case for the U.S. military, of course, is the imposition of strict security measures that fail to increase security while also proving highly disruptive. Other attempts at enhancing security might succeed in this objective but simultaneously inhibit flows of commerce and people, thereby creating offsetting negative consequences. Such an outcome, however, is not preordained. When implemented in conjunction with other measures, enhanced security efforts can work, in spite of creating short-term dislocation. An example of this was the campaign in Sadr City in 2008. U.S. and Iraqi forces conducted an operation in which they reduced enemy activity within the Sadr City segment of Baghdad. The operation was a success because, while significant forces were directed toward building physical barriers to restrict enemy movement, additional resources were directed toward some very effective supporting operations.[198] These included a buyback program that increased the market value of arms and ammunition beyond the capacity of the enemy to compete, as well as measures designed to meet the essential needs of the population behind the walled areas.[199] Some critics have argued that providing for basic needs in fact might actually spur some people to become combatants. If young men, for example, are focused on getting their next meal or finding shelter, they will be too preoccupied to take up arms. However, if their needs are being met, then they

are potentially able to play a more significant role in the conflict. There might be something to this, but it ignores the fact that the provision of services and even more, employment opportunities, tends to create a degree of political support. Although not related to a megacity, the Anbar Awakening was an excellent example of how the United States was able to outbid the insurgents and, in that case, create its own militia.

A recognition of the dangers of a narrow approach to security is also critical in relation to competing narratives. While the Vietnam War and the battle of Mogadishu (1993) clearly displayed the power of the traditional media, the rise of social media has added a new and much more immediate dimension. In the digital age, facts will often be distorted, as events are broadcast minutes after occurring, often without a context or full picture. Such reports tend to become part of what John Arquilla and David Ronfeldt termed "the battle of the story."[200] Presenting compelling narratives can enhance legitimacy and authority in the eyes of many stakeholders (such as the urban population). Understanding the utility and power of digital media, therefore, allows for enormous reach and breadth that can indirectly alter the battlefield. The user-friendliness of mass media and mobile technology allows adversaries to manipulate and garner favorable public opinion and recruit support. For these reasons and more, civilian and military leaders cannot afford to ignore the requirement for compelling narratives.

A military commander should understand, therefore, that his or her decisions and the actions of subordinates could have far larger political impact than in the past because of digital media. This "information wake" will often be incomplete or inaccurate, but that will not prevent it from having serious conse-

quences. It is critical, therefore, that commanders not only enforce strict rules of engagement, interaction, and conduct, but also educate the lower echelons on the impact of the digital battlefield. Furthermore, higher echelons should comprehend that failing to understand and engage in this battle of the narrative might erode public support among not only those in the dense urban area in which military operations are being conducted, but also domestic publics and other stakeholders globally.

In the final analysis, the battle of narratives and the contradictions of security are likely to be at the forefront, especially as the most likely contingencies will be humanitarian or stabilization operations. Moreover, such operations could even take place within the continental United States, as demonstrated by the Los Angeles riots and the responses to Hurricane Katrina and Superstorm Sandy. Presenting a positive image of the military to the American public is indispensable for continued support.

Likely Enemy Actions and Potential Tactical Solutions.

In any military contingency, adversaries react and adapt to the tactical situation on the battlefield. Within a dense urban area such as megacity or submegacity, such reactions can be highly diverse—and have varying degrees of success. Adversaries might seek to minimize or reduce the benefits of U.S. technological or firepower supremacy by changing where they operate. Alternatively, they might seek to leverage technology to their own benefit. In many developing world megacities (such as Mumbai or Cairo), the high level of penetration of feature phones facilitates the creation of flash mobs. The Arab Spring, especially

in Egypt, highlighted the use of this tactic. During a military contingency in a megacity or sub-megacity, flash mobs could be used to hinder the maneuver of forces, to provide distractions, and to offer cover and concealment for an opposition group.

Choosing the place and time of battle is often critical for military success. The dense urban battlefield is no different. Enemy forces might exploit underserviced and underdeveloped feral areas, go underground, or use their knowledge of terrain to maneuver and engage on their own terms. Traditionally, adversaries have utilized the benefits of dense urban areas. These man-made "concrete canyons" restrict movement and funnel attackers, thereby providing significant advantages to defensive forces. The battle of Grozny (1995) clearly highlighted these benefits, as experienced by the Russians when they suffered significant casualties in their attempts at occupying the city. A traditional solution has been simply to increase offensive firepower and essentially raze the city to the ground, thus attempting to deny the enemy the advantages of cover and concealment. Even in World War II, however, this approach was flawed. The battles of Stalingrad (1942) and Berlin (1945), in which both cities were largely destroyed, proved that even the rubble of a city is still a significant source of cover and concealment and thus a combat multiplier. The more modern example of the battle of Grozny (1995) demonstrated that a much smaller defensive force could simply melt away as the attacker accumulated and brought to bear greater firepower. The Chechens simply relocated and, without adequate intelligence, the Russians then inadvertently caused civilian casualties and destroyed the infrastructure of the city.

The IDF utilized a novel conceptual approach during the battle of Nablus in 2002; "concrete canyons" such as streets, courtyards, and alleys were simply circumnavigated by moving horizontally through structures. By using explosives and other breaching tools, the IDF was able to maintain an operational tempo and deny the enemy the usual advantages of urban terrain. The U.S. military also enjoyed some success during the battle of Sadr City (2008) by utilizing heavy armored units in effective support for sustained street fighting.[201] On the other hand, during recent operations against the IDF in dense urban areas, Hamas utilized extensive underground networks to deny targeting and observation opportunities to the Israelis.[202] The resistance groups used an underground infrastructure to move around and maintain its operational capacity. Such underground structures—sewer and subway systems or underground tunnels built by illicit actors—are already part of the fabric of many dense urban areas. Furthermore, creating such structures near critical civilian infrastructure or population centers could further add to their utility. While numerous technological advances and weaponry make it possible to engage and destroy such underground networks, their continued utility and resilience will ensure their appearance in a dense urban environment.

Many megacities and dense urban areas also contain numerous slums or "sheet metal forests," which are very different from "concrete canyons." These areas cannot be traversed easily, if at all, with heavy armored units. Moreover, the use of heavy firepower will be restricted because of the density of civilians, and the inherently weak structures that are unable to provide any effective protection. At the same time,

these areas can provide significant concealment to adversaries, and even become strong operational bases. Apart from moving the population out and bulldozing the slum, there is very little that can be done. In addition, expulsion and relocation can prove difficult even in peacetime. In September 2014, the Indian city of Mumbai bulldozed 309 acres of slums to protect the airport region. The displacement of 90,000 slum dwellers, however, imposed additional resource demands on city authorities.[203] Attempting something similar during a military contingency would probably be regarded as politically unacceptable. An alternative would be to deal with alternate governance stakeholders, such as criminal entities, that often reside and operate in such slums and engage in both predatory and paternalistic behavior. A tacit or explicit agreement with the forces of alternative governance might make it possible to prevent adversaries from utilizing these "sheet metal forests." Of course, there would have to be something in return, even if only an implicit understanding that U.S. military forces would not interfere with the illicit business of the criminal organizations.

The proliferation and democratization of drones or unmanned aerial vehicles (UAVs) present both challenges and advantages within megacity combat zones. While much has been written about the benefits and drawbacks of drones, their utility in a dense urban area is hard to dispute. Their over-the-horizon capabilities as surveillance or weapons platforms, as well as their capacity to loiter over the battlefield, are significant assets. Yet, there are numerous anti-UAV defense systems (AUD) that reduce the effectiveness of drones. One of these AUD methods includes using cyber and technological means to hack or hijack the drone, either seizing it or rendering it inoperable. Other techniques

include counter-drone weaponry such as freezing rays or radio jamming, which are being developed by United Kingdom-based firms.[204] Another AUD low technology technique is using Dutch-trained eagles to hunt and destroy UAVs.[205] Moreover, it is only a matter of time until other states and non-traditional actors invest significantly in AUD technology. Similarly, while micro-UAVs and unmanned ground vehicles (UGVs) will provide added benefits on the battlefield, countermeasures will also rapidly be devised.

Finally, the use of smaller camera systems (whether micro-drones or the GoPro variety) and global positioning system (GPS) programs will provide real-time battlefield intelligence that could be a combat multiplier. Yet, there are limits inherent in the technology itself. Moreover, some useful technologies have not yet been widely adopted. For example, the Waze application provides navigation assistance and real-time traffic updates, but is community based and has not yet spread to the developing world. Consequently, there is no Waze map of slums within megacities. There are also some dangers; user-submitted data, for example, might be subject to deliberate manipulation. Perhaps even more important, the data flow would likely be reduced at the very time it is most needed. Military action would lead many of the users to flee the area, or forget about posting data as they try to keep themselves safe. Nevertheless, the long-term potential for such technology is considerable, as it would offer constant updating to existing maps.

Unforeseen Actions and Unanticipated Consequences.

Unfortunately, there are always unforeseen actions and inadvertent consequences in any military contingency. In the context of a dense urban area,

these include human crushes, inadvertent alienation of population segments, and a constant knowledge gap. Human crushes often occur when large groups of people are funneled through inadequate flow systems, and people are simply trampled to death. This occurred on August 31, 2005, when hundreds of thousands of people converged on a pilgrimage across the Al-Aaimmah Bridge in Baghdad.[206] A mortar attack earlier in the day hit part of the crowd, and many of the pilgrims suspected another attack was imminent. Consequently, a man claiming he saw someone wearing explosives triggered a panic. This caused a rush to the bridge, which had been closed for security reasons. As security forces opened a gate, people rushed the bridge, trampling and crushing those who fell. At least 953 people attempting to flee across the bridge were killed.[207] Unfortunately, such events are relatively frequent in dense urban areas in the developing world—even without military activities. They are even more likely in combat zones and cities targeted by terrorists. Consequently, commanders and their subordinates should be sensitive to the contradictions of security and recognize that, under some circumstances, heightened security measures could prove deadly—with significant media and political repercussions.

Another dilemma arises in relation to local knowledge. It is clear that there is no substitute for local knowledge and expertise, and unless this can somehow be co-opted by the contingency force, commanders will be operating at a major disadvantage. Consequently, attempts should be made to co-opt this knowledge, whether through better relationships with host governments and forces, building ties and relationships with criminal enterprises, or utilizing

private-public relationships. The difficulty is that such relationships can become too exclusive and thereby alienate other stakeholders, with both unforeseen and unfortunate consequences in the short term and long term.

Future Considerations.

Anticipating future combat scenarios is a formidable undertaking; there will always be knowledge gaps, major uncertainties, and unpleasant surprises. Sometimes there will also be indeterminate outcomes. Nevertheless, with increasing urbanization, the likelihood of combat or at least some kind of contingency in a megacity or sub-megacity increases. Given the trends in urbanization, especially in the global south and the concomitant problems of instability and fragility, it is more likely that the U.S. Army will find itself in a fragile or feral megacity than in a smart city. Consequently, it will have to display an unprecedented degree of sensitivity toward issues such as alternative governance, social and political networks, and the flows and rhythms of the city. Indeed, a willingness to make tradeoffs between enhanced security and maintaining the mobility inherent in cities will also be essential. Nor can the United States count on unchallenged technological superiority, as it will have to contend with both traditional and nontraditional forces engaging in both imitative and offset reactions. Moreover, the prospect of a "black swan" event or innovation that could dramatically change the dynamics of megacity combat cannot be ruled out. Such events or innovations play a disproportionate role, and are hard to predict. Nevertheless, by understanding the dynamics of a megacity and by engaging in appropriate doctrinal and technological innovation, the U.S.

Army can develop a robust capability for operating effectively in a megacity environment.

The impact of focusing on dense urban areas will obviously have an impact on the U.S. military and on the U.S. Army in particular. Through greater integration with non-kinetic stakeholders, the Army will become more adept at tackling humanitarian and governance issues. This will be of even broader relevance and importance—such issues have been critical in recent stabilization interventions such as in Iraq and Afghanistan. Therefore, the focus on governance in dense urban areas will indirectly increase Army expertise in stabilization efforts. Another significant benefit for the Army will be the integration of non-traditional technologies and tactics, such as the use of social media and law enforcement techniques as additional mechanisms of political leverage.

CONCLUSION

Urbanization will most certainly continue at a significant pace, resulting in cities becoming ever more important politically and economically. The likelihood, therefore, is that cities will become more important strategically, and that the United States will find itself, at some point in the not-too-distant future, engaged in military contingencies in large cities. It is imperative, therefore, that political and military leaders in the United States understand the intricacies of the interlinked systems that compose dense urban areas and are able to leverage that understanding into battlefield success. The U.S. Army can be better prepared for the dense urban battlefield than ever before through: a conceptual understanding of megacities and sub-megacities; an institutionally embedded system of intelligence collection and analysis for the

urban battlefield; innovations in doctrine, equipment, and training; and an appreciation of likely scenarios and adversary actions. Inherent and unforeseen challenges will remain. Indeed, it is important to keep in mind the cautionary note articulated by Barry Posen, who observed that:

> combat of any kind in an urban environment is very difficult. A skilled, reasonably well armed, adversary with a few thousand good and committed infantry can probably impose very significant costs on even a very competent Western military force. Military operations in urban areas should thus be avoided to the extent possible.[208]

Such cautions notwithstanding, an inhibition cannot be allowed to become a prohibition. If there is a highly compelling strategic rationale for action, the United States might not have the luxury of avoiding the dangers of an urban contingency. Consequently, it needs to be as prepared as possible, in terms of knowledge, equipment, training, and tactics. This is reflected in the following recommendations.

Key Findings and Recommendations:

- As megacities and sub-megacities take on increasing salience and importance in the next few decades, they should become a distinct focus of analysis for intelligence. Understanding and anticipating developments and events in dense urban areas will need to become a central responsibility of the U.S. intelligence community, supplementing and at times even surpassing both the traditional focus on states and the more recent focus on transnational actors. Cities have to be understood as a layered and

interacting series of complex adaptive systems, outlined with a more refined intelligence of and for the battlefield. Operating in these cities requires an understanding of these systems and an ability to harness rather than disrupt their dynamics.

- Developing a repository of knowledge and understanding of these cities is a critical component of IPB in megacity and sub-megacity military contingencies. Moreover, this is not something that can be improvised for particular contingencies without a depth of background knowledge and understanding. Given all this, it is critical that the U.S. Army create an Urban Analysis Center and a supporting network that provides a surge capability for crisis interventions.
- Greater cooperation among the armed services themselves is essential for any operations in megacities or sub-megacities. This requirement will be quite demanding and could all too easily lead to inter-service turf wars, particularly if the Army envisages combat operations in littoral urban areas, traditionally the preserve of the Marine Corps. Not only is cooperation among the armed services essential, but civilian government agencies (including the Department of State and the U.S. Agency for International Development) as well as law enforcement agencies will also have key roles to play. Their involvement is essential for success.
- It will also be necessary to interact with both the formal and informal mechanisms of governance within megacities and sub-megacities. This may involve cooperating with non-tradi-

tional stakeholders such as criminal elements or other alternative governance actors.

- Once the United States is involved in a dense urban contingency, then it should make extensive use of equipment and tactics that leverage American as well as coalition advantages and that reduce the capabilities of likely adversaries. This equipment should include drones, reach-back and reach-forward technologies (Skype, GoPro cameras, and components of a land-warrior type system), and appropriate logistics and maneuver technology.
- Conducting operations in megacities, as well as other urban areas, will require highly trained, quality personnel. The armed services will have to increase incentives to draw talented individuals to serve. It will also be necessary to incorporate recruits and affiliates with broader skill sets, especially those required for urban management and urban law enforcement. These initiatives will need to be complemented by in-house training for professional soldiers to prepare them more effectively for the demands of operating in complex urban environments.
- Recognize that there are synergies—and important economies of scale—between the skill sets required for operating in dense urban areas and those appropriate for stabilization operations.

Finally, this monograph proposes two broad checklist-based acronyms defined below—**URBAN** and **SMART**—that encapsulate many of the arguments and themes articulated in the preceding analysis. To fight effectively in a dense urban environment, the U.S. Army will have to meet the following requirements and approaches:

- **U**nderstanding the megacity battlefield;
- **R**esponding appropriately to the stringent demands of the urban battlefield;
- **B**attle management that is accommodating to the city's rhythms, flows, and networks;
- **A**lliances that go beyond government agencies and the usual partners; and,
- **N**ovel approaches that are essential to creating the smart urban soldier.

Moreover, within this urban approach the smart soldier would exhibit the following qualities:

- **S**ophisticated understanding of the urban battlefield;
- **M**ultimedia and social media awareness;
- **A**bility to act as intelligence collectors and receivers;
- **R**apid responses both within the command system and in decentralized operations; and,
- **T**echnological knowledge and expertise.

Ultimately, fighting smart in an urban environment is the only feasible approach. This monograph has offered some preliminary considerations of what this might mean. Yet, it has obviously raised more questions than it has answered and can be no more than an early contribution to a debate that needs to be broadened and refined. Only after such a debate will the United States be ready for future contingencies that are likely to be as challenging as they are inescapable.

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ISBN 1-58487-735-9

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