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Militarization and water: a cross-national analysis of militarism and freshwater withdrawals

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The treadmill of destruction theory identifies the military as a major contributor to environmental problems. Water resources exploitation is one major problem that has been insufficiently studied by sociologists. Utilizing the treadmill of destruction framework here, I aim to assess how the military influences water use in nations. The purpose of this article is twofold: first, I utilize the treadmill of destruction theory to explain how the military interacts with water resources through combat and civilian operations. Second, I empirically demonstrate militarization influences on freshwater withdrawals through a fixed-effect analysis of 126 countries between 1997 and 2011. Militarization is measured as the number of military personnel relative to the population and military spending as a percentage of gross domestic product. My results show that as military personnel and spending increases, there is a corresponding increase in freshwater withdrawals. My analysis suggests militarization is an important structural driver of environmental impacts including freshwater resources.

Keywords: water; militarism; military; treadmill of destruction; political economy; environmental impacts

Introduction

In 2007, environmentalists in Arizona filed a lawsuit against the Army base, Fort Huachuca, for over-pumping water from the San Pedro River (Fischer 2014). They argued the base was destroying local ecosystems by depleting water resources. The judge ruled against the Army and ordered them to work with the US Fish and Wildlife Service to develop water conservation reports. In 2014, the environmental groups returned to the courts to demand a specific deadline for the base to decrease water withdrawals from the river. It isn't wrong for environmentalists to suspect the US Military as a major consumer of water resources. In 2014, the Department of Defense (Val 2014) reported to consume about 90 billion gallons of water a year. Research on the environmental impacts of military power has focused on energy consumption, ecological footprints and CO_2 emissions (York 2008; Jorgenson and Clark 2009; Clark, Jorgenson, and Kentor 2010). However, relatively less attention is paid to military influences on freshwater.

Freshwater is essential across many aspects of societies including public health systems, economic sectors and military infrastructures. Issues on freshwater availability have a long history in various nations because water is not evenly divided geographically. Climate change adds tensions through droughts and water allocation conflicts, especially since 260 river basins around the world are divided between two or more nations (Hsiang, Burke, and Edward 2013; Cooley et al. 2012). The military is tied to global environmental issues because military forces rely on large quantities of natural resources, especially energy (Clark, Jorgenson, and Kentor 2010), for the mobilization of troops and distribution of supplies. Militarism is deployed by nations to protect their decisions around water resources. Armed conflicts between and within nations contribute to environmental destruction. About 45% of water conflicts recorded by the Pacific Institute's Water Conflict Chronology (2015) involve military operations.

Previous research suggests that structural drivers are important factors to environmental problems (Dietz and Eugene 1994; York, Rosa, and Dietz 2003a; York 2007; Clement and Schultz 2011; Besek and McGee 2014; Griffin, Pavela, and Arroyo 2015). Existing quantitative sociological research, has examined how water resources are effected by economic, demographic and ecological factors (Longo and York 2009; Clement 2010). Historical and qualitative research (i.e. Reisner 1986; Shiva 2002; Gleick and Heberger 2014) show military and state intervention as additional important components to water withdrawal and usage. The Fort Huachuca legal case, as mentioned earlier, further highlights the important dynamic between military forces and water resources. The military partakes largely in the usage of water resources through combat (including water consumption for bases, high-tech goods and personnel) and civilian (including water allocation agreements and mega water development projects) operations. Military infrastructure and decisions demand large amounts of freshwater, thus overexerting environmental resources.

Here, I address the following research question: Does the size of national militaries, as measured by personnel and spending, influence the scale of freshwater withdrawals? Most researchers in the past have used the treadmill of production theory to explain natural resource exploitation and focus predominantly on the environmental

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consequences of economic expansion (Longo and York 2009; Clement 2010). In this article, I use the treadmill of destruction theory (Hooks and Smith 2004, 2005), which focuses on the ways militarization drives environmental problems, to examine how the military influences national water withdrawals, thereby expanding the literature on the forces driving environmental problems. The purpose of this article is twofold: first, I utilize the treadmill of destruction theory to explain how the military interacts with water resources through combat and civilian operations. Second, I empirically demonstrate militarization influences on freshwater withdrawals through a fixed-effect analysis of 126 countries between 1997 and 2011. Before presenting my analysis, I discuss the treadmill of production and then move to explaining the importance of the treadmill of destruction theory for illustrating military influences on environmental problems in general. As part of this, I explain why militarism is relevant specifically for understanding impacts to water resources and water systems.

The treadmill of destruction

The treadmill of production theory focuses on the political economy of environmental problems in modern societies. Allan Schnaiberg (1980), founder of the theory, argues capital, labor and the state function as a growth coalition and work against social-welfare policies and environmental protection so as to maintain profits, jobs and tax revenue. Environmental sociologists have applied the treadmill of production to a long line of cross-national research examining the societal characteristics driving environmental pollution and resource depletion (see for instance Dietz and Eugene 1994; York, Rosa, and Dietz 2003a; York 2007; Clement and Schultz 2011; Besek and McGee 2014; Griffin, Pavela, and Arroyo 2015). From this work, the treadmill of production argues economic growth is the main cause of environmental impacts through environmental additions (i.e. pollution) and withdrawals (i.e. extractions of natural resources) (Foster and York 2004; Gould, Pellow, and Schnaiberg 2004). The 'treadmill' analogy describes the economy's self-reinforcing cycle toward 'endless' growth, where growth creates problems that more growth is needed to fix.

Hooks and Smith (2004, 2005) extend the treadmill analogy to militarism in the place of capitalism. They introduced the treadmill of destruction theory, illustrating it by showing that the US Military's warmaking pursuits had harmful environmental impacts to Native American peoples and lands. The environmental injustices to Native Americans are a result of coercive state policies and military's dependence on expanding defense operations. Hooks and Smith (2004, 2005) argue a distinct dynamic occurs in the treadmill of destruction where military forces in arm races expand geopolitical power at the expense of the environment. Moreover, they argue the state and military operates in a different autonomy than other actors in the elite growth coalition of capital, government and labor because military's decisions include defense decisions like testing atomic bombs and disposal of toxic waste. The state relies on the military for defense, and not commercial interests, thus the environmental inequalities of the military cannot be reduced to capitalism: 'Whereas corporations increase production for the sake of profits and market shares, states increase the size and lethality of military forces to fend off or conquer geopolitical rivals' (Hooks and Smith 2005, 24). Hooks and Smith (2005) argue military efforts expand contentiously like capital through expenses in space, resources and cost. While the treadmill of destruction demonstrates the importance of militarism to environmental impacts, it is not to replace the treadmill of production, but instead to supplement it (Hooks and Smith 2004).

The framework of the treadmill of destruction complements the treadmill of production by recognizing the state participates in the economic realm through the military–industrial complex (Hooks and Smith 2005; Jorgenson, Clark, and Givens 2012; Clark and Jorgenson 2012). After World War II, military infrastructures carried more toxic and resource intensive weapons (Hooks and Smith 2012). State, military and markets began to use 'big science' through research and development departments (Clark and Jorgenson 2012). Consequently, weapons and infrastructures changed to require special materials that were more resource demanding and harmful. The military not only endangers civilians through facilities bearing toxins, but also actively pursues the creation of toxic products (Frey 2013). In addition to nuclear weapons, the US Military uses various chemicals in warfare, such as Agent Orange, a herbicide used during the Vietnam War to deforest vast areas so as to deprive Vietnam soldiers of cover (Frey 2013). The military–industrial complex has spread to the global level where nations are in arm races to expand geopolitical power globally (Hooks and Smith 2012).

The current relationship between militarism and capitalism goes beyond the 'military–industrial complex' (Bonds 2016) where capitalist elites use military efforts to maintain capital accumulation and to secure natural resources from periphery countries (Bonds and Downey 2012; Downey, Bonds, and Clark 2010; Rice 2007; Foster 1994; Jorgenson and Clark 2009). The North/South divide among nations will only continue to grow as natural resources become more scarce: 'Nations controlling key materials will be powerful; wars will be fought to ensure secure and privileged access to them. Because many of these key resources are concentrated in the nations of the Global South, wars will be fought on this terrain to control access to these resources' (Hooks and Smith 2012, 69). As nations use military power in economic and domestic matters, military presence and infrastructural demands on natural resources grow stronger. Furthermore, military enforcements expand, similar to capital expansion, as nations compete for geopolitical power (Hooks and Smith 2005). The expansion of militaries around the world generates operations, personnel and equipment, all

of which require high use of resources. Nations after World War II are increasingly dependent on using the military to reserve a global position; as a result, militaries have become an important structural driver to environmental impacts (Clark and Jorgenson 2012).

Civilian and combat operations carried out by military forces influence water resources. The civilian affairs of the military involve peacekeeping and municipal operations. The combat aspect involves national security, arms and war operations. The civilian operations include engineering projects to ensure national defense, political control or international 'peace' operations. Examples of these include dams and other social infrastructure. Militaries carry out these operations as political or development missions within and between nations, whereas the combat operations involve events like international wars or the development of nuclear testing. In both instances, military impacts public and private business economies because the military itself is a huge consumer of environmental resources, such as energy and oil and creates an everlasting dependency on fossil fuels (Clark, Jorgenson, and Kentor 2010; Kentor, Jorgenson, and Kick 2012). The private sector benefits from previous infrastructural investments and research in advanced technologies from military weapons (Jorgenson, Clark, and Givens 2012).

Information on military actions and water usage is limited compared to research on energy usage. However, we know water is necessary for almost all military aspects including large technologies. For instance, the military demands large amounts of water for chemical decontamination where chemical-related procedures need tens of thousands gallons of water to decontaminate people or military equipment (Mitchel 2007; Army, Marine Corps, Navy, Air Force 2008). Military structures demand large amounts of water resources to fulfill combat operations on bases along with military troops. Military influences on water resources extend beyond large-scale combat operations to civilian issues such as water allocations and water-related conflicts.

State and military factors play an important role in controlling water resources through multinational treaties of water allocation and governmental infrastructure. National security and stability are tied to water availability, yet, water resources are not equally distributed geographically. For instance, 40% of rivers are shared between nations (Cooley et al. 2012). Water allocation agreements are decided through international law and multinational treaties. Most water resources have 'inter-basin transfer' where water is transferred from another area (Islar and Boda 2014). As officials divert water resources between geographic regions, water is politicized by framing dams as a solution to water scarcity and overlooking the social drivers of water use (Islar and Boda 2014). Expensive mega projects transporting water supplies in many cases exacerbate water crises by destroying ecosystems. Armed forces are used against residents resisting dam construction and relocation (Cummings 1990; Fearnside 2006, 2008; Bosshard 2008, 2009). For instance, prior to the construction of the Merowe Dam in Sudan, residents who refused to relocate were shot by militias (Bosshard 2008). The military and state interact with these water resources and systems to secure economic growth. For example, international pressure from industries such as timber and rubber drive the need for infrastructural development of water systems in the Amazon Basin (Cummings 1990; Fearnside 2006, 2008). Additionally, the US Military supported American involvement in the creation of dams in India to secure irrigation projects (Shiva 2002). Here, the treadmill of destruction is working in conjuncture with the treadmill of production through coercive polity: '[f]irms often profit from war (sometimes scandalously so) and, in some instances, states wage war to protect commercial interest' (Hooks and Smith 2004, 561). Mega water projects demonstrate how militarism and capitalism are dependent on each other in a relationship beyond the military–industrial complex where military efforts are used to secure opportunities for capital accumulation (Bonds 2016).

Overall, the military influences water resources through combat and civilian operations including consuming large water resources for bases and personnel, participating in mega water infrastructural development and creating water intensive weapons. In these processes, military forces affect all types of freshwater sources from rivers to groundwater through withdrawal and pollution. By situating freshwater within the treadmill of destruction, we can understand the connections between militarization and environmental problems: (1) military infrastructure demands large amounts of water for technologies, bases and personnel; (2) military forces are used to enforce water allocation decisions. Thus, military powers are a structural driver of environmental impacts. In my analyses, I employ the treadmill of destruction theory to examine whether increased levels of militarism (i.e. in military spending and number of soldiers) are associated with increased freshwater withdrawals in nations. This paper continues the traditional methods of measuring social drivers of environmental impacts (see for instance York 2008; Jorgenson and Clark 2009; Clark, Jorgenson, and Kentor 2010; Lengefeld and Smith 2013). I also take into account the treadmill of production by including economic and modernization variables such as gross domestic product (GDP) per capita, urbanization and population.

Alternatively, if results show militarism as a nonsignificant factor of freshwater withdrawals, then this would support modernization theory. Modernization argues nations can 'develop' by participating in economic activities such as trade and investments. Ecological modernization research contributes to environmental sociology by understanding the responses of modern societies on environmental problems, emphasizing the importance of social actors (i.e. firms, industries and state) in the analysis of environmental problems and demonstrating that wealthy countries can achieve sustainability (Mol 2001; Mol and Janicke 2009). Ecological modernization posits that there is no need to change the entire capitalist system, and therefore, modernization and capitalism are solutions to environmental problems. State and market regulations

should then focus on the developing green economies (Mol 2001; Mol and Janicke 2009). Examples within ecological modernization include internal changes in consumption and production processes such as waste reduction and elimination, reuse, recycling, dematerialization and resource conservation (Sonneneld 2009).

Data and methods

The research question of this study is does militarism drive freshwater withdrawals? I address this question using fixed-effect regression models of total freshwater withdrawals in 126 countries for 1997, 2002, 2007 and 2011, for the nations and time where sufficient data are available. Table 1 presents a summary of the countries included in the analysis. The countries included in my analysis come from a range of world system positions thereby testing the treadmill of destruction as an overall global phenomenon.

Table 1. Summary of countries in analysis.

Afghanistan	Ghana	Niger
Albania	Greece	Nigeria
Algeria	Guinea	Oman
Angola	Guinea-Bissau	Pakistan
Argentina	Guyana	Panama
Armenia	Haiti	Paraguay
Australia	Hungary	Peru
Austria	India	Poland
Azerbaijan	Indonesia	Qatar
Bahrain	Iran, Islamic Rep.	Romania
Belgium	Iraq	Russian Federation
Belize	Ireland	Saudi Arabia
Benin	Israel	Senegal
Bolivia	Italy	Seychelles
Botswana	Jamaica	Sierra Leone
Brazil	Japan	Singapore
Bulgaria	Jordan	Slovak Republic
Burkina Faso	Kazakhstan	Somalia
Burundi	Kenya	South Africa
Cameroon	Latvia	Spain
Chad	Lebanon	Sri Lanka
China	Lesotho	Sudan
Colombia	Liberia	Suriname
Congo, Rep.	Libya	Swaziland
Costa Rica	Lithuania	Sweden
Cote d'Ivoire	Luxembourg	Syrian Arab Republic
Cuba	Macedonia, FYR	Tajikistan
Cyprus	Madagascar	Togo
Czech Republic	Malawi	Trinidad and Tobago
Denmark	Malaysia	Tunisia
Djibouti	Mali	Turkey
Dominican Republic	Malta	Turkmenistan
Ecuador	Mauritania	Uganda
Egypt, Arab Rep.	Mauritius	United Arab Emirates
El Salvador	Moldova	United Kingdom
Equatorial Guinea	Mongolia	United States
Estonia	Morocco	Uruguay
Fiji	Mozambique	Uzbekistan
Finland	Myanmar	Venezuela, RB
France	Namibia	Vietnam
Gabon	Netherlands	Yemen, Rep.
The Gambia	New Zealand	Zambia
Germany		Zimbabwe

I used a fixed-effect model so that each country is only compared to itself and not each other. I included all countries with available data for all given time points in order to have a balanced data set. The years employed in this analysis are post-Cold War years because previous research notes militarism in the twenty-first century has changed from before (Smith, Hooks, and Lengefeld 2014).

Fixed-effect models focus on change over time and are therefore better at allowing for causal inference than cross-sectional analyses (Allison 2009). These models are particularly useful because they control for time-invariant variables particular to each nation (e.g. a country's geographical size, location, topography). Fixed-effect models are panel analyses where there are observations for every k country (k = 1,2,3,. . .,k) at every t time point (t = 1,2,3,. . ., t). Fixed-effect models have been used in numerous cross-national quantitative analyses in environmental sociology (see for instance Clark, Jorgenson, and Kentor 2010; Clement and Schultz 2011). The models included time dummies in order to control for general period effects (Jorgenson and Clark 2009).

The panel data are gathered from The World Bank (2014) World Development Indicators online, which has data on many national characteristics, and the Stockholm International Peace Institute. The Stockholm International Peace Institute provides data on military and arms among various countries and is free to the public. Military expenditures' data are from the Stockholm International Peace Institute and all other variables are from the World Bank. The dependent variable is total annual freshwater withdrawals measured in billion cubic meters. Freshwater withdrawal estimates includes those for public supply, the industrial sectors, the agricultural sectors and thermoelectric plants. Agricultural sectors withdrawals include irrigation and livestock. The industrial sectors comprises of manufacturing and other industrial uses and water cooling for thermoelectric plants. The public sector consists of municipal uses, commercial uses, home uses and public services. Freshwater withdrawal estimates do not include water loss from evaporation.

The independent variables correspond to the theoretical framework. The treadmill of destruction is represented through two measurements of militarism: federal military spending (% of GDP) and military personnel (number of active personnel per 1000 citizens). The two variables measure distinct aspects of the military. The estimates include armed forces (including peace keeping forces), governmental agencies, paramilitary forces and military space activities. The World Bank data on military personnel are from the annual report *The Military Balance* by the International Institute of Strategic Studies. Military personnel estimates include national forces stationed domestically and aboard (The Military Balance 2015). These military variables have been used in previous cross-national quantitative research of military influences on environmental impacts (York 2008; Jorgenson and Clark 2009; Clark, Jorgenson, and Kentor 2010; Lengefeld and Smith 2013).

Table 2. Descriptive statistics and bivariate correlations, all variables have been transformed into their natural logarithms.

	Variable	Mean	Std. Dev.	1	2	3	4	5	6	7	8	9
1	Freshwater withdrawals	0.959	2.269	1.000								
2	Population	16.042	1.637	0.844	1.000							
3	Urban %	3.932	0.495	0.103	−0.055	1.000						
4	GDP per capita	8.053	1.605	0.108	−0.076	0.710	1.000					
5	Federal military spending (% GDP)	0.576	0.931	0.097	0.047	−0.028	−0.027	1.000				
6	Military participation	1.454	0.984	0.109	−0.101	0.385	0.337	0.553	1.000			
7	Nondependent age %	4.115	0.117	0.237	−0.005	0.599	0.756	−0.106	0.388	1.000		
8	Manufacturing (% GDP)	2.441	0.591	0.317	0.186	0.166	0.276	0.037	0.099	0.406	1.000	
9	Exporting (% GDP)	3.570	0.615	−0.346	−0.444	0.288	0.389	0.043	0.177	0.339	0.044	1.000

I incorporate the treadmill of production and world-system theory through additional variables. GDP per capita is included and measures a country's affluence. Population is another important control variable to include in environmental analyses since it influences the scale of demand for and capacity to supply natural resources. Urbanization (% of population living in urban areas) is included since it is connected with technologies, infrastructure and lifestyles that influence water use (York 2008). Additional control variables include nondependent population (citizens between 15 and 64), manufacturing as a percentage of GDP and exports as a percentage of GDP. Table 2 presents the descriptive statistics and bivariate correlations among the variables. All variables in my analysis are in natural logarithmic form, making these elasticity models, where the coefficients can be interpreted as the percentage change in the dependent variable for a 1% change in the independent variable (York, Rosa, and Dietz 2003b).

Results and analysis

The results from the panel analysis are presented in Table 3, where I report two models. The first model is the more parsimonious one. The second model is the full saturated model, including all of the independent variables. Model 1 shows support for the treadmill of destruction, with both of the militarization variables having a significant positive effect on freshwater withdrawals. The military participation coefficient indicates that a 1% increase in military participation corresponds with a 0.14% increase in freshwater withdrawals. Similarly, the military spending coefficient shows for every 1% increase in military spending consists of a 0.08% increase in freshwater withdrawals. Likewise, in Model 2, both militarization variables have significant positive effects. Therefore, the results clearly suggest that the military has a substantial effect on water resources.

Surprisingly, GDP per capita was not found to be statistically significant in either model. In a model not presented here, I tested for the presence of an environmental Kuznet's curve, where the relationship between GDP per capita and water withdrawals switched from positive to negative after at turning point is reached by adding a quadratic term for GDP per capita, but the quadratic did not have a statistically significant effect. Urbanization has a significant effect in both models (although only marginally so in Model 2). Population was also found to have a significant effect on water withdrawals in both models, consistent with many other quantitative studies of environmental impacts. None of the additional control variables in Model 2, dependent-age population, exports as a percentage of GDP and manufacturing as a percentage of GDP had a significant effect.

Table 3. Estimation results of fixed effects models.

	Treadmill of destruction	Full saturated model
Population (ln)	0.514***	0.659***
Urban % (ln)	0.648*	0.600^
GDP per capita (ln)	−0.015	−0.035
Federal military % GDP (ln)	0.083*	0.094*
Military participation (ln)	0.136***	0.198***
Nondependent age % (ln)		−0.58
Manufacturing % GDP (ln)		0.05
Exporting % GDP		0.05
Constant	−10.099***	−10.14*
R^2 within	0.226	0.24
R^2 overall	0.716	0.734
Rho	0.972	0.96

One-tailed test; ^$p < 0.10$;*$p < 0.05$;**$p < 0.01$;***$p < 0.001$.

Conclusion

Environmental sociology has a long line of research looking into the structural drivers of various environmental impacts (Dietz and Eugene 1994; York, Rosa, and Dietz 2003a; York 2007, 2008; Clement and Schultz 2011; Besek and McGee 2014; Griffin, Pavela, and Arroyo 2015). However, water-related impacts have received only limited attention (Clement 2010; Longo and York 2009). The literature on environmental impacts has shown the importance of modernization, population and world-systems position to environmental degradation. Recently, there has been a rising interest in militarism as a major structural force in environmental degradation (Hooks and Smith 2004; York 2008; Jorgenson and Clark 2009; Jorgenson, Clark, and Givens 2012;

Lengefeld and Smith 2013). The aim of this paper is to situate water resources in the treadmill of destruction theory, which argues militarism contributes to environmental problems. The military affects freshwater resources through combat operations including large technologies, bases and personnel. The military also influences water resources through civilian operations connected with water allocation agreements and large-scale water projects. The theoretical framework identifies the military as a major social institution in modern societies influencing environmental degradation. The results of my analysis show militarization, measured as military personnel and spending, influences freshwater withdrawals. Furthermore, the outcomes did not support ecological modernization theory. Interestingly, military presence has a stronger effect than military spending. Scanlan and Jenkins (2001) explain military presence as representing military force on political matters and military spending as military control on resources. In the context of my findings on freshwater resources, military forces on political matters has a stronger effect than military spending on the treadmill of destruction for water use. My findings are consistent with previous quantitative analyses of the impacts of militarism on natural resources (Clark, Jorgenson, and Kentor 2010; Jorgenson and Clark 2009; York 2008). My findings also are consistent with case study research arguing the military and state are important actors affecting water resources (Shiva 2002). For instance, Jongerden (2010) writes about Turkey's proposed dams being used as military tools to control water resources and secure the border. The work of Jongerden (2010), water conflict analyses from Gleick and Heberger (2014) and the quantitative study I present here highlight the importance of militarization on water resources.

Demonstrating militaries as a significant factor on water resources furthers our understanding of societal drivers on environmental problems. Militaries are an important institution within societies because (1) military infrastructures consist of resource intensive operations including large-scale technologies, bases and personnel, and (2) their participation has serious consequences. The Department of Defense (2014) notes that freshwater is as necessary in military operations as liquid fuel. Military power plays a primary role in natural resources at various stages including armed enforcement and regulation of water treaties and projects (Downey, Bonds, and Clark 2010). Gleick and Heberger (2014) describe various water-related conflicts including militants attacking water systems and people involved them. They further argue water conflicts are increasing because freshwater availability is decreasing and political agreements are contested. Water stress events such as droughts add political pressures to water allocations and social unrest. In many instances, when mega water projects that are financed by core countries face local opposition usually by indigenous peoples (Marzec 2014) in periphery countries, the result is armed forces and deaths. The majority of structural driver analyses within environmental sociology focus on economic and demographic factors. With the increase public attention on environmental issues, it is crucial to include the ecological impact and role of militaries.

Future research is crucial to further understand the ways which military power influence water resources. Specifically, future research should investigate case studies of military's roles with water including life-cycle or stakeholders analyses. Furthermore, it would be interesting to see whether water pollution has similar effects as water withdrawals. This article provides a global macro-narrative of the relationship between military and water. The results from my analysis show the important contributions the treadmill of destruction has for nature/society relationships. This finding demonstrates scholars should focus on expanding knowledge on militarization as a major structural influence on the environment.

Disclosure statement

No potential conflict of interest was reported by the author.

Notes on contributor

Camila Alvarez is a Ph.D. Candidate at the University of Oregon in the Department of Sociology. She earned her B.A. in Sociology and Mathematics at the University of Nevada, Las Vegas and her M.S. in Sociology at the University of Oregon. Her research interests include environmental sociology, urban sociology and quantitative methods.

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