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Urban Warfare

Challenges of Military Operations on Tomorrow's Battlefield

Mikael Weissmann

Introduction

> The future of warfare lies in the streets, sewers, high-rise buildings, industrial parks, and the sprawl of houses, shacks, and shelters that form the broken cities of our world. We will fight elsewhere, but not so often, rarely as reluctantly, and never so brutally. Our recent military history is punctuated with city names—Tuzla, Mogadishu, Los Angeles, Beirut, Panama City, Hue, Saigon, Santo Domingo—but these encounters have been but a prologue, with the real drama still to come.[1]

It is often said that future combat will take place in dense urban areas, including in megacities, and the importance of urban warfare has been widely recognized. Today, it is agreed upon and accepted that the battlefields of tomorrow will include battles in urban terrain. This is a fact that could be observed in practice after the Russian invasion of Ukraine in February 2022. In short, to prepare for urban warfare has become a necessity.[2] This necessity is the result of a number of reinforcing trends, urbanization and technology being driving forces, the former makes it clear that cities are the centre of gravity and the latter forcing insurgency into the urban areas as it is providing the defensive advantage needed for irregular forces to survive.

[1] Ralph Peters, 'Our Soldiers, Their Cities', *Parameters* 26, 1 (1996).

[2] A number of labels are used for operations and combat in urban environments, including urban operations, military operations in urban terrain (MOUT), operations in built-up areas (OBUA), fighting in built-up areas (FIBUA), and Close Quarter Battle (CQB). The labels often have specific definitions in doctrine and handbooks. For the purposes of this chapter, the term urban warfare is used as a blanket term for different forms of operations and combat in urban terrain.

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The changing character of war, with a compression of time ('the death of distance'), with the information domain being the centre of gravity, with space and cyber domains in their own right, with AI coming to the forefront of military thinking, can be added to the above.[3] In short, fighting asymmetrical warfare, where the weaker force must seek defence in urban areas, has become a necessity, in particular in the Global South where mega- and feral cities will become the new normal, sometimes even in the form of cross-border megaregions, creating previously unheard of complexity.[4]

Furthermore, future urban operations will need to meet challenges from both cross-domain and cross-conflict-spectrum fighting, since the grey zone between peace and war has grown. The former calls for multi-domain operations, whilst at the same time handling urban warfare in an operating environment that is often situated in the grey zone between peace and war.

A future that includes urban warfare is widely recognized among practitioners. It is a case in point that General Mark Milley, then Chief of Staff of the US Army, now Chairman of the Joint Chiefs of Staff and the highest ranking officer of the US Armed Forces in 2016 stated '[I]n the future, I can say with very high degrees of confidence, the American Army is probably going to be fighting in urban areas', adding, 'We need to man, organize, train and equip the force for operations in urban areas, highly dense urban areas.'[5] A similar idea can be seen with regards to NATO, where a general consensus exists that NATO forces will be engaged in urban operations in the future, and the need for NATO Allies to strengthen their capabilities in the area is recognized.[6] In short, Lt. Col. Leonhard seems to have been correct when he argued in 2003 that, 'Urban areas should become our preferred medium for fighting. We should optimize our force structure for it, rather than relegating

[3] Zachery T. Brown, 'Unmasking War's Changing Character', *Modern War Institute*, 12 March 2019, https://mwi.usma.edu/unmasking-wars-changing-character/. Also see T. X. Hammes, 'The Changing Character of War', 15 May 2022, https://keystone.ndu.edu/Portals/86/Future%20of%20Conflict.pdf; T. X. Hammes, 'Technologies Converge and Power Diffuses: The Evolution of Small, Smart, and Cheap Weapons', *Policy Analysis* no. 786, Cato Institute, 22 January 2021.

[4] Jeremiah Rozman, 'Urbanization and Megacities: Implications for the U.S. Army', The Institute of Land Warfare, the Association of the United States Army, ILW SPOTLIGHT 19–3, August 2019, https://www.ausa.org/sites/default/files/publications/SL-19-3-Urbanization-and-Megacities-Implications-for-the-US-Army.pdf; Margarita Konaev, 'The Future of Urban Warfare in the Age of Megacities', *Focus stratégique* 88 (March 2019); Joel Lawton and Lori Shields, 'Mad Scientist: Megacities and Dense Urban Areas in 2025 and Beyond', United States Army, Training and Doctrine Command (TRADOC) G-2, Fort Eustis, VA, 18 August 2016, https://community.apan.org/wg/tradoc-g2/mad-scientist/m/mdua/170637.

[5] Michelle Tan, 'Army Chief: Soldiers Must Be Ready To Fight in "Megacities"', *Defense News*, 5 October 2016.

[6] Philippe Michel-Kleisbauer, 'URBAN WARFARE', NATO Parliamentary Assembly, SCIENCE AND TECHNOLOGY COMMITTEE (STC), Sub-Committee on Technological Trends and Security, 20 November 2020, 12.

it to Appendix Q in our fighting doctrine, treating it as the exception rather than the norm. … Instead of fearing it, we must own the city [sic].'[7]

The need to plan for urban warfare has also been observed given the increasing frequency of operations in cities in the last two decades. After the September 11 attacks, the US military became entangled in war in Iraq and Afghanistan. At the same time as the US Army and the United States Marine Corps (USMC) fought al Qaeda supporters and the Taliban mainly in the rural farm areas and eastern mountains of Iraq, US forces also found themselves fighting in Baghdad, Fallujah, Tal Afar, Ramadi, Najaf, and many more urban areas.[8] This trend has continued, with major urban battles involving city attacks identified in the ongoing civil war in Syria, the war against the Islamic State in Iraq, Syria, and the Philippines, and in Ukraine.[9]

This chapter will address the daunting challenge of urban warfare on tomorrow's battlefield. In the first section, it will provide a brief background of the urban warfare phenomenon. It approaches urban warfare by asking why the field has now emerged after a long period of relative neglect. Thereafter, the chapter outlines the different challenges to and expectations for urban operations on today's and tomorrow's battlefields. Here, a number of key challenges will be addressed: the impact of rapid urbanization, multi-domain operations, the grey zone problems, and the impact of technology on urban operations, and the urbanization of insurgency. Finally, several conclusions will be drawn.

One problem in most urban warfare research, as well as in doctrine and handbooks, is a focus on superior and more technologically advanced Western regular forces, often the USA, conducting offensive operations against weaker, less technologically advanced irregular forces. Whilst this focus is of course not unjustified, given the short-term needs of the field, this chapter will take a broader perspective and engage throughout with the impact of the offensive/defensive dimension, types of force, power symmetry, and level of

[7] Lt. Col. Leonhard, U.S. Army cited in Stephen Graham, 'Imagining Urban Warfare: Urbanization and US Military Technoscience', in *War, Citizenship, Territory*, edited by Deborah Cowen and Emily Gilbert (New York, London: Routledge 2008), 41.

[8] Gian Gentile, David Johnson, Lisa Saum-Manning, Raphael Cohen, Shara Williams, Carrie Lee, Michael Shurkin, Brenna Allen, Sarah Soliman, and James Doty, *Reimagining the Character of Urban Operations for the U.S. Army: How the Past Can Inform the Present and Future* (Santa Monica, CA: RAND Corporation, 2017), 1.

[9] Recent examples include Aleppo, Syria, 2016; Ghouta, Syria, 2018; Deir ez-Zor, Syria, 2017; Ilovaisk, Ukraine, 2014; Kobani, Syria, 2014/2015; Debal'tseve, Ukraine, 2015; Ramadi, Iraq, 2015/2016; Fallujah, Iraq, 2016; Mosul, Iraq, 2016/2017; Raqqa, Syria, 2016/2017; Marawi, Philippines, 2017; Tal Afar, Iraq, 2017.

Other historical examples of city attacks in limited warfare where the attacking force attempted to kill the defenders or seize the city include Hue, Vietnam, 1968; Vukovar, Croatia, 1991; Sarajevo, Bosnia and Herzegovina, 1992–1996; Grozny, Chechnya, 1994/1995; Grozny, Chechnya, 1999/2000; Fallujah, Iraq, 2004. (John Spencer, 'The Eight Rules of Urban Warfare and Why We Must Work to Change Them', *Modern War Institute*, 12 January 2021, https://mwi.usma.edu/the-eight-rules-of-urban-warfare-and-why-we-must-work-to-change-them/).

Table 7.1 Dimensions of warfare

Dimensions	Us	Them
Offensive/defensive	Attacker	Defender
Type of force	Regular	Irregular
Power symmetry	Asymmetric/STRONG	Peer or near-peer adversaries
Technology	HIGH TECH	LOW TECH

technology (see Table 7.1). For example, how do we conduct urban warfare against peer or near-peer adversaries? How does the proliferation of civilian technology impact urban warfare?

Approaching Urban Warfare

> … the worst policy of all is to besiege walled cities.
>
> **Sun Tzu, The Art of War**

Whilst urban warfare itself is nothing new, there are trends inexorably forcing battles to move to urban areas to a greater extent than ever. Rapid urbanization and new technologies are two forces moving warfare toward urban areas, whilst also impacting the manifestation of the urban battlefield and how urban battles are fought. The strategic environment is changing with population growth and inexorable urbanization, as global populations move to cities, often megacities with populations of over 10 million. Today, more than half of the world population lives in urban areas.

Furthermore, technological development not only forces battles into the city, for example when sensors eliminate the cover traditionally gained from darkness or forests, or so that irregular fighters can resist technologically superior forces, but also transforms the battlefield along the digital/cyber dimension, breaking down the border between kinetic and non-kinetic warfare. Technology also throws into question what is (identifiable) warfare, further increasing the need to account for non-conventional warfare, much of which can be expected to occur in the urban areas where half the world's population lives.

As wars tend to ultimately be decided where people live, armies need to organize, equip, and train to win fights in urban areas, including in megacities.[10] This is a daunting challenge, as military leaders have steered away from conducting operations in cities for 2,700 years. In 500 BC, Sun Tzu advised

[10] David Kilcullen, *Out of the Mountains: The Coming Age of the Urban Guerrilla* (Oxford, New York: Oxford University Press, 2013), 28.

against attacking walled cities, calling it the worst military policy of all, and doctrine as recent as the post-Second World War era advised avoiding, isolating, or bypassing cities altogether.[11] This has clearly changed, as military leaders recognize and prepare for a future of urban warfare.

The significant advantages of dense modern urban terrain to the defender, together with urban canyons—that is, streets flanked by buildings on both sides—and underground warfare, also explain why experience and doctrine advise avoiding cities. This is also why past US doctrinal manuals emphasized that urban areas should be avoided insofar as possible, since historical experiences, for example at Aachen, Metz, and Manila in the Second World War, Seoul during the Korean War, and Hue during the Vietnam War, show that urban combat can be extremely costly for both combatants and civilians.[12]

In fact, as argued by Ian Rigden, '[t]he urban environment is perhaps arguably the most difficult because it is among the people and it is a man-made environment with all the intentional and unintentional challenges that entails. … There are rarely clear winners in urban warfare which, in the context of warfare in the twenty-first century, challenges the very concepts of winning and victory.'[13]

It should be noted that the city-avoidance doctrine can at least in part be traced to Cold War thinking regarding the eventuality of US ground forces confronting the Soviet Union in Western Europe, where fighting would take place not in large cities or urban areas but out in the open.[14] Not until the late 1990s, nearly a decade after the end of the Cold War, did US planners begin to realize that large urban areas could not be avoided, since they were the hubs of political, economic, and cultural significance.[15]

Looking further back, cities have always been centres of gravity, thus fighting has often been drawn toward cities. Perhaps a force needed to attack an urban area to destroy the enemy, achieve a strategic location, or access a capability needed for future operations. Often, an inferior defender sought shelter in urban terrain, which provides an inherently defensive advantage.[16] This

[11] Kenneth K. Goedecke and William H. Putnam, *Urban Blind Spots: Gaps in Joint Force Combat Readiness*, National Security Fellows Program, Paper, November 2019, Belfer Center for Science and International Affairs, Harvard Kennedy School, 6.

[12] David Johnson, 'Urban Legend: Is Combat in Cities Really Inevitable?', *War on the Rocks*, 6 May 2019, https://warontherocks.com/2019/05/urban-legend-is-combat-in-cities-really-inevitable/.

[13] Ian Rigden, 'The Poisoned Chalice: Urban Warfare in the Twenty-First Century and Beyond', in *A History of Modern Urban Operations*, edited by Gregory Fremont-Barnes (Cham: Palgrave Macmillan, 2020), 346.

[14] Gentile et al., *Reimagining the Character of Urban Operations for the U.S. Army*.

[15] Ibid.

[16] Louis A. DiMarco, *Concrete Hell: Urban Warfare from Stalingrad to Iraq* (Osprey Publishing, 2012), 15.

can also be seen today in, for example, Afghanistan, Iraq, and Syria, as well as historically.

However, there is one key difference between historical and present-day battles over cities. Historically, battles were fought *about* the city, but seldom *in* the city. Siege warfare entailed breaking through the outer walls thereby having conquered the city, in contrast to modern day house-to-house fighting which is a very different beast. Historically, siege warfare was common and can be traced back to antiquity. It was also common during the Middle Ages. In fact, not until the Second World War did extensive fighting within cities become a more common occurrence.

The historical fact of urban warfare does not, as we will see, mean that it has not changed. The character of warfare has changed, and the size and complexity of the urban terrain has grown exponentially. Furthermore, the international security environment has become more complex, the world more interconnected, and there is increasingly no clear distinction between war and peace, as we live in a grey zone where conflict is always ongoing, and where non-kinetic effects also play an important role.

This complexity has been recognized by military forces and scholars alike. To cite the UK Ministry of Defence, 'the urban environment will be one of the most challenging areas to operate in. The city, and its surrounds, will become an increasingly complex and ambiguous tapestry of multiple actors with shifting allegiances, in which we may be required to operate in a variety of ways, from major conflict at range to peace support and humanitarian operations'.[17] Professor Anthony King of Warwick University even argues for treating urban warfare as its own domain together with land, sea, air, space, and cyber: '[T]oday, urban warfare has coalesced into gruelling micro-sieges, which extend from street level—and below—to the airspace high above the city—as combatants fight for individual buildings, streets, and districts. At the same time, digitalized social media and information networks have communicated these battles to global audiences across the urban archipelago, with these spectators often becoming active participants in the fight.'[18]

Having clearly demonstrated the level of complexity of future urban warfare, it is now time to look closer at the future challenges, their impact, and the means of managing them.

[17] UK MOD Developments, Concepts and Doctrine Centre, *Future Operating Environment 2035* (14 December 2015), 55.

[18] Anthony King, *Urban Warfare in the Twenty-first Century* (Cambridge UK, Medford MA: Polity Press, 2021).

Future Challenges for Urban Warfare

> We talk about the three-block war, but we are moving quickly to the four-floor war. … We are going to be on the top floor of a skyscraper … evacuating civilians and helping people. The middle floor, we might be detaining really bad people that we've caught. On the first floor we will be down there killing them. … At the same time, they will be getting away through the subway or subterrain. How do we train to fight that? Because it is coming, that fight right there is coming I do believe with all my heart.
>
> **Brig. Gen. Julian Alford, the Marine Corps Warfighting Laboratory commander**[19]

As outlined above, at least four key areas pose fundamental challenges to expectations about fighting tomorrow's wars. This section addresses those areas, focusing first on urbanization, as the cause of increasingly urbanized warfare and the defining feature of the battlefield of the future. Thereafter, the focus moves to discussing multi-domain operations and the handling of grey zone problems. Thirdly, emerging, novel, and disrupting technologies are addressed as forces move battles into the city and alter how urban battles are fought. Finally, the fourth section analyses the irregular turn in urban warfare and the urbanization of insurgency, given the increasingly critical importance of urban areas for irregular and weaker actors seeking to challenge a superior or stronger opponent.

Urbanization

The rapid urbanization trend is one of the main reasons why urban warfare has been identified as a key area for the battles of the future. The most recent National Intelligence Council report, *Global Trends 2040*, sees the urbanization trend continuing, and expects the share of urban population to rise from 56 per cent, in 2020, to nearly two-thirds by 2040. Nearly all this growth is predicted to occur in the developing world, with urban residents of poor countries projected to increase by 1 billion, to more than 2.5 billion by 2040.[20] Furthermore, and of foremost importance for the future urban battlefield, both large and mega cities are increasing. It is estimated

[19] Cited in Jen Judson, 'US Troops Need Training to Battle in Future Megacities, Marine General Warns', *Defense News*, 25 May 2017, 3.

[20] National Intelligence Council, *Global Trends 2040: A More Contested World* (The National Intelligence Council 2021). P 20.

that more than 600 million people will live in almost 40 megacities by as soon as 2025–2030. Another approximately 400 million people will live in cities of 5–10 million people, and just over 1 billion will live in cities in the 1–5 million range.[21]

The urbanization trend does not stop here. In fact the 'peri-urban' or 'rurban' areas—the space between the city and the countryside—is growing faster than city centres. There is also an increase in the number of megaregions, metropolitan regions that spill over multiple jurisdictions, with at least 40 large bi- or tri-national metro-regions expected by 2030.[22] To this, add littoral cities. To cite David Kilcullen, '[a]lready in 2012, 80% of people on the planet lived within sixty miles of the sea, while 75% of large cities were on a coast. Of twenty-five megacities … at the turn of the twenty-first century, twenty-one were on a coast or a major river delta, while only four (Moscow, Beijing, Delhi, and Tehran) lay inland.'[23]

In short, the battlefield of the future is, if not a nightmare, at least a great challenge. Not only is the size of the urban terrain daunting,[24] but as strategists have long preferred avoiding the complex and messy environments of coastal cities, the fact that cities tend to develop on coasts complicates the task further. Coastal cities also often include waterways, like canals, river, inlets, and harbours, creating an overlapping need for sea and land capabilities.[25]

Challenges and Problems

Urban warfare is the most difficult form of warfare, being a high-cost, high-risk operation. With rapid urbanization, not only will the rate of urban warfare increase, but it will increase in complexity and scope as the scale of urban areas grows. For example, Fallujah was a densely populated city occupying an area of approximately 25 square kilometres, including its immediate surroundings, and with a population of between 250,000 and 350,000 people and 50,000 structures.[26] In contrast, Jakarta, the capital of Indonesia,

[21] European Strategy and Policy Analysis System, *Global Trends to 2030: The Future of Urbanization and Megacities*, 1, https://espas.secure.europarl.europa.eu/orbis/sites/default/files/generated/document/en/Think%20piece%20global%20trends%202030%20Future%20of%20urbanisation.pdf.

[22] National Intelligence Council, *Global Trends 2030: Alternative Worlds a Publication of the National Intelligence Council* (Washington, DC: National Intelligence Council, 2012).

[23] Kilcullen, *Out of the Mountains*, 30.

[24] See e.g. Lawton and Shields, 'Mad Scientist'; Mad Scientist Laboratory, '44. Megacities: Future Challenges and Responses', 12 April 2018, https://madsciblog.tradoc.army.mil/44-megacities-future-challenges-and-responses/; Dave Dilegge, Robert J. Bunker, John P. Sullivan, and Alma Keshavarz (eds), *Blood and Concrete: 21st Century Conflict in Urban Centers and Megacities* (Bethesda, MD: Small Wars Foundation, 2019); Konaev, 'The Future of Urban Warfare in the Age of Megacities'.

[25] Kilcullen, *Out of the Mountains*, esp. 263–94.

[26] Timothy S. McWilliams and Nicholas J. Schlosser, *U.S. Marines in Battle: Fallujah November–December 2004*, United States Marine Corps, 15 May 2022, https://www.usmcu.edu/Portals/218/FALLUJAH.pdf.

is an urban area of almost 35 million people covering an area of 16,262 square kilometres. Furthermore, at the time of the Second Battle of Fallujah in November–December 2004, only an estimated 500 civilians remained together with 3,000 to 4,500 insurgents.[27] Even Mosul, about 180 square kilometres with a population of 1.5 million, is dwarfed by a megacity like Jakarta.

The vertical dimension must also be considered. As JP 3-06 notes, '[v]olume, not area, is the more pertinent spatial measure of the urban environment' since a '10-story building may take up the same linear space on a two-dimensional map as a small field, but the building has eleven times the actual defensible space—10 floors plus the roof and any associated subterranean structures.'[28] Admittedly an extreme case, Hong Kong in 2018 had 8,733 high-rise buildings and 300 buildings surpassing 150 metres in height.[29]

Drawing on John Spencer's eight rules of urban warfare,[30] the defenders' advantage grows exponentially with the size and complexity of the city, as does how 'urban terrain reduces the attacker's advantages in intelligence, surveillance, and reconnaissance, the utility of aerial assets, and the attacker's ability to engage at distance'. The problem buildings pose 'as fortified bunkers that must be negotiated' increases in a large city, as does the defenders' ability to maintain 'relative freedom of maneuver within the urban terrain', and as do problems with the underground serving 'as the defender's refuge'. To give an example, the proceedings of the 2018 Multi-Domain Battle in Megacities Conference indicate that the army today does not have sufficient divisions to isolate and control one megacity, and that it would not be feasible for a coalition military force to conduct extensive combat operations across the whole expanse of a megacity.[31]

A challenge is also posed by complex, adaptive, and interconnected systems characterizing megacities. As observed by Spencer, 'Cities are complex adaptive systems—or more accurately, many systems of systems. … Like other complex systems, when it is touched, it changes, and the system's complexity makes it nearly impossible to truly know the second- or third-order effects

[27] Ibid., 6.

[28] Joint Chiefs of Staff, *JP 3-06, Joint Urban Operations* (2013), I-3.

[29] Hana Davis, 'How Hong Kong Rose to Become Tallest City in the World', *South China Morning Post*, 30 June 2018, https://www.scmp.com/news/hong-kong/community/article/2152952/how-hong-kong-rose-become-tallest-city-world.

[30] Spencer, 'The Eight Rules of Urban Warfare and Why We Must Work to Change Them'.

[31] Russell W. Glenn, Eric L. Berry, Colin C. Christopher, Thomas A. Kruegler, and Nicholas R. Marsella, eds, *Where None Have Gone Before: Operational and Strategic Perspectives on Multi-Domain Operations in Megacities*, Proceedings of the 'Multi-Domain Battle in Megacities' Conference, 3–4 April, 2018, Fort Hamilton, New York, 11–13; Konaev, 'The Future of Urban Warfare in the Age of Megacities'.

of those changes.'[32] In short, assessing the full effect of one's actions in an urban setting, both within the area itself and effects in other interconnected cities across the globe, is arguably an impossible task (see also the section on Technology below).

With size come new tactical challenges that place new demands on doctrine, training, and partnerships. The combined effect of skyscrapers and high-rise buildings, tunnels, and the sheer density of today's cities challenges such basic elements of warfare such as fires, manoeuvre, communication, and situational awareness. Large cities also challenge electronic and cyber capabilities, given difficulties communicating between floors in high-rise buildings and at subterranean levels, for example (not to mention the challenge of fighting in subterranean environments and in high-rise buildings). Buildings and other urban features also hamper the efficiency of weaponry, often acting as fortifications. For example, a study conducted by the Bundeswehr in the late 1990s found that munitions were unfit for modern combat conditions; the 20-mm gun arming their Marder infantry-fighting vehicle lacked penetration power and the Leopard tank's multipurpose (MZ)25 12-cm hollow-charge shell was unable to blast a hole big enough to penetrate a building.[33] The complexity of urban areas also often provides the defender with distinct advantages and the ability to maintain the initiative.[34]

Given the added layers of complexity in urban warfare, not found in operations in unpopulated, rural terrain, the demand for intelligence is paramount. This is particularly so given that cities are centres of human activity, where the civilian population often outnumbers enemy combatants. Thus, there is a need to understand the civilian population as well as the enemy. It is essential to find a good mix of different intelligence sources, including Human Intelligence (HUMINT), Signals Intelligence (SIGINT), and Open-Source Intelligence (OSINT) (but also Communications Intelligence (COMINT)), Imagery Intelligence (IMINT), Geospatial Intelligence (GEOINT), and Measurement and Signatures Intelligence (MASINT)). It is important to develop an advanced system for operational assessments, analysis, and planning, including everything from skilled analysts to AI- and machine-learning capabilities. Future urban warfare is very much a big data affair, where at issue might be whether a given analysis asks the correct question of a

[32] Graham, 'Imagining Urban Warfare'; Stephen Graham, *Cities under Siege: The New Military Urbanism* (London, New York: Verso, 2011); Stephen Graham, *Vertical: The City from Satellites to Bunkers* (London: Verso, 2018); John Spencer, 'The City Is Not Neutral: Why Urban Warfare Is So Hard', *Modern War Institute*, 22 March 2020, https://mwi.usma.edu/city-not-neutral-urban-warfare-hard/.

[33] Alexandre Vautravers, 'Military Operations in Urban Areas' (en), *International Review of the Red Cross* 92, 878 (2010).

[34] Gentile et al., *Reimagining the Character of Urban Operations for the U.S. Army*, 119.

system, rather than answering it itself. If this is not done, one will inexorably lag behind in the OODA-loop. The main challenges to tackle here are (1) the collection, processing, and dissemination of information (so-called 'fog of information' problems), (2) intelligence and the role of the security function in the planning process (information dissemination between and within levels), and (3) continuous assessment and operational adaptation (flexibility).

Achieving Success

The key for success in operations and combat on the future battlefield is as simple as it is difficult to achieve: the daunting challenges and problems of urban warfare must not be avoided or downplayed. The difficulty of this task makes it even more important to be as well prepared and trained as possible. Because urban warfare will arise. Despite preferences for avoiding urban terrain, you will simply not be able to (and be victorious). Preparation requires building intelligence capabilities suitable to the urban environment. Good leaders and fit, well-trained soldiers are also, as always, essential. Soldiers must be well educated and trained in urban warfare tactics.

It is also important, particularly in a European context, to plan for contingencies beyond offence. The defence of urban areas should be planned for. Similarly, most urban warfare writings assume that the opponent is irregular fighters, not a regular army. This may also change in a European context, where armies must also train for contingencies where the adversary fields regular forces. Learning to fight against regular forces may also be useful elsewhere. Often, as in Afghanistan and elsewhere, the opponent—or their units—have been professionally trained and are furthermore battle tested (and reasonably equipped). With the proliferation of the private military industry, one must also be prepared to meet highly trained private soldiers, who are often former regular soldiers.

There is also a problem related to power symmetry, we are not well equipped for fighting peer- or near peer adversaries in urban terrain, nor for the idea that we are the weak part of an asymmetric power capability. What if we cannot compartmentalize and separate the opponent? What if we must fight outnumbered? These contingencies must be addressed. Part of the problem here is that much of the research is done by the USA who wield incomparable military power, and Israel, whose situation is unique. Much can be learned from the USA and Israel, but it is also important to remember one's own situation and needs, as well as capacities.

A similar situation applies with regard to technology (see the section on Technology below), although here the technological breakthroughs also

create capabilities available beyond militaries, in the form of unmanned aerial vehicles, or using the internet for surveillance and control. Yes, these provide an edge, but there is a quantitative aspect.

In conclusion, thought must be given to future wars and those one is expected to participate in. Megacities do apply in some cases, particularly for actors with expeditionary capability and ambitions in the developing world. For others, megacities are less relevant. In Europe, fighting in megacities is not a key task. Fighting irregular opponents in dense, confined urban terrain is central in Israel, yet may be less so in Estonia. Lessons can and should be learned, but equally important is understanding one's own situation and probable future fights.

As we will see in the next sub-section, there is also a need to be able to master multi-domain operations in a grey zone setting, utilize existing technology to get an edge, when fighting opponents with a natural defensive advantage in urban terrain.

Multi-domain Operations and Grey Zone Problems

The next challenge is the need for multi-domain operations (MDO) and the impact of grey zone problems.

As the volatility and intensity of the international security environment have grown in recent years, the grey zone between peace and war has expanded considerably.[35] Cities, the interconnected hubs of population and power, are the nexus of this grey zone, where future conflicts and wars are largely expected to take place. The challenges related to hybrid threats and hybrid warfare, and the need to manage a range of hybrid measures, are today recognized globally among experts and practitioners as well as key international organizations such as NATO and the European Union (EU). The battlefield of the future clearly exists in the grey zone between war and peace. In this grey zone, non-kinetic effects replace, or mix with, kinetic effects. A synergistic assortment of military and non-military activities will be carried out, ranging from different forms of strategic communication, through active measures such as intrusions, special operations, sanctions, and subversions, and even the use of masked soldiers, like the so-called green men in Crimea,

[35] Niklas Nilsson, Mikael Weissmann, Björn Palmertz, Per Thunholm, and Henrik Häggström, 'Security Challenges in the Grey Zone: Hybrid Threats and Hybrid Warfare', in Mikael Weissmann, Niklas Nilsson, Björn Palmertz, and Per Thunholm, eds, *Hybrid Warfare: Security and Asymmetric Conflict in International Relations* (London: I.B. Tauris, 2021).

cyberattacks, sabotage, and terror or proxy warfare, all without constituting actual war.[36]

The ability to conduct MDO operations is crucial to success here, as the five domains and the information dimensions all come together in the grey zone, with the cities as the centre of gravity. In future warfare, not only will the cyber and information domains be of upmost importance, but warfare itself will occur across the five domains as well as in the information environment. The battlefield will not be geographically limited, but in an interconnected world will have an impact on a global level. This all comes together in the cities. Thus, the urban environment is a key context where different countries must be prepared to defend against and counter a wide range of hybrid attacks, threats, and influence operations, be they 'little green men', disinformation campaigns, sabotage, intelligence operations, election-influence operations, or cyberattacks, to mention but a few possibilities.

The complexity and the importance of cities are both widely recognized. To give an example, the US Army notes that the emerging operational environment is multidimensional with

> [f]our interrelated trends … shaping competition and conflict: adversaries are contesting all domains, the electromagnetic spectrum (EMS), and the information environment … smaller armies fight on an expanded battlefield that is increasingly lethal and hyperactive; nation-states have more difficulty in imposing their will within a politically, culturally, technologically, and strategically complex environment; and near-peer states more readily compete below armed conflict making deterrence more challenging.[37]

They also recognize the importance of cities.

> Dramatically increasing rates of urbanization and the strategic importance of cities also ensure that operations will take place within dense urban terrain. Adversaries, such as China and Russia, have leveraged these trends to expand the battlefield in time (a blurred distinction between peace and war), in domains (space and

[36] Mikael Weissmann, 'Conceptualizing and Countering Hybrid Threats and Hybrid Warfare: The Role of the Military in the Grey Zone', in *Hybrid Warfare: Security and Asymmetric Conflict in International Relations*, edited by Mikael Weissmann, Niklas Nilsson, Björn Palmertz, and Per Thunholm (London: I.B. Tauris 2021). See also US Army, 'The U.S. Army in Multi-Domain Operations 2028', TRADOC Pamphlet 525-3-1, 6 December 2018, https://api.army.mil/e2/c/downloads/2021/02/26/b45372c1/20181206-tp525-3-1-the-us-army-in-mdo-2028-final.pdf; Ministry of Defence, 'Joint Concept Note 1/20, Multi-Domain Integration', November 2020, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/950789/20201112-JCN_1_20_MDI.PDF.

[37] US Army, 'The U.S. Army in Multi-Domain Operations 2028', vi.

> cyberspace), and in geography (now extended into the Strategic Support Area, including the homeland) to create tactical, operational, and strategic stand-off.[38]

It should be noted here that it is not only great powers or states that wield such leverage, but all types of actors do so to some degree.

There is also a need to prepare for hybrid urban combat, as we can expect not only conventional urban combat but also the need to engage in an internal security role, fighting adversaries such as terrorists and revolutionaries as well as carrying out urban operations and combat that is more similar to traditional police work than traditional military combat. The UK operations in Belfast and Londonderry, and the French experience in Algiers, are examples of the latter situation. Hybrid urban combat requires a more sophisticated military capability than traditional combat, as military forces must be able to operate simultaneously across the entire spectrum of urban combat intensity. This includes not only special operations capability but also civil affairs expertise, sophisticated methods for intelligence gathering, and close policy coordination between the military and politicians.[39]

Achieving Success

Success on tomorrow's urban battlefield requires not only the ability to conduct MDOs, but also developing capabilities to engage in the information environment. Success in the land, maritime, air, space, and cyber domains is insufficient to win a city; one must also win the battle of narratives in the information sphere that, together with the cyber domain, is predicted to be the centre of gravity in future conflicts. Furthermore, this must be done across the spectrum of conflict, from peace through the grey zone, as well as in war.[40] One must also prepare for all levels of combat intensity, from conventional warfare to what would normally fall within policing and humanitarian relief operations.[41] As observed by Stephen Graham, '[n]othing lies outside the battlespace, temporally or geographically. Battlespace has no front and no back, no start nor end.'[42]

[38] Ibid.

[39] DiMarco, *Concrete Hell*, 212. Also see Alice Hills, *Making Mogadishu Safe: Localisation, Policing and Sustainable Security: Localisation, Policing and Sustainable Security* (London: Routledge, 2019); Alice Hills, *Future War in Cities: Rethinking a Liberal Dilemma* (London: Frank Cass, 2004); Alice Hills, 'Making Mogadishu Safe', *The RUSI Journal* 161, 6 (2016).

[40] Frank G. Hoffman, *The Contemporary Spectrum of Conflict: Protracted, Gray Zone, Ambiguous, and Hybrid Modes of War*, 5 October 2015, https://www.heritage.org/military-strength-topical-essays/2016-essays/the-contemporary-spectrum-conflict-protracted-gray; Mikael Weissmann, 'Hybrid Warfare and hybrid Threats Today and Tomorrow: Towards an Analytical Framework', *Journal on Baltic Security* 5, 1 (2019); Weissmann, 'Conceptualizing and Countering Hybrid Threats and Hybrid Warfare'.

[41] Hills, *Making Mogadishu Safe*; Hills, *Future War in Cities*.

[42] Graham, *Cities under Siege*, 31.

To be able to handle the outlined challenges, doctrines and handbooks must be developed that pay attention to the increasing importance of urban warfare. It is also essential to train for multi-domain operations in urban settings. Cross-domain integration and the information sphere are therefore crucial. The information sphere does not only include technology, although that is admittedly important, but also the battle of narratives on the local, regional, and global level. Everything is connected, and the public view of the population—among adversaries, adversary population, at home and elsewhere—is crucial and cannot be taken for granted. This is not only a result of what you say, but also very much what you do (or do not do). Thus, urban warfare is about more than combat and 'winning battles'. It requires collaboration not only across domains, but also between the military and civilian spheres.

It is also important to think outside the asymmetrical warfare box, preparing for contingencies other than taking the offensive in an asymmetric conflict against a non-peer adversary, which tends to be the focus of most current research, particularly in the US literature. However, the idea of defensive urban operations is relevant in a European context, in particular in the Baltics, where the main focus is the deterrence of potential Russian aggression. Here 'U.S. and NATO forces could create conditions in urban areas in the Baltics that make it impossible for the Russians to overrun them rapidly, thus removing the possibility of a fait accompli and thereby changing their risk calculation to preclude assumptions of an early, cheap success.'[43]

It is also important to consider the technological balance. Besides the obvious case of peer or near-peer adversaries, the less obvious situation of opposing irregular forces becomes more and more likely with increases in the availability of technology. This is so regarding, for example, the increased availability of UAVs, and the equalizing capability of irregular forces to utilize the cyber domain despite the technological superiority of regular forces. Non-state armed groups are capable of utilizing social media not only to fight the 'battle of narratives', but also for recruitment, propaganda, and even the coordination and organization of combat operations.[44] This leads us to the next challenge, namely technology.

[43] Gentile et al., *Reimagining the Character of Urban Operations for the U.S. Army*, 60.

[44] For examples, see David Kilkullen's presentation on 'Emerging Patterns of Adversary Urban Ops: Insights from the NATO Urbanisation Program', RUSI Urban Warfare Conference 2018, available at https://www.youtube.com/watch?v=mbxknQrNEgY&t=4075s (starts at 6:17).

Technology

The breakthroughs in technology have not only forced the battle to the city, but emerging and novel technologies also have a great impact on battles and combat itself.[45] The physical terrain, infrastructure, and civilian presence in urban areas are major operational challenges, to which the adoption and development of new technology is a potential solution. The availability and quality of UAVs and sensor technology have increased greatly, whilst battlefield information at the tactical, operational, and strategic levels has also become available at greater scale. This is very important in the rapidly changing and chaotic urban environment, since these and other technologies enhance intelligence, surveillance, and reconnaissance (ISR) and for command and control, which is particularly important in the type of joint multi-domain operations that need to be the focus in urban operations. These technologies also assist in force protection and the limitation of collateral damage, as well as protecting and controlling the civilian population.

The use of UAVs is not new; they have been used by military forces for many years in a broad range of tasks. In the context of urban warfare, their reconnaissance role has been the most important one. They also play an important role in target identification and precision targeting, enhancing fighting power, and helping to reduce collateral damage. Both small and large drones may be used to enhance battlespace awareness, although at least against peer or near-peer adversaries the latter are limited by being observable by radar. UAVs are also part and parcel of the US Defence Advanced Research Projects Agency's Urban Reconnaissance through Supervised Autonomy (URSA) project, where the aim is to find ways to use autonomous systems to help the military detect hostile forces in urban environments and positively distinguish combatants from civilians before own forces come in contact.[46] Drones can also deliver warning signals to any humans they encounter and forward information on the response, together with video and location data, to military personnel who can in turn decide how to respond to a situation.[47]

[45] Michael Raska, 'The Sixth RMA Wave: Disruption in Military Affairs?', *Journal of Strategic Studies* 44, 4 (2021); Kelley M. Sayler, *Emerging Military Technologies: Background and Issues for Congress*, CRS Report R46458, updated 10 November, Congressional Research Service 2020. Also see the special issue on Defence Innovation and the 4th Industrial Revolution: Security Challenges, Emerging Technologies, and Military Implications, edited by Michael Raska, Katarzyna Zysk, and Ian Bowers, of which this article is a part (*Journal of Strategic Studies*, 44, Issue 4 (2021)).

[46] Lauren C. Williams, 'Can AI and Autonomous Systems Detect Hostile Intent?', *Defense Systems* 4 October 2021.

[47] Paulina Glass, 'Here's the Key Innovation in DARPA AI Project: Ethics from the Start', *Defense One* 15 March 2019.

One important development in drone technology is the emerging proliferation of what are called 'swarms', that is 'large numbers of simple, low cost, expendable systems that are interconnected'.[48] Swarms are argued to have the potential to change how we fight, with large autonomous swarms of drones flying and operating together as a single unit, with the capability to autonomously alter their behaviour and action based on intercommunication.[49] Such drones will also have great potential as sensors, able to identify threats and targets and relay relevant information both to each other and back to base for further assessment and action.

Moving on, sensors are one of the key technologies for the future of urban warfare. Sensors encompass a wide range of technologies and devices, including radar, acoustic, thermal, optics, seismic, magnetic, active sensors, smart sensors, nano sensors, and wearable sensors. For example, sensors today can enable soldiers to see through walls and detect fired projectiles. The use of unattended ground sensors has increased among high-tech forces such as the US and NATO to enhance their intelligence, surveillance, and reconnaissance abilities to a degree limiting adversaries' possibilities for cover and concealment. This is also why huge R&D investment has been made in developing new forms of concealment. Cheap and manoeuvrable micro- and nano-drones have also been developed for use in reconnaissance and surveillance, as has wearable sensor technology providing location and navigation data and uninterrupted communication between troops and UAVs in areas where GPS signals are weak or absent.[50] The importance of the need for uninterrupted communication should not be underestimated, since communication in urban terrain often creates particular difficulties.

Another important area is artificial intelligence (AI), used increasingly on all levels. For example, Israel has developed the Fire Weaver, 'a networked sensor-to-shooter system' that 'connects forces on the battlefield to a network that works with advanced computer vision technology and artificial intelligence algorithms to aid in targeting for commanders and soldiers. … The new system allows leaders to use a host of resources at the tactical level, from drones to forward observers who are networked so that military leaders can see the same battlefield and targets from different angles. An increasingly

[48] Michel-Kleisbauer, 'URBAN WARFARE', 6. More formally defined: 'multiple unmanned systems capable of coordinating their actions to accomplish shared objectives' (Zachary Kallenborn and Philipp C. Bleek, 'Swarming Destruction: Drone Swarms and Chemical, Biological, Radiological, and Nuclear Weapons', *The Nonproliferation Review* 25, 5–6 (2018)).

[49] Zachary Kallenborn and Philipp C. Bleek, 'Drones of Mass Destruction: Drone Swarms and the Future of Nuclear, Chemical, and Biological Weapons', *War on the Rocks*, 20 February 2019; Kallenborn and Bleek, 'Swarming destruction. See also T. X. Hammes, 'The Future of Warfare: Small, Many, Smart vs. Few & Exquisite?', *War on the Rocks*, 7 August 2015; Shmuel Shmuel, 'The Coming Swarm Might Be Dead on Arrival', *War on the Rocks*, 10 September 2018.

[50] Konaev, 'The Future of Urban Warfare in the Age of Megacities'.

digitized battlefield requires a system to digest all the data coming in from various sensors and potential shooters.'[51]

So far, the application of autonomous systems has been limited by their dependence, on some level, on direct human control. With the proliferation of data provided by sensors, and the advances in AI, the need for human control will diminish over time. Autonomous ground vehicles will also improve the survivability and resilience of ground troops in an urban environment. Several countries are already researching robotic vehicles for use in ground supply and medical evacuation, two dangerous and resource-intensive tasks. Systems have also been developed to improve force protection, and are already in use investigating tunnels, caves, and buildings before sending in soldiers. Unmanned Ground Vehicles (UGVs) have also been developed.[52] Both Israel and Russia have fielded UGVs in battles. Russia has mainly used UGVs in Syria.[53] In contrast, Israel's Carmel Armoured Combat Vehicle is particularly suited for urban combat; the system integrates advanced artificial intelligence and autonomous capabilities to enhance mission effectiveness for the Israel Defence Forces (IDF).[54] The importance of unmanned vehicles cannot be underestimated, as recent experience, such as in Fallujah, Baghdad, or Mogadishu, has shown a high casualty rate among soldiers in urban operations particularly due to IEDs, mines, and sniper fire.

Two other areas where technology will have an impact on urban warfare are Augmented Reality (AR) and biometrics. The former has great potential, as it allows for moving beyond the traditional 2D map, which is inadequate for the three-dimensional urban battlefield where the vertical dimension is essential.[55] Not least, benefits may be drawn from tactical augmented reality (TAR), helping improve soldiers' ability to locate themselves, friendly

[51] Seth J. Frantzman, 'Israel Finds an AI System to Help Fight in Cities', *C4ISRNET*, 5 February 2020, https://www.c4isrnet.com/battlefield-tech/2020/02/05/israel-finds-an-ai-system-to-help-fight-in-cities/.

[52] Michel-Kleisbauer, 'URBAN WARFARE'.

[53] Sten Allik, Sean Fahey, Tomas Jermalavičius, Roger McDermott, and Konrad Muzyka, 'The Rise of Russia's Military Robots: Theory, Practice and Implications', International Centre for Defence and Security, Estonia, February 2021, https://icds.ee/wp-content/uploads/2021/02/ICDS-Analysis_The-Rise-of-Russias-Military-Robots_Sten-Allik-et-al_February-2021.pdf; Sebastien Roblin, 'What Happened When Russia Tested Its Uran-9 Robot Tank in Syria?', *The National Interest*, 7 April 2021, https://nationalinterest.org/blog/reboot/what-happened-when-russia-tested-its-uran-9-robot-tank-syria–182143; David Hambling, 'Russia's Autonomous Robot Tank Passes New Milestone (and Launches Drone Swarm)', *Forbes*, 2 September 2021, https://www.forbes.com/sites/davidhambling/2021/09/02/russias-autonomous-robot-tank-passes-new-milestone-and-launches-drone-swarm/.

[54] ESD Team, 'Israel's Carmel Programme Charting Future Concepts for Mounted Combat', *European Security & Defence*, 7 February 2020, https://euro-sd.com/2020/02/articles/16078/israels-carmel-programme-charting-future-concepts-for-mounted-combat/; Michael Peck, 'Carmel: Israel Unveils New Stealth Street-Fighting Tank', *The National Interest*, 28 September 2019, https://nationalinterest.org/blog/buzz/carmel-israel-unveils-new-stealth-street-fighting-tank–72491.

[55] Xiong You, Weiwei Zhang, Meng Ma, Chen Deng, and Jian Yang, 'Survey on Urban Warfare Augmented Reality', *International Journal of Geo-Information* 7, 2 (2018); Yaakov Lappin, 'Israel's Rafael Reshapes Urban-warfare with AI, Augmented Reality', Israel Hayom, 2 February 2020, https://www.israelhayom.com/2020/02/02/israels-rafael-revolutionizes-urban-warfare-with-ai-augmented-reality/.

soldiers, and adversaries compared to using traditional night vision googles and GPS.[56] Biometrics is also useful in the urban setting, where the mixture of foes and civilians creates a need for an ability to identify hostile individuals and non-state actors. Automated identification and the analysis of different behaviours and biological characteristics is one way to do this.[57] Biometric technologies, which use unique attributes like fingerprints, facial or ocular measurements, DNA, cardiac signatures, and voice or gait patterns to identify individuals, have been used for decades, but the possibility to combine such identifiers with advances in artificial intelligence (AI) and Big Data analytics expands their applicability tremendously.[58]

Loitering munition will become increasingly important in urban warfare, as they can be used by soldiers on the ground to reduce radar, visual, and thermal signatures, making them more difficult to find, track, and defeat. This is important as a countermeasure to the proliferation of sensor technology and UAVs.

Social media also poses challenges. Traditionally, technological superiority has enabled information superiority, in the form of influence and control over the flow of information in and out of the area of operations.[59] As argued by Margarita Konaev, 'information superiority and asserting control over the information environment is all the more critical in urban warfare, as it allows the state's force to cut off local hostile forces from their strategic leadership, prevent them from disseminating their message and from communicating with the city's civilian population and the outside world, shape public opinion in their favour and win the "battle of narratives".'[60] States' superiority in the information sphere has been challenged by platforms like Facebook, Twitter, and YouTube.[61] In fact, not only do all conflicting parties use social media platforms to spread their version of reality, non-state groups have also proven very capable of doing so.[62]

[56] E.g. David Vergun, 'Heads-up Display to Give Soldiers Improved Situational Awareness', US Army, 20 September 2021, https://www.army.mil/article/188088/heads_up_display_to_give_soldiers_improved_situational_awareness.

[57] Mark Lunan, 'Biometrics', *The Three Swords Magazine* 33 (2018); Kelley M. Sayler, *Biometric Technologies and Global Security*, CRS IF11783, updated March 30, Congressional Research Service 2021.

[58] Sayler, 'Biometric Technologies and Global Security'.

[59] Konaev, 'The Future of Urban Warfare in the Age of Megacities'.

[60] Ibid., 39.

[61] E.g. ibid.; P. W. Singer and Emerson T. Brooking, *LikeWar: The Weaponization of Social Media* (Boston, MA: Houghton Mifflin Harcourt, Mariner Books, 2019[2018]); David Patrikarakos, *War in 140 Characters: How Social Media is Reshaping Conflict in the Twenty-first Century* (New York: Basic Books, 2017).

[62] E.g. Anna Leander, 'Digital/commercial (in)visibility', *European Journal of Social Theory* 20, 3 (2017); Bozorgmehri Majid, 'Recruitment of Foreign Members by Islamic State (Daesh): Tools and Methods', *Journal of Politics and Law* 11, 4 (2018).

Achieving Success

The above outline of new technology's impact on urban warfare paints an apparently promising picture, in which technology can be key for success urban warfare. This is all very well, but experience has also shown that the underlying principles of technology, as well as the technologies themselves, tend to break down in cities.

It is clear that breakthroughs in technology are crucial for the future of urban warfare. It might seem like technology, especially sensors and unmanned systemic combined with AI, is a panacea. This may be so, but it is also important to be cautious. Throughout history, revolutions in military technology have often been expected to change everything. The reality never turns out to be that simple. In the case of urban warfare, we can expect the fights of the future to be at least as dirty as those of the past. No other environment is as complex—in physical and human terms—as cities, and cities have never been so complex or interconnected as today. Yes, technology will help. But penetrating walls, and clearing house to house, and room to room, are hardly tidy tasks, even with improved technology. David Bellavia's memoirs of his experiences from Fallujah, *House to House: A Soldier's Memoir*, here offers a telling tale.[63] Whilst not being an operation and combat with all the tools of the future, it shows the difficulty of fighting a non-peer irregular opponent despite superiority in force and technology. Unless you want tomorrow's war to be fought only with unmanned vehicles and robots, or by flattening enemy cities to the ground, urban warfare will remain a dirty business. Furthermore, even if you chose unmanned combat or total destruction you might win the fight, but still lose the war, which is not contained to the battle zone, but is interconnected and ultimately embedded in the information sphere and the battle of narratives.

Dense concrete environments drastically reduce the advantages of superior technology, since buildings and other infrastructure mask targets and create urban and suburban canyons in which to hide and manoeuvre. There is a reason why so much emphasis has been put on developing doctrine, training, and equipment to fight underground.[64] To give a specific example of the scale of this investment: in 2017, the US Army launched a $572 million effort to train and equip twenty-six of thirty-one active combat brigades for fighting in

[63] David Bellavia and John R. Bruning, *House to House: An Epic Memoir of War* (London: Simon & Schuster, 2007).

[64] See Jeremiah Rozman, 'The Army Is Preparing to Go Underground', *RealClearDefense* 3 July 2019, for an overview of efforts. See also Todd South, 'The Subterranean Battlefield: Warfare is Going Underground, into Dark, Tight Spaces', *Military Times* 25 February 2019; Modern War Institute, 'The Elephant in the Tunnel: Preparing to Fight and Win Underground', 18 March 2019, https://mwi.usma.edu/elephant-tunnel-preparing-fight-win-underground/.

large-scale subterranean facilities under dense urban areas.[65] There are also initatives addressing areas such as multi-domain battle (MDB) in megacities, bio-convergence, and the soldier of 2050, addressing the 'Gen Z' perspective in relation to the operational environment and national security challenges.[66]

Also, the existing warfare literature is biased toward the stronger and technologically superior force fighting against a non-peer, irregular, and less technological adversary. It is worth considering the implication of urban warfare against a peer or near-peer opponent from the perspective of their mutual possession of advanced technology. Furthermore, contingences should be considered in which one does not have control of the area of operation, or superiority in force, or the offensive advantage of choosing the time and place of fighting. Lastly, not only has enabling technology been developed, but also counter-measures.

When fighting an equally high-tech opponent, concrete and tunnels may interfere with sensors, but so also may electronic warfare counter measures, creating a contested communications environment. This must be taken into consideration, as well as the opponent using offensive cyber capabilities. Nor can you expect that you have intelligence superiority, as it may be both challenged and a target for deception. In fact, if history is correct, urban warfare between peers might be the most recognizable contingency, harkening back to Stalingrad 1942–43, Manilla 1945, or Hue 1968.

The Urbanization of Insurgency

After the Cold War, the urbanization of insurgency has become a factor. Urban battle spaces have always been to the defenders' advantage, as 'the physical environment tends to mitigate many technological advantages held by the attacker; the presence of civilians can greatly complicate the operations of attacking forces, while sometimes also providing cover and concealment to the defender; and it opens the battle to modern media scrutiny'.[67] With the urbanization and technology megatrends, moving the fight to urban areas is arguably the only way for irregulars to win future battles against high-tech regular forces. Not only is it easier to defend an urban environment, but one

[65] Matthew Cox, 'Army Is Spending Half a Billion to Train Soldiers to Fight Underground', *Military.com*, 24 June 2018, https://www.military.com/daily-news/2018/06/24/army-spending-half-billion-train-troops-fight-underground.html.

[66] In many cases such innovations are being conducted as collaborative partnerships and dialogues between academia, industry, and government. A good example here is the US Army Mad Scientist Laboratory initiative.

[67] DiMarco, *Concrete Hell*, 24–5.

cannot win today holding fields and forests, since urban areas have people and power.

Today's sensors and high-precision weapons limit operational and tactical manoeuvres in open terrain (including forests). Commanders who lack technological capacities will simply find cities appealing terrain, especially since they often know the city better and have a superior ability to mobilize their resources and population compared to their opponent. To this can be added the tendency of insurgencies to have more flexible rules of engagement, as well as interpretation of laws of war. It is also in the city, at close range, that the relative inefficiencies of the weapons used by insurgents are negated. The city also works as protection, as the effect on the urban terrain of military actions, or one's own fortification work, makes it easier to defend and harder to attack.[68]

Here, the cyber and information dimensions should be considered, which not only add a social media dimension to warfare, but also an array of open-source material, access to services like Google Maps, photo sharing, coded communication, different connected sensors, and increasingly cheap and capable UAVs. For example, a connected surveillance camera today costs £30 at a local hardware store (or online). As cities are interconnected, physical presence is not always needed on-site—for either side—since forces can be commanded, controlled, and launched from anywhere, as long as they are connected. The cyber dimension goes beyond the information sphere and the battle of narratives, as not only states can use different forms of cyberattack. In interconnected cities, it is also possible for defenders in the Global South to move the battle to the homes of the adversary, conducting counter-attacks in Brussels, London, Tokyo, or Washington.

It should be noted here that the main drivers of technological developments are no longer the military, but the civilian sector . Thus, commercially available technological advances today also benefit non-state actors, who can incorporate cheap, off-the-shelf products in their operations. One good example is the availability of cheap, commercial drones providing non-state actors with at least a limited air force capability that may least interfere with, if not challenge, the dominance of conventional forces. Non-state actors like ISIS, Hezbollah, Houthi rebels in Yemen, and the Russia-backed militants in eastern Ukraine demonstrate the potential use of commercially available drones, as well as military-grade UAVs, for reconnaissance, surveillance, and even combat in Syria, Iraq, and eastern Ukraine.[69]

[68] E.g. Spencer, 'The City Is Not Neutral'.
[69] Konaev, 'The Future of Urban Warfare in the Age of Megacities'.

A similar case can be made regarding the cyber domain and the information sphere, where non-state actors have shown increasing adaptability in using and combining expertise to spread propaganda globally and contest the battle of narratives, recruit supporters internationally, and draft recruits. These actors have also demonstrated an ability to utilize the interconnected world, both moving the fight out of the city and home to their opponents, and enabling supporting to get involved in the battle from afar.

Achieving Success

There will be fighting on the ground in cities. Unless one wishes to raze cities, house to house fighting will be necessary. Technology may help, but it would be overoptimistic to expect technology to replace the need for the human soldier. Thus, the role of western forces against irregular forces in urban combat must be considered: whether and to what extent we engage with our own ground forces; whether they cooperate with indigenous forces; what role do they play, as advisors, reserves, enablers? executing close combat? or rather focusing on intelligence, surveillance, and reconnaissance systems and precision strikes?[70]

Population control must also be considered. Fighting insurgencies in a city, by definition, complicates distinguishing civilians from foes. Here, one also needs to ask whether the civilian populations should be evacuated to enable operations, and whether this is possible. However, historically, populations have remained even after evacuation. Furthermore, it is not realistic to evacuate megacities. Where should the 35 million inhabitants of Jakarta be moved to?

In short, civilians will be at hand during urban warfare. They will impact the battle space, as they can both constrain and enable operations. This is particularly so as any city has an abundance of cell phones, and ways to relay messages both within and beyond the city.

Urban defenders will also be able to maintain their freedom of movement within their defences. Here, they 'can prepare the terrain to facilitate their movement to wherever the battle requires. They can connect battle positions with routes through and under buildings. They can construct obstacles to lure attackers unknowingly into elaborate ambushes because of the limited main avenues of approach in many dense urban environments.'[71] This creates a situation where the use of available technology for ISR will be crucial, and where the benefits of multi-domain operations must be utilized, since the

[70] See e.g. Johnson, 'Urban Legend: Is Combat in Cities Really Inevitable?'.
[71] Spencer, 'The Eight Rules of Urban Warfare and Why We Must Work to Change Them'.

synergies to be gained are necessary to win in a battlefield that favours the defender.

Conclusion: Eleven Takeaways about Urban Warfare

It should by now be clear not only that the introductory statement that '[t]he future of warfare lies in the streets, sewers, high-rise buildings, industrial parks, and the sprawl of houses, shacks, and shelters that form the broken cities of our world'[72] was correct, but also that this is just the beginning as the urban battlefield reaches far beyond the city limits. As we have seen, the character of war is changing, cities are interconnected, the grey zone between war and peace is increasing, and the information sphere has become a centre of gravity, consequently the urban battlefield knows no borders but reaches across the physical and temporal domains.

Having outlined the challenges of urban warfare on tomorrow's battlefield—urbanization, multi-domain operations, the grey zone problems, technology, and the urbanization of insurgency, eleven lessons about urban warfare can now be outlined.

Takeaway 1: Urbanization turns the future urban battlefield into a nightmare. First, but possibly most important, urbanization turns the future urban battlefield into a possible nightmare. This is a fact where resistance is futile and should not be attempted, instead it needs to be accepted. The focus should simply be on accommodating and adopting to the new reality of urban operations and warfare, rather than trying to develop ways to avoid urban areas. Avoidance is like asking for failure, as it is not always possible to choose the battlefield and it is therefore better to prepare thoroughly for the eventuality or urban warfare.

Takeaway 2: Multi-domain operations are crucial for success. The ability to conduct multi-domain operations is crucial for success. Future urban operations will need to meet the challenges from cross-domain and cross-conflict-spectrum fighting. In future warfare, not only will the cyber and the information domains be of outmost importance, but warfare itself will occur across the five domains as well as in the information environment.

[72] Peters, 'Our Soldiers, Their Cities'.

Takeaway 3: Urban battles will take place in the grey zone. You need to prepare for urban battles that will take place in the grey zone between peace and war, where the five domains and the information dimensions all come together, with the cities being the centre of gravity. You need to be prepared to conduct urban warfare in a legal state of non-war as well as war, alone as well as in collaboration with civilian actors.

Takeaway 4: The urban battlefield knows no physically borders. Do not expect the urban battlefield to be geographically limited to a physically defined area. The world is interconnected, nowhere more so than in cities. What happens in one place will have an impact on a global level. There is simply no such thing as 'outside the battle space'. You need to be prepared to defend against and counter a wide range of hybrid attacks, kinetic as well as non-kinetic, hybrid threats, and influence operations everywhere, including in yours and your partners' home country.

Takeaway 5: The importance of the information environment cannot be underestimated. The importance of the information environment cannot be underestimated. If you cannot win the 'battle of narratives' you will not be able to achieve victory. This battle of narratives happen on the local, regional, as well as the global level. Everything is connected, and the perception of the public—among adversaries, adversary population, at home and elsewhere—is crucial and cannot be taken for granted. It should here be stressed that perception is not only a result of what you say, but also what you do (or do not do, or do not say). Thus, urban warfare is about more than 'combat' and 'winning battles'. It requires collaboration not only across domains, but also between the military and civilian spheres.

Takeaway 6: Breakthroughs in technology are crucial for the future of urban warfare. Novel, emerging, and breakthrough technologies will be crucial for the future of urban warfare. Whilst technologies might appear to resolve the problems of urban warfare, especially with the use of sensors and unmanned systemics combined with AI, it should be stressed that technology should not be perceived as a panacea, and some caution is advised. If history has taught us anything, it is that whilst revolutions in military technology have often been expected to change everything, reality has frequently turned out to be less straightforward. More concretely, we should not expect

future fights in cities to be any less dirty than those of the past. There are no other environments as complex in physical and human terms as cities, and the cities themselves have never been as complex and interconnected as they are today.

Takeaway 7: The demand for intelligence is paramount. The demand for intelligence is paramount given the added layers of complexity in urban warfare compared with operations in rural areas. Cities are not only interconnected and complex centres of human activity, but also an environment where the civilian population regularly outnumbers enemy combatants. Thus, it is essential with good intelligence, of all types, to understand the civilian population as well as the enemy. Here future urban warfare is expected to be very much a big data affair, where at issue might be whether a given analysis asks the correct question of a system, rather than answering it itself.

Takeaway 8: Think beyond the asymmetrical warfare. There is a need to think beyond the asymmetrical warfare box, where offensive operations against irregular, often low-tech, non-peer adversaries are in focus. There is a need to prepare for contingencies against high-tech, peer- or near peer adversaries (and in some cases superior adversaries). This is of particular importance not least in a European context, where there is a need to plan for defensive contingencies against high-tech adversaries with regular forces.

Takeaway 9: Plan for your own, not others' urban wars. Your own needs and operating environments should be in focus. Each country needs to ensure sufficient focus is put on safeguarding its own needs and preparing for the kinds of urban warfare it expects in its own operating environment. In short, plan for the wars you expect to fight. For example, megacities will not be a concern for all land forces, but is something of major interest for actors with expeditionary capability and ambitions in the developing world. There are of course lessons to be learned from other environments, including combat in megacities, but one should select and adopt according to one's own needs, capabilities, and resources.

Takeaway 10: All urban warfare will have a civilian dimension. All urban warfare will have a civilian dimension. The presence of civilians will impact the battle, both as a constraining and enabling force. It is essential that their presence is acknowledged and included in the

operational planning, ranging from adapting behaviour and fire from own forces to avoid unwanted secondary effects, how the information sphere is utilized, to policing and population control.

Takeaway 11: The urbanization of insurgency is a matter of fact, not a possibility. Finally, it should be recognized that the urbanization of insurgency is a matter of fact, not a possibility. With the urbanization and technology megatrends, moving the fight to urban areas is simply the only way for irregular forces to have chance to win future battles against stronger high-tech opponents. Not only is the urban environment to the defenders' advantage, in addition one can neither hide in, nor win by holding, fields and forests, since urban areas hold the centre of people and power.

To sum up, urban areas will be an increasingly important arena for future land warfare. Urban operations and warfare should therefore acquire a greater significance in our understanding of the operational environment. With large cities being the centre of gravity for political and economic interaction and although urban warfare is a nightmare that one reasonably hopes to avoid, it is not always possible to choose the battlefield and it is therefore better to prepare thoroughly for this eventuality.