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The military revolution of limits and the changing character of war¹

an address to the Institute on 26 November 2013 by

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Dr Palazzo argues that humanity's voracious consumption of raw materials cannot continue indefinitely. Our consumption is reaching the planet's natural limits and this will force revolutions in society, in the way conflicts are resolved and in the way wars are fought. States that think through the implications of the 'revolution of limits' and master its associated military revolution will have an advantage over those that do not.

Key words: population growth; consumption limits; natural resource conflicts; military revolutions; warfare changes.

Military Revolutions are defining points for those who study and wage war. These rare but sweeping events bring about systemic change in society, recast the character of war and change the ability of states to project power. In effect, Military Revolutions are a periodic redefining of what is possible in war and what is not, and those military organizations that first grasp their potential have an advantage over their less adept rivals. Those that follow must either embrace the change too, find the means by which to negate its advantage, or, if neither is possible, face decline. While it is still early days, it is now becoming increasingly likely that we are on the cusp of another Military Revolution. Its effect promises to offer both opportunities and dangers, and it will produce winners and losers. I call it 'The Military Revolution of Limits'.

Military Revolutions

Since the publication of Michael Roberts's 1956 seminal essay 'The Military Revolution, 1560-1660', scholars and military practitioners have seen these events as a means to make sense of the significant changes in the art of war that periodically occur (Roberts 1995). While Roberts focused on the early modern period, his ideas had sufficient flexibility to be applicable to war in all ages, even the future. Within the military, it was the Soviet Union that first advanced the idea of the possibility of initiating a discontinuous shift in military capability, although it used the expression 'Military Technical Revolution'. In the United States, the Pentagon's Office of Net Assessment saw such advances as more than just technical issues and preferred the term 'Revolutions in Military Affairs' (RMA). United States

thinkers believed that RMAs held the possibility of fundamentally altering the way the military did business (Adams 2006: 12).

While numerous thinkers built upon Roberts's work, they tended to overlook the societal aspect of Military Revolutions, preferring to focus on emerging technologies. A decade ago, MacGregor Knox and Williamson Murray clarified the utility of Roberts's thesis by restating his original idea as two complementary parts, 'Military Revolutions', where the focus is on changes to the framework of society, and 'Revolutions in Military Affairs', where the focus is on the incorporation of weapons and systems into the character of war. Knox and Murray (2001: 6) identified just five Military Revolutions in the modern era. Appropriately, they are characterised by the sweeping effect they had, not simply on the military in war, but on the organisation and operation of human society as a whole. They are:

1. the 17th century rise of the modern nation state;
2. the French Revolution;
3. the Industrial Revolution;
4. the First World War; and
5. the onset of the nuclear age.

As this paper's title suggests, its focus is on Military Revolutions, not RMAs. It will argue that the coming Revolution of Limits will be humanity's sixth such revolution.

The Military Revolution of Limits

Since the Industrial Revolution, parts of humanity have enjoyed an unprecedented period of economic growth and general improvement in well-being, though much of this has been shared unequally. In recent decades less fortunate parts of the world have begun to catch up; some, as in the case of China, dramatically so. This growth required the voracious consumption of raw materials, especially cheap energy, which has enabled our species to avoid the population collapse predicted by Thomas Malthus in his 1798 essay on the principle of population (Malthus 2007), while supporting a seven-fold

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increase in numbers since 1800 (Hall and Day 2009). This period of growth cannot continue indefinitely. Our planet is reaching its limits in the availability of the cheap resources with which we have achieved this unprecedented growth, while population continues to rise and is expected to do so by a further two billion by mid-century. Adding to the coming crisis will be the predicted movement of three billion people into the middle class, who in doing so will aspire to more intensive Western styles of consumption (Dobbs *et al.* 2011: 5). The exploitation of resources has been so rapid that many key materials will no longer be available in sufficient quantities at a functionally useful price (Klare 2012: 36-40; Martenson 2011). Of greatest concern is the supply of energy and water, and their essential role in the production of food, although the ongoing availability of a host of other critical resources is also in doubt (Brown 2012; Klare 2012).

The forecast for water availability is especially grave. Official United States predictions suggest demand for this precious commodity will continue to outpace supply, which will have a flow-on effect of decreasing food production and increasing costs for the food that is available, accompanied by worsening public health risks. Food shortages are likely to result in greater political instability in affected areas (ONI 2012; Chellaney 2011). For example, there is some suggestion that rising food prices are a factor in the growing instability in Egypt (Power 2013a). Worryingly, the situation is probably understated because, in order to keep up with expected population growth and to meet increasing consumer demand, the world will require 70 per cent more food to meet future requirements.

As unceasing demand confronts resource constraint, humanity will face a harsh reality. We live on a planet in which physical limits do apply. As a species we have only been able to escape this reality by harvesting resources that were laid down over millions of years and which we have consumed in only a few hundred. For example, much of the water used for irrigation today comes from ancient aquifers that cannot be replenished (Brown 2009). In effect farmers are mining a finite resource that cannot be readily replaced, even as they dig deeper wells to replace those that have run dry. When the tyranny of limits takes hold, the effect this will have on societies and states will be profound and the necessity for change inescapable.

The imposition of limits on human endeavour will create a world different to the one we know. It will create challenges which will place many states under huge civil stress, possibly causing them to destabilise and collapse into civil war or prey upon weaker neighbours. The Arab Spring may prove a mere harbinger of what is to come as fragile societies try to cope with rising food costs, resource shortages and the ensuing social unrest (ONI 2013: 9-13; Perez 2013; Werrell 2013). Migration and war are likely outcomes for desperate peoples trying to escape desperate situations (Sullivan *et al.* 2007: 13-16). Receiving states will have to ask at what point refugees are no longer the victims of unfortunate circumstances but invaders who pose an existential threat.

So far this paper has not mentioned climate change. This is neither to ignore nor minimise its threat to global security and stability. Instead, it is out of a belief that climate change is a further amplification of the coming Revolution of Limits. The risks to humanity's future resulting from changes to the composition of the atmosphere, the acidification of the oceans and the degradation of the soil, for example, are all a result of the great exploitation of resources that has taken place since the onset of the Industrial Revolution. Atmospheric warming, sea-level rises, shifts in rainfall patterns and more frequent and stronger storms will affect resource availability, especially that of food and water. In addition, the international community may impose limits on the consumption of resources in order to avoid the worst effects of climate change. From this perspective, climate change will contribute to the effects of the Revolution of Limits by acting as another brake on the availability and rate of humanity's consumption of resources.

The Societal Implications of the Revolution of Limits

As with all the previous Military Revolutions, the threads which define the fabric of contemporary society will come under strain and some will break as the tyranny of limits takes hold. Past revolutions suggest that a different order will emerge, one that takes advantage of the opportunities that the new age offers. Core traits of the present age will fall under scrutiny and redefinitions will take place. Two traits of contemporary society that are at particular risk are the international community's deep economic integration – that is Globalisation – and the accepted belief in the possibility of continuous economic growth.

Globalisation underpins the politics, economics, culture and even security of the present world. While it is true that some degree of economic and cultural integration has always existed, the intensity of interaction between states and peoples is now at a never-before-achieved high. Today's degree of integration may be seen as the norm, but is of relatively recent origins; the acceleration began only in the final quarter of the 20th century. It would not be too strong to suggest that over recent decades the world has moved towards a single global society in which seemingly isolated distant events now have significant effects far from their point of origin.

There are a number of factors which explain Globalisation's success. These include a greater acceptance of international action by the global community, a development hastened by the end of the Cold War. For the consumers of the developed world, Globalisation has brought lower prices for a whole range of goods. Conversely, for the developing world, it has provided greater employment opportunities and a chance to escape poverty. As a result, a growing middle class is emerging across the developing world. Another factor is the intensification of global trade. The international trade system supports Globalisation because it provides a means to balance world-wide resource demand with supply. Imbalances have periodically occurred, such as

famines or energy shocks, but the system has generally been able to respond and shift resources to restore equilibrium.

In effect, a global trading system acts as a world-wide safety valve. It allows resource-rich states to allocate resources to those in need, either via the market or through direct grants or subsidies, thereby lessening political instability while moderating inter- and intra-state points of tension. The effectiveness with which the global system performs this function, however, may soon peak – if it has not already – and then diminish. As resource availability declines, and as prices for various commodities rise, it will become increasingly hard to shift resources, even in the face of urgent need. This is because in an age of resource limits, suppliers will struggle to increase the availability of a resource even at a higher price, assuming what is needed is available at all. Of course, resources will not simply disappear, but they will decline in availability as readily-accessible sources run out, replacements become harder to source and the cost to do so increases. Without assurance of supply, the utility of a global world trading system will no longer be valid and a different exchange system – or systems, perhaps even regional ones – will emerge. The decision by Russia to suspend grain exports in 2010, for example, should be seen as it safeguarding its own requirements at the expense of global ones. Russia protected domestic prices at the expense of international ones. This act was a warning that flexibility or generosity exists in the system not because of the efficiency of the market but because of the availability of surplus supply.

There are already places in the world where this transition is beginning to play out. Ethiopia's determination to press ahead with the building of a dam on the Nile River may have calamitous repercussion for Egypt if there is any reduction in the water flow to downstream states. Egypt's provocative response has led to an escalation of the tension between the two countries (Power 2013b). An international riparian agreement may eventuate, although there is little sign of one so far.

The expectation of continuous economic growth will also be challenged as the tyranny of limits takes hold. The supply of all resources is finite. Yet, the expectation of governments, and their citizens, is that growth is required and desirable. Growth is the norm (Tverberg 2010). In part, this is a result of the need to provide for the subsistence, education, employment and health requirements of an increasing population. Meeting the widespread needs of additional mouths is most easily met by growth; economic stagnation, by contrast, would mean that everyone must receive a smaller share of existing supply. The need for growth is also a product of the human instinct to desire more, even when more is not required. Yet, in a finite world unlimited growth is not feasible, if not illogical. As resources become increasingly scarce, the difficulty of their extraction rises, as does the cost of production. Money that is now used for discretionary purchases will be directed to more essential requirements and as spending secures fewer goods because of higher prices, global economic activity will slow or even decline, unemployment will rise, inflation

soar and standards of living sink. With resource constraint, particularly of energy, the future is likely to be different from what most people have come to expect. Rather than economic growth, the norm may be a long period of economic stagnation, or even negative growth. A future without growth is hard to imagine, but the Revolution of Limits may make it necessary to do just that (Tverberg, 2012).

The Revolution of Limits and the Military

Military organisations will not escape the coming era of limits unaffected. The effect on the military will be profound as leaders redefine the art of war for a new age. What has worked in the past may no longer be achievable in a future defined by resource limitation, and weapons acquired now may prove irrelevant to situations for which they were not designed, or simply impossible to operate or sustain. Defence departments will need to ask whether in a petroleum-scarce world it makes sense to operate energy-intense platforms and, if mobility becomes unaffordable, armies will need to redefine how they achieve mass at the decisive point. New policies and strategies will need to be defined for a more hostile world. Regions may plunge into an extended period of near continuous conflict as societies collapse under the strain of inadequate resources and growing populations, a scenario which will make enormous demands upon military organisations worldwide. As with other Military Revolutions, a race to adapt is about to begin.

Some military organisations are aware of the challenges that lie ahead. For example, in 2007 The CNA Corporation published a report by a panel of retired United States senior officers that highlighted the national security implications of climate change (Sullivan 2007). Other areas of the United States defence bureaucracy are examining alternate fuels as the Pentagon considers operating in a post-petroleum age (Hsu 2011; Koronowski 2013). Resources, particularly energy, also received consideration in the latest United States Quadrennial Defence Review (Department of Defence 2012: 7 & 84-88). In the United Kingdom a retired rear admiral now serves as its climate envoy. While these initiatives are welcome because they associate resource shortage with national security, they stop well short of perceiving that a fundamental shift in the fabric of society is coming.

The Military Revolution of Limits will not affect all states equally. Local and regional factors will play an important role in worsening or ameliorating the consequences, as will the decisions states and peoples make as they transition (or attempt to) to a world dominated by limits. There will be winners and losers: those states and peoples who come through the transition as viable, functional polities; and those that tear themselves apart through internal strife or who have been overwhelmed by more powerful and determined rivals.

It is not yet possible to state with any exactitude the military's future tasks in a post-Globalisation world dominated by resource shortage, but a tentative identification of the security consequences is possible.

When considering the employment of military force to achieve state policy, national leaders typically weigh the risks of taking such action against the benefits obtained by success. Theoretically, nations should choose war only when the perceived benefit is sufficiently greater than the consequences of failure. One of the benefits of Globalisation is that it has provided greatly enhanced options for the peaceful exchange of goods and resources, unlike in other economic systems such as autarky in which possession was paramount. This is one of the stabilising features of Globalisation, and it has served to promote international security.

However, in a resource insecure world, in which Globalisation can no longer act as a safety valve, the cost-benefit ratio of whether or not to go to war will be different. Desperate states or sub-states may be more inclined to accept the hazards of war in order to secure what they themselves require but can no longer obtain from the global commons without force. Additionally, as conflict spreads, the international community will be overstretched and therefore less able to intervene to enhance stability or more disillusioned about the benefits of sustaining an international system. They may even have to contend with their own internal disorders in which governments require the military's assistance in preserving society. The result of Globalisation's decline will be more frequent wars of all forms.

Post-limits wars are also likely to be particularly vicious. The term 'wars of choice' has been widely applied by commentators to the nature of many contemporary conflicts. This expression will likely no longer be relevant to wars in an age of limits. Instead, these wars will likely be ones of existence, because the participants' survival could be at stake in a resource constrained world. It is, therefore, questionable whether the international and ethical limits on violence that have done much to reduce the burden of war will remain practical when peoples believe that their very existence is under threat. Ethics, not truth, may be the first casualty of war in an age of limits.

Not only will wars be more vicious, they will be more numerous. A variety of scholars have argued that the greater inter-connectivity of trade and ideas has led to what they term the 'long peace' (e.g. Mahbubani 2013). Thomas L. Friedman has pointed out that the price of disrupting global supply chains would be too high to pay for most countries (Friedman 2005: 421). Such conclusions are likely to prove overly optimistic, however, because they are dependent on humanity's continued movement towards a strengthening global society. One of the possible effects of the Revolution of Limits will be a reversal of this trend, leading to an upsurge in the willingness of states to solve conflict through war.

The military should also expect to play an even greater stabilisation role in states that are under stress or in danger of collapse from resource shortages. Even now, with a functioning international system, there are numerous states whose long-term stability is uncertain at best and whose people live at the edge of survival. With resource limits, the fabric holding such states together may unravel resulting in more numerous and longer

stabilisation operations. Such collapses will also encourage peoples to seek relief by migration causing an upsurge in the number of refugee migrants. Border security, now the responsibility of coast guards, customs or immigration departments, may require a more robust response that only the military can provide.

To date, the focus of military organisations on how to deal with the emerging tyranny of limits has been to improve their own resilience by identifying substitutes for existing materials, for example bio-fuels for petroleum, or designing platforms that have lower energy requirements than existing models. These initiatives should continue, but military organisations will also have to help identify stress points in their parent societies for which they, or other agencies, will have a role in ameliorating. Unlike for most other government agencies, the assessment of risk is core business for defence departments and they typically contain planners who are skilled at solving complex problems.

Additionally, military staffs are well versed in assessing risk, and they commonly plan in environments of less than 100 per cent certainty. As General Gordon R. Sullivan has observed, the military know that you have to act with incomplete information, and, if you delay, something 'bad is going to happen' (Sullivan 2007: 10). Sullivan is referring to the battlefield, but his statement has resonance for all kinds of risk assessment. Defence personnel, therefore, are well placed to examine the networks that support the functioning of their societies, and in doing so identify points of failure whose breaking could have dangerous cascading complications throughout their states. Defence departments will not be able to ameliorate many of these risks on their own, but this analysis would be the first step towards identifying the scale of the challenge occasioned by the move to a world defined by limits.

Conclusion

States that think through the implications of the Revolution of Limits will have an advantage over those that do not. One can only speculate on the full implications of this shift in the fabric of society; there will be surprises. However, building resilience, triaging what is essential from optional, and seeking substitutes or building stockpiles where vital requirements are at stake will assist any state in adapting to the changes that are coming. Preparing for a more hostile and violent world in which war is more common is also a necessity. Defence departments must prepare for a future in which wars will become more frequent, lethal and play a greater role in deciding disputes between and among peoples than has otherwise been the case in recent memory. Transitions are survived best when awareness of the problem has occurred and preparation has taken place.

Those who dismiss the idea of limits as Malthusian foolishness may be right. The spectre of catastrophe resulting from inadequate resources to manage a growing population has been described before (Ehrlich 1971; Meadows *et al.* 1972) and the challenge met. Humans have experience in 'kicking the can of resource tension' into the future. But technological breakthroughs,

such as the Haber-Bosch Process or the Green Revolution of the 1960s, have done only that: pushed the reckoning into the future, while the pressure of population growth redoubles the scale of the problem for the next time. To maintain stability, contain tension and avoid war, humanity is again facing the necessity of reducing the pressure on the global equilibrium between population demand and resource availability. But this time it will have to be accomplished in the face of resource limits possibly exacerbated by the unpredictability of climate change. Perhaps this time, humanity will not be so lucky.

The Revolution of Limits will not affect all states or sub-states equally. Choices will need to be made, and the wisdom of these decisions will determine which societies will survive relatively unscathed and which will decline or disappear. But surviving the Revolution of Limits will necessitate considerable change at all levels of society and require the navigation of a different and more dangerous threat environment. Scientists and public policy experts are already addressing the coming effect of resource limitation, yet it is also an issue of national security as much as population security, one for which military organisations need to consider and plan.

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References

- Adams, Thomas K. (2006). *The army after next: the first postindustrial army* (Praeger Security International: Westport, CT).
- Brown, Lester R. (2009). Could food shortages bring down civilization? *Scientific American*, May 2009, 53-54.
- Brown, Lester R. (2012). *Full planet, empty plates: the new geopolitics of food scarcity* (Earth Policy Institute: Washington, DC).
- Carrington, Damian (2013). Climate change poses grave threat to security, says UK envoy. *The Guardian*, 1 July 2013.
- Chellaney, Brahma (2011). *Water, Asia's new battleground* (Georgetown University Press: Washington).
- Department of Defence (2012). *Quadrennial Defence Review* (Washington, DC).
- Dobbs, Richard, et al. (2011). *Resource revolution: meeting the world's energy, materials, food, and water needs* (McKinsey Global Institute).
- Ehrlich, Paul R. (1971). *The population bomb* (Buccaneer Books: New York).
- Friedman, Thomas L. (2005). *The world is flat: a brief history of the twenty-first century* (Farrar, Straus & Giroux: New York).
- Hall, C. A. S., and Day, J. W. (2009). Revisiting the limits of growth after peak oil. *American Scientist* 97 (3), 230-237.
- Hsu, Jeremy (2011). *How the U.S. Military can defuse resource wars* (Center for a New American Security: Washington).
- Klare, Michael T. (2012). *The race for what's left: the global scramble for the world's last resources* (Picador: New York).
- Knox, MacGregor, and Murray, Williamson, eds. (2001). *The dynamics of military revolution, 1300-2050* (Cambridge University Press: Cambridge).
- Koronowski, Ryan (2013). President Obama nominates Ret. Admiral McGinn to lead Navy energy efforts. *Climateprogress*, 9 July 2013.
- Malthus, T. R. (2007). *An essay on the principle of population* (Dover Publications: Mineola).
- Martenson, Chris (2011). *The crash course: the unsustainable future of our economy, energy, and environment* (John Wiley & Sons: Hoboken).
- Mahbubani, Kishore (2013). *The great convergence: Asia, The West, and the logic of one world* (Public Affairs: New York).
- Meadows, D. H., et al. (1972). *The limits to growth: a report on the Club of Rome's Project on the Predicament of Mankind* (Universe Books: New York).
- ONI (2012). *Global water security*. Intelligence Community Assessment, 2012-08, Washington, DC.
- ONI (2013). *Worldwide threat assessment of the US intelligence community* (Senate Select Committee on Intelligence: Washington, DC).
- Power, Lauren (2013a). *Food crises and political turmoil: the impact of Egypt's military intervention on national food security* (Future Directions International: Perth).
- Power, Lauren (2013b). *The Nile saga: the reason behind the rhetoric* (Future Directions International: Perth).
- Perez, Ines (2013). Climate change and rising food prices heightened Arab Spring. *Scientific American*, 4 March 2013.
- Roberts, Michael (1995). The military revolution, 1560-1660. pp. 13-35 in Clifford J. Rogers, ed., *The military revolution debate: readings on the military transformation of early modern Europe* (Westview Press: Boulder).
- Rubin, Jeff (2009). *Why your world is about to get a whole lot smaller* (Virgin Books: London).
- Sullivan, Gordon R., et al. (2007). *National security and the threat of climate change* (CNA Corporation: Alexandria).
- Tverberg, Gail (2010). Peak oil: looking for the wrong symptoms? *The Oil Drum*, 18 February 2010.
- Tverberg, Gail (2012). Oil supply limits and the continuing financial crisis. *Energy* 37 (1), 27-34.
- Werrell, Caitlin E., and Femia, Francesco (2013). *The Arab Spring and climate change* (Centre for American Progress: Washington, DC).