

## The Future Is More than Scale: A Reply to Diehl and O’Lear

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Current research on resource and environmental conflict – and indeed most research in any field within international relations – rarely consider the concept of scale. Instead, empirical analysis is conducted at a convenient, pre-defined level with little sensitivity to the underlying assumptions of the theoretical propositions. Regardless of the nature of conflict and the qualities of the resources under study, the dominant scale of investigation is the state, including when they come in pairs (i.e. ‘dyads’).<sup>1</sup> Popular theories about why and where war occurs, however, often refer to local factors and micro-level mechanisms. According to Collier and Hoeffler, rebellion is more likely when opportunity costs are unusually low, such as when valuable resources are available for extortion, when unemployment rates are high, and when the environment is favorable to guerrilla warfare (rough terrain, low population density).<sup>2</sup> Similarly, Fearon and Laitin argue that outbreak of civil war is explained primarily by conditions that favor insurgency (again, poverty and rural areas are identified, but also aspects of ‘state weakness’)<sup>3</sup>, whereas Hauge and Ellingsen point to environmental degradation as a significant risk factor.<sup>4</sup> The intensity of such variables may vary considerably across space within the boundaries of states; yet, conflict analyses prevail at the country level. The result is an unfortunate incompatibility in scales between theory and analysis, and this is particularly evident among quantitative studies linking environmental factors with civil war. This essay therefore speaks primarily to that particular literature.

There are various alternative ways to deal with the overly aggregated, state-centered focus of contemporary scholarship. Paul F. Diehl and Shannon O’Lear in this issue argue that the only solution is to develop an ambitious, all-encompassing research design that explicitly aims to capture all relevant aspects of the resource-conflict nexus.<sup>5</sup> Recognizing that scale is “a relationship among specific processes and places”<sup>6</sup> that “may continuously change”<sup>7</sup>, an analysis of resource conflicts should be multidimensional by incorporating actors (both those directly involved in the fighting and external parties), places (from battlefield locations and resource deposits to regional networks and global markets), and their entwined relations. Identifying this so-called resource scale of conflict, Diehl and O’Lear argue, is critical for disentangling the role of natural resources in conflict. While commendable in many regards, I am not convinced that this approach quite constitutes the future – and certainly not the only future – of research on environment-related conflict.

Above all, the sheer complexity of such a grand research design would impose upon the researcher significant constraints, equally serious to those caused by a traditional state-level approach. Methodologically, only in-depth studies of single cases stand a chance of covering all relevant processes and actors at every possible scale at which the conflict plays out. This should not lead us to the conclusion that careful scrutiny of empirical data in a large-N comparative setting cannot provide novel insight into the resource-conflict puzzle. Yet, this is essentially the underlying message of Diehl and O’Lear’s article.

Sound scientific research philosophy implies that research questions guide the choice of methodology, not vice versa. Medical researchers studying patients with bronchogenic carcinomas, or lung cancer, might find that an overwhelming proportion of the sample has repeatedly been exposed to contaminated air. However, a possible causal link between smoking (or the inhaling of other poisonous gases or particles, such as asbestos) and cancer cannot be established unless the investigation compares the affected patients with a control group (e.g. non-smokers). The same logic applies to conflict research. We do not learn much about the impact of natural resources on the risk of civil war by studying cases of conflict only.

By relegating quantitative analysis as a scientific method to a mere hypothesis-producing tool, Diehl and O’Lear severely shrink the range of viable research questions. This becomes particularly evident towards the end of their essay, where the discussion shifts from general aspects of environmental conflicts to management of such events, implicitly presuming that the conflicts have already broken out. While important, conflict management and resolution strategies are suboptimal to successful conflict prevention policies. This is why acquiring *general* knowledge on resource-conflict linkages is so crucial. Case studies are invaluable as tools to gain thorough knowledge of particular cases but the idiosyncratic nature of such investigations implies that they are inappropriate for drawing broader generalizations. Large-N studies, in contrast, may lack refinement with respect to the particulars of events but they are unsurpassed when it comes to identifying the characteristics that distinguish conflict-ridden countries from peaceful ones. The latter factors are of course what we want to concentrate on if we seek to improve on the ability to predict future hotspots of environment-related conflict, to which adequate preventative measures may be taken.

A comprehensive research portfolio consisting of numerous case studies – if carried through – is likely to shed additional light on the many connections between natural resources and the course and outcome of armed conflict. Nonetheless, it will only cover a subset of all possible inroads to environmental conflict research and it will not be well suited to explore arguably the most important questions in this field, namely those concerning the origins of resource-related conflicts and, correspondingly, the best strategies to avoid future wars.

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Concerns regarding the frequent ignorance of scale and the state-centeredness of conflict research obviously deserve serious consideration. In fact – and contrary to the impression left

by Diehl and O’Lear’s article – there is already a significant number of studies that explicitly seek to depart from the chains of the country level and develop more scale-sensitive models. In collaboration with colleagues associated with the *Centre for the Study of Civil War*, I have shown how geographic information systems, GIS, can improve our ability to generate subnational data and develop disaggregated models of armed conflict.<sup>8</sup> A number of related articles, presenting and analyzing geocoded data on various environmental factors (resources, watersheds, demography)<sup>9</sup> have been published in the last couple of years, and this area of research is expanding rapidly.<sup>10</sup> In that sense, Diehl and O’Lear are kicking in open doors. However, there are other aggregation-related challenges in the literature that too often avoid attention, some of which I outline below. Most of these can be handled properly in a slightly more pragmatic fashion than the one suggested by Diehl and O’Lear.

First, the quantitative operationalization of the main explanatory variable – availability of natural resources – is often overly aggregated (lumping together a wide selection of resources) or overly simplistic (dichotomous indicator). This is discussed at some length elsewhere so I shall not repeat this point here.<sup>11</sup> Another problem with the resource measures, briefly touched upon by Diehl and O’Lear, is the lack of spatial reference. Almost all applied indicators are based on country-level statistics of resource production or export levels. However, resource deposits are often confined to limited parts of the country, and so are most civil wars. True, arguments linking resource dependence with weak state and sparse networks mechanisms may pertain primarily to the country level, but the bulk of research on the resource-conflict nexus identify other, localized dynamics (in particular ‘greed’) as more important.<sup>12</sup> If the location of the resources indeed matters, then a disaggregated research design with geocoded data constitutes the natural next step.

Second, conflict studies tend to treat civil wars as a homogenous group of events, afflicting entire countries. Apart from the implausible spatial assumption, which is discussed in more depth by Buhaug and Lujala<sup>13</sup>, it appears questionable to expect specific types of resources – be it abundance of diamonds or scarcity of land – to exert identical effects on the risks of governmental and separatist conflict. A cursory glance indicates that conflicts in regions with alluvial diamonds tend to concern state governance (e.g. Angola, DR Congo, Liberia, Sierra Leone) whereas rebellion in oil-rich regions more often takes the form of separatist insurgency (Ache, Biafra, Cabinda). Along this line, Le Billon<sup>14</sup> presents a typology where different kinds of resources are associated with different forms of conflict. Although this theoretical scheme is yet to undergo systematic empirical testing, recent studies by Ross<sup>15</sup> and Buhaug<sup>16</sup> indicate that some resources do in fact behave differently depending on the nature of the rebellion. However, more systematic research is needed before any firm conclusions can be drawn.

Third, most quantitative research treats the temporal and spatial domains as fixed, not allowing for trends across regions or time. While some argue that we should not expect to find systematic spatial variation as long as the model is correctly specified,<sup>17</sup> the assumption of no time trend seems less plausible. For example, a number of civil wars in the 1970s and 1980s involved super-power struggle for regional influence. With the collapse of the Soviet

Union, warring parties in these so-called proxy wars had to look elsewhere for funding, making valuable commodities an obvious target. This might explain why Lujala et al. report much stronger results for diamonds on civil war for the post-1985 years than for the entire 1945–99 sample period.<sup>18</sup> Similarly, we should not be surprised to find an association between global demand of certain commodities and their involvement in armed conflict. Indeed, Ross argues that the increased share of conflict among petroleum-exporting states after 1973 was partly a result of rising oil prices.<sup>19</sup>

A final issue that I shall raise here relates to the actors involved in conflict. Conventional empirical studies limit themselves to the analysis of states (in studies of conflict onset) or conflicts (duration analysis). Such aggregated designs are likely to conceal important aspects of the conflicts as they ignore characteristics of the warring parties, such as access to lootable resources, materialist grievances, relative strength, and transnational ethnic affiliations, as well as temporal variations in center-periphery relations (e.g. due to the formation of new coalitions). Whether or not a displeased group decides to take up arms to change the status quo depends not primarily on country features (income, size, annual amount of oil exports) but on a combination of group characteristics (intensity of grievances, ideology, relative location, size, etc.) and the relations between the group and the ruling coalition. Among the first to employ a group-level approach to the study of civil war onset, Buhaug, Cederman, and Rød find that powerful but politically excluded ethnic minorities, residing at a considerable distance from the capital, are the most likely to rebel.<sup>20</sup> Similarly, Cunningham, Gleditsch, and Salehyan's duration analysis structures conflict in terms of dyads (each rebel group against the government forms one dyad), permitting individual propensities for conflict resolution.<sup>21</sup> Neither of these pioneering studies relates particularly to environmental factors, however, and the role of natural resources is not explored.

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So where does the future of environmental conflict studies lie? Three complementary avenues come to mind: 1) a sustained blend of case-based and large-N empirical assessments; 2) disaggregation of the subject under study, theoretically as well as empirically; 3) increased use of advanced methods, such as GIS, spatial regression, and multilevel modeling.

1) The very fact that in-depth studies of single (or a limited number of) cases and statistical analyses across large sections of data are designed to answer different kinds of research questions is in itself a sufficient reason to secure the future of both. Policy makers who seek advice on possible strategies to end a ravaging civil war will base their decisions in large part on recommendations from expert assessments of that particular case. Yet, the same policy makers are better off turning to statistics-based, multiple-case analyses whenever they need predictions on future scenarios, involving unknown actors and places. For example, the recent World Bank report *Natural Disaster Hotspots: A Global Risk Analysis* provides an unrivaled assessment of natural hazards propensity across the globe that could not have been accomplished by merely joining a set of qualitative studies covering the same cases.<sup>22</sup> Based on this report, the Bank can “identify with relative precision the geographic ‘hotspots’ – the

countries most vulnerable to natural disasters – [and] anticipate the foreseeable human and economic risks [...] ahead of the disaster event.”<sup>23</sup> The two broad methodological traditions complement each other whereby findings from cross-sectional analyses can be tested in single cases (as suggested by Diehl and O’Lear), but the reverse is also true.

2) In order to avoid the ecological fallacy (explaining lower-order phenomena with higher-order data) it is important to continue the trend towards disaggregating the study of armed conflict. I believe it is useful to think of civil war as sets of interactions between state and non-state actors. This way, we may escape from the static, state-centered ‘territorial trap’<sup>24</sup> and simultaneously incorporate transnational dimensions of conflict whenever pertinent. When studying processes of ongoing conflict (location, duration, escalation, severity, settlement, etc.), identifying the directly relevant actors is fairly simple. For analyses that require null cases (observations without conflict; typically studies of conflict onset), the *ex ante* identification of relevant actors is less trivial. One way to deal with this is to limit the focus to ethnic conflicts and consider all marginalized ethnic groups as potential non-state actors in civil war.<sup>25</sup> Another option is to treat civil conflict as center-periphery dyads where pre-defined geographic segments (artificial grids or administrative regions) constitute the potential locus of conflict.<sup>26</sup> Either way, a disaggregated research design is perfectly compatible with country- and transnational-level explanations and should thus be able to account for such contextual factors as neighboring conflict and environmental concerns, refugee flows, and global fluctuations in commodity prices. Research along these lines, of course, will require richer and more complete geo-referenced data on armed conflict as well as on important environmental and socioeconomic factors.

Similarly, it is important that theories of environmental conflict account for the heterogeneous nature of civil wars. Despite advances in this direction by e.g. Le Billon,<sup>27</sup> most work on natural resources and civil war still fail to distinguish between various types of conflict and implicitly assume that the spatial extent of conflicts mirrors that of the states.<sup>28</sup> This is problematic if statistical associations at higher levels do not hold up at more suitable scales of analysis, and even more worrying if factors are excluded from further theorizing because they fail to exert a significant effect at the inappropriate aggregate level. Major oil exporters appear more conflict prone than other states, but the reasons for this empirical finding are disputed. Some argues that this signifies greed mechanisms (the state/self-determination becomes a more prized asset worth fighting for), others point to grievances (resource revenues do not benefit the local population), while yet others claims that oil wealth leads to weak states and corruption, and makes regimes more vulnerable to economic shocks. By breaking away from the state-centered focus of contemporary scholarship, we will be much better able to separate between and rank these and similar competing explanations.

3) As high-resolution geo-referenced indicators of conflict and the environment increasingly become available, users may have to depart from conventional regression models and statistical packages in order to exploit the richness of the data. Among the recent advances in peace science is the introduction of GIS. In a GIS environment, researchers can incorporate the spatial dimension of the units under study, account for and visualize relationships across

space, and conduct various exploratory spatial data analysis.<sup>29</sup> Even for time-series data, which are generally not GIS-friendly, GIS may be used for data generation, manipulation, and conversion, upon which the data can be scrutinized in traditional non-geographic statistical software.

Another possible avenue to mitigate the timely criticism regarding scale is multi-level modeling. The combination of disaggregated units of observation and an awareness of potential regional patterns imply that the data are likely to exhibit a hierarchical structure. Although so far rarely used in conflict research, multi-level models are ideal to evaluate and compare the importance of factors at different scales.<sup>30</sup> A nested analysis may thus provide valuable insight into such puzzles as the influence of neighborhood characteristics relative to national and local factors in determining the probability of armed conflict or peaceful resolution.

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Geographers and political scientists traditionally approach the field of political geography from different angles, for different purposes, and with different means.<sup>31</sup> With their emphasis on issues of place and scale, Diehl and O’Lear echo a traditional ‘geographic’ stand. This is reflected by their proposed solution to the flaws of contemporary research on environment-related conflict, pointing to the uniqueness of the phenomena under study and seeking to provide a sweeping account of all elements involved in each case. In contrast, my recommendations are colored by a discipline searching for “order and regularity in the political realms”<sup>32</sup>, and to this end, I find spatial statistics and increasing use of geo-referenced data particularly promising. I do not believe, as Diehl and O’Lear appear to do, that only one methodological tradition (case studies) can further research on natural resources and armed conflict. Rather, the fact that the strengths of one method are the weaknesses of the other and vice versa suggests that the town is big enough for both. Diehl and O’Lear, in their review, offer perspectives on how an all-encompassing case-based research design could add to our understanding of environment-conflict linkages. In this essay, I have attempted to provide similar thoughts within a quantitative analysis framework.

## Notes

<sup>1</sup> For an early critique of the 'state-centeredness' of international relations studies, see J. Agnew, 'The Territorial Trap: The Geographic Assumptions of International Relations Theory', Review of International Political Economy 1/1 (1994) pp. 53-80.

<sup>2</sup> P. Collier and A. Hoeffler, 'Greed and Grievance in Civil Wars', Oxford Economic Papers 56/4 (2004) pp. 663-95.

<sup>3</sup> J.D. Fearon and D.L. Laitin, 'Ethnicity, Insurgency, and Civil War', American Political Science Review 97/1 (2003) pp. 75-90.

<sup>4</sup> W. Hauge and T. Ellingsen, 'Beyond Environmental Scarcity: Causal Pathways to Conflict', Journal of Peace Research 35/3 (1998) pp. 299-317.

<sup>5</sup> P.F. Diehl and S. O'Lear, 'Not Drawn to Scale: Research on Resource and Environmental Conflict', Geopolitics X/X (2007) pp. XXX-XXX.

<sup>6</sup> Ibid, p. XXX.

<sup>7</sup> Ibid, p. XXX.

<sup>8</sup> H. Buhaug and P. Lujala, 'Accounting for Scale: Measuring Geography in Quantitative Studies of Civil War', Political Geography 24/4 (2005) pp. 399-418; <sup>8</sup> H. Buhaug and J.K Rød, 'Local Determinants of African Civil Wars, 1970-2001', Political Geography 25/3 (2006) pp. 315-35.

<sup>9</sup> E. Gilmore, N.P. Gleditsch, P. Lujala, and J.K. Rød, 'Conflict Diamonds: A new Dataset', Conflict Management and Peace Science 22/3 (2005) pp. 257-72; P. Lujala, N.P. Gleditsch, and E. Gilmore, 'A Diamond Curse? Civil War and a Lootable Resource', Journal of Conflict Resolution 49/4 (2005) pp. 538-62; P. Lujala, J.K. Rød, N. Thieme, 'Fighting over Oil: Introducing a New Dataset', Conflict Management and Peace Science 24/3 (2007) forthcoming; A.T. Wolf, J.A. Natharius, J.J. Danielson, B.S. Ward, and J.K. Pender, 'International River Basins of the World', Water Resources Development 15/4 (1999) 387-427; N.P. Gleditsch, K. Furlong, H. Hegre, B.A. Lacina, and T. Owen, 'Conflicts over Shared Rivers: Resource Wars or Fuzzy Boundaries?', Political Geography 25/4 (2006) 361-82; H. Hegre and C. Raleigh, 'Population Size, Concentration, and Civil War: A Geographically Disaggregated Analysis', Polarization and Conflict workshop, Konstanz, 2-5 June 2005.

<sup>10</sup> See e.g. contributions to the University of California, Institute on Global Conflict and Cooperation conference on Disaggregating the Study of Civil War and Transnational Violence 7-8 March 2005, available from <http://www-igcc.ucsd.edu/gleditschconf.php>.

<sup>11</sup> M.L. Ross, 'A Closer Look at Oil, Diamonds, and Civil War', Annual Review of Political Science 9 (2006) pp. 265-300.

<sup>12</sup> See M. Humphreys, 'Natural Resources, Conflict, and Conflict Resolution: Uncovering the Mechanisms', Journal of Conflict Resolution 49/4 (2005) pp. 508-37 for a review of various proposed mechanisms.

<sup>13</sup> Buhaug and Lujala (note 8).

<sup>14</sup> P. Le Billon, 'The Political Ecology of War: Natural Resources and Armed Conflicts', Political Geography 20/5 (2001) pp. 561-84.

<sup>15</sup> Ross (note 11).

<sup>16</sup> H. Buhaug, 'Relative Capability and Rebel Objective in Civil War', Journal of Peace Research 43/6 (2006) pp. 691-708.

<sup>17</sup> G. King, 'When Context Should Not Count', Political Geography 15/2 (1996) pp. 159-64; see also P. Collier and A. Hoeffler, 'On the Incidence of Civil War in Africa', Journal of Conflict Resolution 46/1 (2002) pp. 13-28.

<sup>18</sup> Lujala, Gleditsch, Gilmore (note 9).

<sup>19</sup> Ross (note 11).

<sup>20</sup> H. Buhaug, L.E. Cederman, and J.K. Rød, 'Disaggregating Ethnic Conflict: A Dyadic Model of Exclusion Theory', Annual Meeting of the American Political Science Association, Philadelphia, 31 Aug-3 Sept. 2006.

<sup>21</sup> D. Cunningham, K.S. Gleditsch, and I. Salehyan, 'Dyadic Interactions and Civil War Duration', Polarization and Conflict Workshop, Nicosia, 26-29 April 2006.

<sup>22</sup> M. Dilley, R.S. Chen, U. Deichmann, A.L. Lerner-Lam, and M. Arnold, Natural Disaster Hotspots: A Global Risk Analysis (Washington, DC: World Bank 2005).

<sup>23</sup> Ibid, p. 24.

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<sup>24</sup> Agnew (note 1).

<sup>25</sup> Buhaug, Cederman, and Rød (note 20).

<sup>26</sup> Buhaug and Rød (note 8).

<sup>27</sup> Le Billon (note 14).

<sup>28</sup> See contributions to the special issue of Journal of Conflict Resolution 49/4 (2005) on natural resources and civil war.

<sup>29</sup> See H. Starr, 'The Power of Place and the Future of Spatial Analysis in the study of Conflict', Conflict Management and Peace Science 20/1 (2003) pp. 1-15; and L. Anselin, 'The Future of Spatial Analysis in the Social Sciences', Geographic Information Sciences 5 (1999) pp. 67-76.

<sup>30</sup> H. Goldstein, Multilevel Models in Educational and Social Research (London: Charles Griffin). For a demonstration of this method, see M. Carlson and O. Listhaug, 'Public Opinion on the Role of Religion in Political Leadership: A Multi-Level Analysis of Sixty-three Countries', Japanese Journal of Political Science 7/3 (2006) pp. 251-71.

<sup>31</sup> J. O'Loughlin, 'Geography as Space and Geography as Place: The Divide between Political Science and Political Geography Continues', Geopolitics 5 (2000) pp. 126-137.

<sup>32</sup> O'Loughlin *ibid*, p. XXX.