

Can UN Peacekeeping Promote Environmental Quality?

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This research focuses on a positive, and previously largely unknown, implication of United Nations (UN) peacekeeping: better environmental quality. While maintaining international peace and security remains the main goal of peacekeeping operations, we contend that they can also be linked to environmentally friendly outcomes. Mission mandates and UN policies increasingly comprise actions that potentially promote environmental quality. At the same time, positive side effects on the environment materialize due to the cooperation with and activities of other UN bodies. The empirical analyses, also correcting for the likely non-random assignment of peace missions and employing several alternative outcome measures, suggest that UN peace missions are indeed substantively associated with better environmental quality. This research has important implications for our understanding of peacekeeping operations, and it contributes to the literatures on the (unintended) consequences of peacekeeping as well as environmental politics.

Esta investigación se centra en una repercusión positiva, que antes prácticamente se desconocía, del mantenimiento de la paz de las Naciones Unidas: una mejor calidad ambiental. Si bien preservar la paz y la seguridad internacionales continúa siendo el objetivo principal de las operaciones de mantenimiento de la paz, sostenemos que también pueden relacionarse con resultados ecológicos. Cada vez más, los mandatos de las misiones y las políticas de las Naciones Unidas incluyen medidas que promueven potencialmente la calidad ambiental. Al mismo tiempo, los efectos secundarios positivos en el medioambiente se materializan gracias a las actividades de otros órganos de las Naciones Unidas y la cooperación con ellos. Los análisis empíricos, que también corrigen la probable asignación no aleatoria de las misiones de paz y emplean varias mediciones de resultados alternativos, sugieren que las misiones de paz de las Naciones Unidas ciertamente se relacionan de manera considerable con una mejor calidad ambiental. Esta investigación tiene repercusiones importantes para nuestro conocimiento de las operaciones de mantenimiento de la paz, y contribuye a la bibliografía sobre las consecuencias (no intencionadas) de la preservación de la paz y de las políticas ambientales.

Cette recherche se concentre sur une implication positive, et précédemment en grande partie inconnue, du maintien de la paix de l'ONU : une amélioration de la qualité environnementale. Bien que le maintien international de la paix et de la sécurité reste le principal objectif des opérations de maintien de la paix, nous soutenons qu'elles peuvent également être associées à des résultats écologiques. Les mandats de mission et les politiques de l'ONU incluent de plus en plus des actions pouvant potentiellement promouvoir la qualité environnementale. Dans le même temps, des effets secondaires positifs sur l'environnement se matérialisent en raison de la coopération avec d'autres organes de l'ONU et des activités qu'ils entreprennent. Les analyses empiriques, qui réajustent également l'affectation probablement non aléatoire des missions de paix et ont recours à plusieurs mesures alternatives des résultats, suggèrent que les missions de paix de l'ONU sont effectivement substantiellement associées à une meilleure qualité environnementale. Cette recherche a d'importantes implications pour notre compréhension des opérations de maintien de la paix et contribue aux littératures portant sur les conséquences (imprévues) du maintien de la paix ainsi que sur les politiques environnementales.

Introduction

More than seventy United Nations (UN) peacekeeping operations (PKOs) have been established in conflict or post-conflict contexts since the first mission in 1948, making peacekeeping a popular instrument to restore and maintain international peace and security. Given this main goal of UN PKOs, interventions are commonly considered as effective if violence and conflict are lowered at several levels. For example, fewer battle-related deaths (e.g., Hultman, Kathman, and Shannon 2014; Bove and Ruggeri 2019), a better protection of civilians (e.g., Kathman and Wood 2011; Hultman, Kathman, and Shannon 2013; Bove and Ruggeri 2016; Haass and Ansorg 2018; Fjelde, Hultman, and Nilsson 2019), preventing conflicts from spreading across bor-

ders and recurring (e.g., Fortna 2004; Gilligan and Sergenti 2008; Beardsley 2011; Hegre, Hultman, and Nygård 2019), or the transformation to a stable post-conflict environment (e.g., Doyle and Sambanis 2000; Howard 2008; Balas, Owsiak, and Diehl 2012; Autesserre 2014) are all seen as benchmarks for effective peacekeeping. Indeed, there is strong and robust evidence that peacekeeping “works,” and that PKOs do deliver by meeting the main goals that have led to the establishment of a mission in the first place.

Peacekeeping has evolved over the past few decades from “traditional” to multidimensional missions or “peacebuilding” (Doyle and Sambanis 2000; Da Costa and Karlsrud 2012). These “new” interventions are based on more complex and far-reaching mandates that “include elements of longer-term post-conflict economic, social, and political development” (Fortna and Howard 2008, 285). Such “integrated missions” (Fortna and Howard 2008, 285) still pursue peace and security promotion as the primary goals, but also encompass a series of non-military elements pertaining to, among others, electoral assistance, socio-economic development, or even cultural activities. As a result, next to analyzing PKOs’ impact on their primary mission targets of peace and security, the literature has begun to study other, less obvious implications and consequences of peacekeepers. That

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is, scholars increasingly seek to shed light on how PKOs affect economic, political, and social development more generally and besides the narrow focus on military tasks and the absence of violence (for an overview, see, e.g., Di Salvatore 2019). Peace missions, for instance, can influence national, local, and even household economic well-being, facilitating economic growth or agricultural production under some conditions (Jennings and Nikolić-Ristanović 2009; Hoeffler, Ijaz, and Von Billerbeck 2011; Caruso et al. 2017; Bove, Di Salvatore, and Elia 2021). Di Salvatore (2019) reports that although lowering criminal activity is not always included in mission mandates, PKOs can have unintended consequences: while regular troops actually induce a higher level of crime, UN police troops have the opposite effect. Moreover, Belgioioso, Di Salvatore, and Pinckney (2021) find that peace missions, especially those comprising contributing states with an active civil society, are likely to be linked to peaceful protests in post-conflict societies. Gizelis and Cao (2020) argue that peacekeepers promote maternal health as well as women's access to medical services and education. Di Salvatore and Ruggeri (2020) provide an overview of possible implications of PKOs on a variety of outcomes including gross domestic product (GDP) growth, the level of democracy, state authority, and women's conditions (see also Steinert and Grimm 2015). Finally, Kim (2017) contends that PKOs may induce that governments are more responsive to citizen needs, which can improve health conditions and resources for reconstruction.

Our research adds to these and related studies on the (side) effects of peacekeeping missions other than the primary goal of peace by examining a previously largely unknown implication that PKOs can have: improved environmental quality. Environmental quality, broadly defined, "is a measure of the condition of an environment relative to the requirements of one or more species and/or to any human need or purpose" (Johnson et al. 1997, 586). Hence, the concept captures the properties and state of the environment, as they affect human beings or other organisms and, in turn, are influenced by them (see also Scruggs 2003; Jahn 1998). This includes the degree of human burden on nature: improving environmental quality thus lowers the human impact on and increases the sustainability of the ecosystem. A "better" environmental quality may then refer to lower levels of pollution in, e.g., air, soil, and water—environmental degradation, i.e., "any change or disturbance to the environment perceived to be deleterious" (Johnson et al. 1997, 584) is reduced (Scruggs 1999; Jahn 2016). The focus of this study is on PKOs improving environmental quality in their host countries and, as we detail below, water quality.¹ The main purpose of any peace mission since the 1940s has not been the promotion of environmental outcomes, but we argue that UN missions may nonetheless be potentially linked to better environmental quality in assigned countries. At least three avenues suggest that this direct effect exists. First, several mandates now comprise principles that potentially promote environmental quality and facilitate sustainability directly. As Maertens (2019, 1) contends, "multiple transformations in terms of norms and practices resulted," which likely not only lower the environmental footprint of PKOs as such, but also improve environmental quality at large. Second, UN peace missions increasingly cooperate with and benefit from the activ-

¹Johnson et al. (1997, 589) provide an extensive definition of water quality: "levels of water quality expected to render a body of water suitable for its designated use. Criteria are based on specific levels of pollutants that would make the water harmful if used for drinking, swimming, farming, fish production, or industrial uses."

ities of other UN bodies that have expertise in environmental protection, most importantly the UN Environment Program (UNEP). Third, the UN incorporated environmental-friendly policies relevant for PKOs at least since the early 2000s, most recently via its "Declaration of Shared Commitments."²

The empirical analysis employs quantitative data on UN PKOs in the post-Cold War era. Regression models comprising a series of controls, unit and year fixed effects, and while accounting for the likely non-random assignment of PKOs to conflicts, do highlight that UN peace missions are indeed linked to host nations' better environmental performance. Based on the criteria for environmental-performance measures in Jahn (2016) and considering that PKOs must at least principally have the possibility to affect such an outcome (see also Bernauer and Koubi 2009), we capture environmental quality with data on improving water sources and sanitation from Kyu et al. (2018). The robustness of this finding is explored via a series of changes in research-design specifications, including different outcome variables for environmental quality.

Our research and its core result make a number of key contributions to several strands of the literature. First, we add to the peacekeeping literature by examining another, mostly unknown, implication of PKOs. The direct and intended effects of PKOs with regard to addressing peace and security are well studied (e.g., Doyle and Sambanis 2000; Fortna 2004; Gilligan and Sergenti 2008; Howard 2008; Hultman, Kathman, and Shannon 2013, 2014; Bove and Ruggeri 2016, 2019; Hegre, Hultman, and Nygård 2019). However, only recently have scholars begun to explore the externalities of PKOs. By focusing on environmental quality, we shed light on another implication of PKOs other than the direct promotion of peace as such.

Second, we contribute to the literature on environmental politics and outcomes (e.g., Shafik 1994; Scruggs 1999; York, Rosa, and Dietz 2003; Caviglia-Harris, Chambers, and Kahn 2009; Farzin and Bond 2006; Ward 2008; Bernauer and Koubi 2009; Bernauer and Böhmelt 2013; Jahn 2016; Böhmelt, Vaziri, and Ward 2018). Previous works focus on factors like income, economic growth, or political regime type. PKOs have not been considered as a decisive factor in promoting environmental quality, which is understandable given that mission mandates are primarily conflict-related and evaluations of PKO effectiveness mostly concentrate on the degree of political violence. Hence, earlier research has overlooked the influence of UN peace interventions and we address this shortcoming theoretically and empirically in a systematic fashion. What is more, we extend the literature on "green peacekeepers" (e.g., Maertens and Shoshan 2018; Maertens 2019) by demonstrating that UN peace missions can actually affect the environmental performance of host countries at large.

Finally, there is the emerging scholarship on the relationship between environmental politics and peace-and-conflict studies (see, e.g., Ide and Detges 2018; Ide 2019; Ide and Tubi 2020; Ide et al. 2021). It has been argued, for instance, that conflict and political violence can be overcome by cooperation over environmental issues—"environmental peacebuilding" (Conca et al. 2002; Ide and Detges 2018; Ide 2019; Ide and Tubi 2020; Ide 2020; Ide et al. 2021). Previous research also points to a relationship between climate change and conflict (Nordås, and Gleditsch 2007; Hsiang, Burke, and Miguel 2014; Theisen, Gleditsch, and

²Available online at: <https://peacekeeping.un.org/sites/default/files/a4p-declaration-en.pdf>.

Buhaug 2013; Buhaug et al. 2014), even if only indirectly and potentially moderated by mitigation and adaptation measures (Mach et al. 2019; Pearson and Newman 2019).³ Our finding that PKOs improve environmental quality potentially adds to this debate. UN interventions may facilitate cooperation directly, and also affect conflict risk as peacekeepers' activities relate to climate-change mitigation and adaptation. Moreover, PKOs seem to increasingly respond to conflict precipitated by climatic changes, also as preventive deployments (Diehl 2018).⁴ When subscribing to these avenues, peacekeepers' influence is, in fact, more substantive and far-reaching than ever anticipated—given, of course, that we can link peace missions to better environmental quality. This research is one of the first to provide this evidence.

How UN Peacekeeping Can Promote Environmental Quality

The starting point of our argument is the change in the nature of PKOs and their mandates, particularly after the end of the Cold War (Doyle and Sambanis 2000, 2006; Fortna and Howard 2008; Howard 2008). UN peace missions have become more complex and ambitious in establishing and maintaining peace, with the latter remaining the core aims of such interventions, of course (see Fetherston 2000; Greig and Diehl 2005). Increasing complexity went hand in hand with a transition to peacebuilding interventions and altered mandates, which not only became more robust over time, but also increasingly sought to address less traditional aspects of PKOs such as economic growth, social development, and—as it is the focus of our research—environmental issues and outcomes (see also Diehl 2018). The multidimensional mandates of “integrated missions” (Fortna and Howard 2008, 285) move beyond peace defined as the absence of overt violence, since they seek to create a context where civilians can live a “normal” life, thereby addressing multiple dimensions not linked to the more traditional military focus of PKOs (Barnett, Fang, and Zürcher 2014). UN missions are thus more and more designed and employed to keep and make peace at multiple levels, potentially including the environment as well. And indeed, primarily since the early 2000s (see Maertens 2019; Ide et al. 2021), UN PKOs are now aware of the environmental challenges they could encounter and the environmental footprint missions might cause (Krampe 2017; Krampe and Gignoux 2018; Maertens 2019; Ide 2020). We claim that, in turn, this has paved the way to at least three avenues that associate UN peace missions with better environmental quality in their host countries: in particular, mandates of PKOs and, generally, UN policies such as the “Declaration of Shared Commitments” incorporate principles and norm prescriptions that likely promote environmental quality for the host country at large (see also Krampe 2017; Krampe and Gignoux 2018; Maertens 2019). In addition, peacekeepers have fostered the cooperation with and input from other UN bodies that have expertise in environmental politics.

First, mandates are the principal legal framework legitimizing PKOs and providing them with guidelines on what to do on the ground. The activities of peacekeepers are, therefore, significantly influenced by the underlying mandate, since missions seek to implement in host nations what their mandates formulate as goals. Especially since the early 2000s (Maertens 2019), UN peace mission mandates now

refer to a series of activities that directly address environmental concerns and can promote its quality in the host country. Among others, these activities include the provision of agricultural land as part of the reintegration process, the building of water-related infrastructure to address grievances and support livelihoods, and the reduction of illegal resource extraction that might finance further violence (Bruch, Muffett, and Nichols 2016). If peacekeepers do indeed implement such “green goals” of their mandates effectively, the environmental quality in the host country should improve. There is rich anecdotal evidence illustrating this first avenue. For example, while the primary goal of the UN mission in Darfur (UNAMID) has been the protection of civilians, its mandate was more multidimensional and organized around four areas: information management and analysis, training and capacity-building, natural resources and the environment, and the implementation of quick impact projects (QIPs).⁵ Particularly the latter two areas also address environmental quality. For example, UNAMID has been implementing more than 500 QIPs and community-based labor-intensive projects on, among others, water, sanitation, and the sustainable exploitation of forest resources since 2007.⁶ Also, consider the extension of the mandate of the UN Multidimensional Integrated Stabilization Mission in the Central African Republic, where the UN recognizes “the adverse effects of climate change, ecological changes and natural disasters [...]” Likewise, the Multidimensional Integrated Stabilization Mission in Mali has been training military, police, and civilian personnel as part of their environmental action plan “to observe the management of solid and dangerous waste, energy, water, wastewater, flora and fauna, as well as the protection of historical and cultural sites.”⁷ And there is the United Nations Mission in Liberia (UNMIL) with its mandate referring to the “effective implementation of the Forestry Reform Law,” encouraging “UNMIL to continue its joint patrols with the Forestry Development Authority,” or emphasizing that UNMIL should “assist the transitional government in restoring proper administration of natural resources.”

Second, among other UN officials, the Secretary-General, António Guterres, has highlighted the importance of environmental matters when stating that protecting the environment is a preventive measure against conflict triggered by competition over scarce natural resources. He adds that “protecting our environment is critical to the founding goals of the United Nations to prevent war and sustain peace.”⁸ Against this background, other UN bodies such as (and primarily) the UNEP have been stressing the need to put the environment at the center of preventing and resolving conflicts (see Jensen and Lonergan 2012). We argue that fostering cooperation with and increasingly using the expertise of these agencies and programs could further enhance the positive impact of PKOs on the environment. Specifically, the UNEP complements PKOs' activities by focusing on environmental protection and resource management. UNEP and its partners state, for example, that they support African countries through “[a]ddressing [...] the environment as part of the peacemaking and peacekeeping process.”⁹ The UNEP also developed recommendations in

⁵ Available online at: <https://unamid.unmissions.org/>.

⁶ Available online at: <https://www.fao.org/gender/projects/detail/en/c/449355>.

⁷ Available online at: <https://minusma.unmissions.org/en/environment>.

⁸ Available online at: <https://www.unep.org/annualreport/2016/index.php>.

⁹ Available online at: <https://tinyurl.com/u436nm6>. As an illustrative case, the UNEP's program in the Democratic Republic of Congo (established in

³ See also online: <https://tinyurl.com/y6w4luap>.

⁴ See also online: <https://tinyurl.com/ybammbwk>.

2009,¹⁰ which the UN's International Law Commission formally adopted and the International Committee of the Red Cross was prompted to update their guidelines on environmental protection during armed conflict. Moreover, the UN High Commissioner for Refugees started to take into account the environmental consequences of refugee camps as of the 1980s (Maertens and Shoshan 2018) and there is the Environmental Peacebuilding Association,¹¹ which develops, manages, and shares knowledge on environment conflict and peace, acknowledging the importance of environmental quality to promote sustainable peace. Making use of this expertise on environmental matters, formally or informally, likely improves peacekeepers' influence on environmental quality. Consider here, for example, the UN-AMID that directly refers to cooperation with UNEP in its mandate. That is, the mandate "[c]ommends the outcome of the Darfur International Conference on water held in Khartoum on 27 and 28 June 2011 as a step towards sustainable peace, and calls on UNAMID, where consistent with its mandate, and all other UN agencies in particular UNICEF, UNDP, UNEP, as well as international actors and donors to meet their commitments made in that conference."

Third, general UN policies commit PKOs to environmental-friendly actions (Diehl 2018) most recently via their "Declaration of Shared Commitments on UN Peacekeeping Operations." Issued in September 2018, Article 23 of this statement of principles claims that the UN "further commit to sound environmental management by implementing the United Nations Environmental Policy for UN field missions, and to support environmentally-responsible solutions to our operations and mandate delivery." Hence, not only do peace missions seek to improve environmental conditions for the host country at large, but also to reduce their own environmental footprint. UN peacekeepers acknowledge more and more that large operations generate a lot of waste or consume a significant amount of resources in places where these are scarce to begin with (Maertens 2019). This has triggered a series of policies to manage environmental issues within missions, the "Declaration of Shared Commitments on UN Peacekeeping Operations" being the latest one in this regard. The first policy issued, however, was the 2004 "Environmental Policy for UN Field Missions" and there were other, general actions and evaluations in the early 2000s (Maertens and Shoshan 2018, 9). Maertens (2019), examining the environmental norms and practices that target the ecological footprint of UN peacekeeping, concludes that environmental concerns have been translated to actions *within* UN PKOs—but also, as we contend, this potentially has an effect beyond interventions for the host country as such.

When subscribing to the effectiveness of these three avenues, i.e., peacekeepers successfully implement and follow environmental goals of mission mandates, pursue the cooperation with and benefit from activities as well as input of other UN bodies, and they adhere to the principles in general such as the "Declaration of Shared Commitments," we expect that environmental quality in countries hosting peacekeepers improves as a result of PKO activity.

Research Design

Our empirical analysis uses a monadic (country-year) time-series cross-sectional data set comprising African states that have seen the outbreak of at least one civil war in 1995–2012. This sample is based on Hultman, Kathman, and Shannon (2014) who focus on African countries in civil wars since the early 1990s (see also Di Salvatore 2019). Data limitations on peacekeeping troops (discussed below) essentially dictate the end year of the temporal coverage of our analysis. The focus on civil-war countries allows that peacekeeping was at least a possibility and we exclude states that have not seen domestic warfare at all in the period of study. This approach, and after accounting for missing values, limits the analysis to seventeen African states and has two important implications. On one hand, (conflict) states in other regions of the world are not included. On the other hand, however, the African focus as well as concentrating on states in conflict or thereafter ensure that we have a set of countries that are rather similar in several aspects at the macro level, which may affect environmental outcomes. Only analyzing the seventeen states outlined in figure 1 increases the chances that our sample represents the population we wish to describe. The full model with controls is based on 200 observations (country-years).

For the dependent variable, we require a proxy for environmental quality. In line with our broad definition of this concept, the literature offers and discusses several options (e.g., Ward 2006; Bernauer and Koubi 2009; Caviglia-Harris, Chambers, and Kahn 2009; Bernauer and Böhmelt 2013; Cao and Ward 2015; Böhmelt, Vaziri, and Ward 2018). While "no single measure is ideal for all purposes" (Böhmelt, Vaziri, and Ward 2018, 483), there are essential criteria for any environmental-quality indicator (Jahn 2016, 91ff): the variable is at the outcome level, human activity and political action can influence it, it refers to an obvious problem and can be subject to government regulations, there are available abatement technologies for implementation of the regulations, and data are available for a large set of countries and comparable over time (see also Bernauer and Koubi 2009, 1358). The main results presented below employ a variable capturing water quality: an item on the number of age-standardized disability-adjusted life-years lost per 100,000 persons (DALY rate) due to unsafe water sources and sanitation (Kyu et al. 2018). That is, we focus on one aspect of environmental quality that meets the requirements outlined above and that can, at least in principle, be influenced by PKO deployments. Recall, for instance, that the building of water-related infrastructure has become a key activity of many peacekeeping interventions (Bruch, Muffett, and Nichols 2016). This has the potential to shape safe water access and sanitation. Moreover, Johnson et al. (1997) and Jahn (2016) stress that water pollution is a core component of any understanding of environmental quality.

Kyu et al. (2018) provide the data for country-years' DALY rate.¹² Our dependent variable follows Jahn (2016, 93) in that we measure changes or progress in safe water use and sanitation. That is, first, we calculated the average per country-year of the two DALY rates (one for unsafe water and the second one for unsafe sanitation) to arrive at a combined value. Second, we follow the quotient rule of logarithms and divide the current year's value (t) by the previous year's value ($t-1$) before calculating the logarithm. The log-transformation accounts for the rate's skewed distribution and outliers and we take the inverse of this. Ultimately,

2008) works "with other members of the UN family to assist the government of DR Congo in its post-conflict recovery and sustainable development." Available online at: <https://www.unenvironment.org/explore-topics/disasters-conflicts/where-we-work/democratic-republic-congo>.

¹⁰ Available online at: https://postconflict.unep.ch/publications/int_law.pdf.

¹¹ Available online at: <https://www.environmentalpeacebuilding.org/>.

¹² Available online at: <https://ghdx.healthdata.org/gbd-results-tool>.

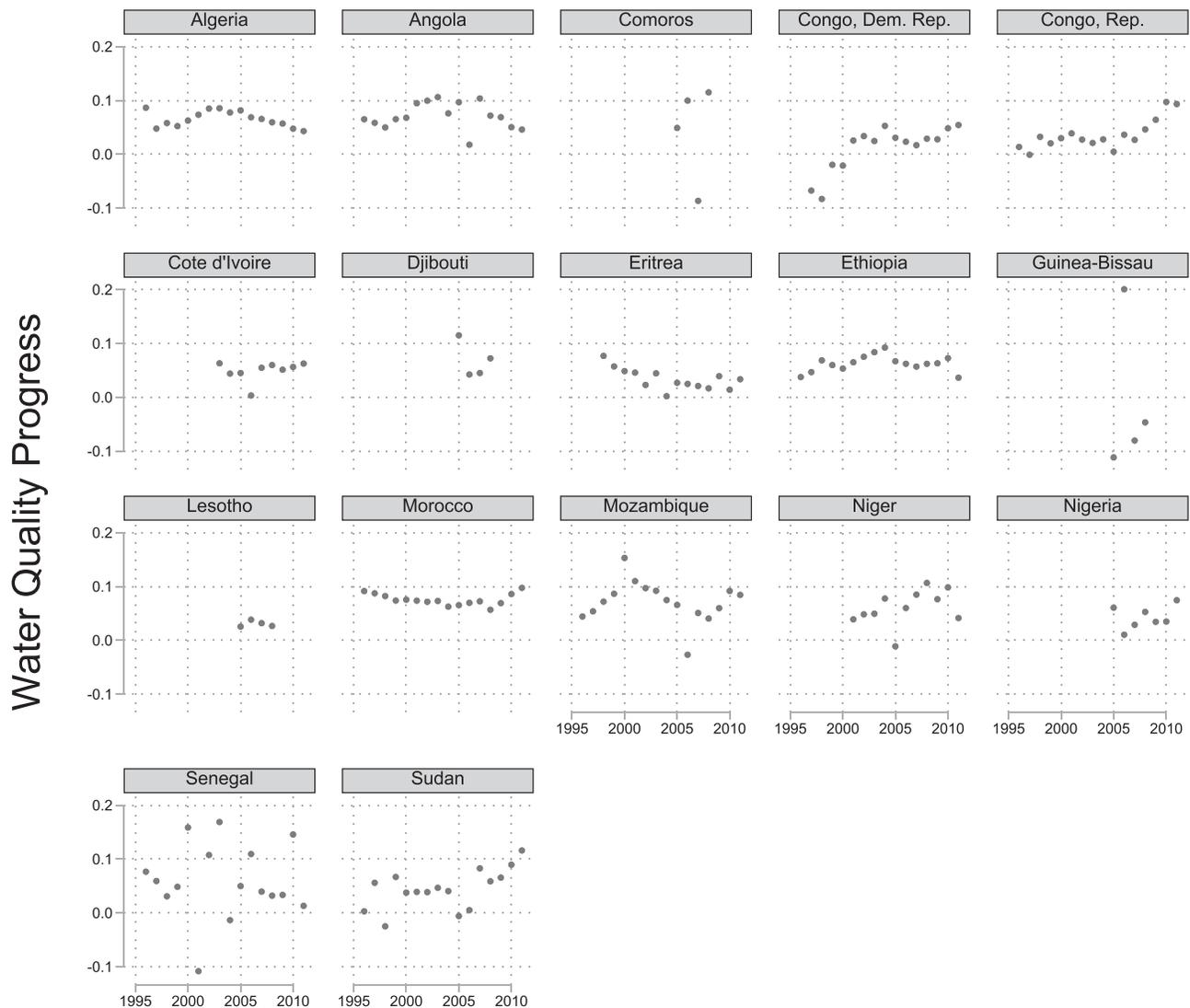


Figure 1 Environmental quality–water quality progress.

Note: Graph shows distribution of outcome variable for all countries and years in our sample.

the final dependent variable thus constitutes the inverse of the subtracted logs of DALY rates due to unsafe water and sanitation. It ranges between -0.112 and 0.201 , with higher values standing for more water-quality progress. In fact, negative values pertain to more life-years lost, while positive values are related to fewer life-years lost. [Figure 1](#) outlines the development of the dependent variable for all countries in our observation period. The graph also shows that there is low within country variation for some of our sample states. We address concerns related to this in the Supporting Information (SI) by jackknifing the sample and we explore additional outcome variables for the analysis there.

In terms of the estimator, we rely on panel-corrected standard-error models that comprise fixed effects for countries and region-years. Panel-level heteroskedastic errors address country-specific idiosyncrasies and we specify that, within panels, there is first-order autocorrelation with the coefficient of this process being common to all panels. This approach addresses measurement errors, assuming that the error is “systematically related to the country, but does not change much over time” ([Neumayer 2003](#), 628). The fixed effects allow us to control for any unobserved unit-level

effects as well as region-specific shocks in a given year. In the SI, we consider modifications to this estimation strategy and we discuss how it relates to a differences-in-differences setup.

The main explanatory variable refers to the deployment of UN peacekeeping troops. We focus on two different variants. First, using data from [Di Salvatore \(2019\)](#) who compiled the information from the International Peace Institute, we focus on a binary variable that receives a value of 1 in a given country-year if any peacekeepers are deployed (0 otherwise). In our sample, about 31 percent of all country-years saw UN peace missions. Second, based on the same source, we created a variable on the actual number of peacekeepers per operation. To account for the skewed distribution of the original item, we log-transform it. Both variables and all of the control variables that are discussed next are temporally lagged by 1 year. Note the near consensus in the literature that PKOs are not randomly assigned to countries, but selected and deployed following very strategic and political considerations (see [Fortna 2004](#); [Gilligan and Sergenti 2008](#); [Hultman, Kathman, and Shannon 2013, 2014](#); [Bakaki and Hinkkainen 2016](#); [Meiske and Ruggeri 2017](#);

Bove and Ruggeri 2019; Hegre, Hultman, and Nygård 2019). Hence, next to analyzing the regular sample, we also employed Coarsened Exact Matching (CEM; Blackwell et al. 2009; Iacus, King, and Porro 2012) to pre-process the data: this ensures that we obtain a sample that is virtually identical in the control variables, but country-years differ in whether they received the treatment, i.e., the deployment of peacekeepers, or not. Eventually, CEM allows us to identify a causal influence stemming from UN interventions with more precision.

The control variables are selected in light of a two-fold rationale: they either affect the outcome variable, i.e., environmental quality, and thus are alternative mechanisms, or they are related to the deployment of peacekeepers. The latter then ensures that we control for a selection on observables or, when analyzing the matched data, address any remaining imbalances between treated and control observations. To capture overall conflict dynamics, we include variables on civil-war casualties, ongoing ceasefires, the strength of rebel groups, the presence of disarmament, demobilization, and reintegration (DDR) programs, and post-conflict years. First, casualties refer to battle-related deaths and are taken from Pettersson, Högbladh, and Öberg (2019). Battle-related deaths are those caused by the warring parties that can be directly related to combat. We focus on the best estimate for each conflict and modify the original data to fit into the monadic, country-year format of our analysis. Second, data on whether a country-year is a post-conflict year or not and the information on the presence of ceasefires are taken from Kreutz (2010). Both variables are binary. Third, the strength of rebel groups is coded in an ordinal fashion by Cunningham, Gleditsch, and Salehyan (2013). As the original data focus on conflict episodes, we modified this information as well to adjust for our unit of analysis. Finally, whether a country has an ongoing DDR program is coded in Pettersson, Högbladh, and Öberg (2019) and we consider a dichotomous item for this.

Next to these variables, we also control for population, income, and energy use. More populous countries may represent more difficult cases and, thus, are more likely to attract peacekeepers. At the same time, population also correlates with worse environmental quality (e.g., Caviglia-Harris, Chambers, and Kahn 2009; Farzin and Bond 2006; Ward 2008; Bernauer and Koubi 2009; Bernauer and Böhmelt 2013; Jahn 2016; Böhmelt, Vaziri, and Ward 2018; Cao and Ward 2015). In addition, the literature has thoroughly studied the relationship between income and environmental outcomes. Some argue for the existence of an environmental Kuznets Curve, i.e., environmental quality first decreases with income, but then improves once a tipping point has been reached (Grossman and Krueger 1995; Selden and Song 1994; Dasgupta et al. 2002). While it remains ambiguous whether such a curve exists (e.g., Itonkonen 2012) or what functional form describes best the relationship between income and environmental quality, we control for income using GDP per capita and allow for a curvilinear relationship by including this item's squared term. Data for both population and income are taken from Gleditsch (2002). Finally, using the World Bank Development Indicators, we control for energy use, which is defined as "the use of primary energy before transformation to other end-use fuels. This is equal to indigenous production plus imports and stock changes, minus exports and fuels supplied to ships and aircraft engaged in international transport." The variable is measured in kilograms of oil equivalent per capita and is log-transformed. Table 1 summarizes the descriptive statistics of all variables discussed.

Table 1. Descriptive statistics

Variable	Obs.	Mean	Std. dev.	Min.	Max.
Water quality progress	200	0.052	0.043	-0.112	0.201
Peacekeeping	200	0.305	0.462	0.000	1.000
Peacekeeping personnel	200	1.611	3.169	0.000	9.716
Conflict deaths	200	14.101	68.779	0.000	500.50
Ceasefire	200	0.460	0.500	0.000	1.000
Rebel strength	200	1.993	0.655	1.000	4.00
Population	200	9.632	1.254	6.377	11.870
GDP per capita	200	7.110	0.856	5.293	8.489
GDP per capita ²	200	51.287	11.997	28.020	72.065
Energy use	200	5.789	0.745	2.256	7.051
DDR	200	0.070	0.256	0.000	1.000
Post conflict	200	0.555	0.498	0.000	1.000

Table 2. Peacekeeping and environmental quality

	Model 1	Model 2
Peacekeeping	0.023*** (0.007)	
Peacekeeping personnel		0.004*** (0.001)
Conflict deaths	-0.000 (0.000)	-0.000 (0.000)
Ceasefire	0.007 (0.010)	0.004 (0.010)
Rebel strength	-0.064** (0.026)	-0.059*** (0.022)
Population	0.035* (0.021)	0.027 (0.021)
GDP per capita	-0.020 (0.121)	-0.050 (0.117)
GDP per capita ²	0.001 (0.008)	0.002 (0.008)
Energy use	-0.012 (0.019)	-0.013 (0.019)
DDR	-0.007 (0.010)	-0.010 (0.010)
Post conflict	0.011* (0.007)	0.009 (0.006)
Observations	200	200
Country fixed effects	Yes	Yes
Region-year fixed effects	Yes	Yes
Prob. > χ^2	0.000	0.000

Notes: Constant included, but omitted from presentation. Standard errors in parentheses; * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$.

Empirical Findings

Table 2 presents our core models. The first estimation concentrates on the binary variable *peacekeeping*, while model 2 focuses on the actual troop numbers of UN interventions. All models comprise fixed effects for countries and region-years. The coefficients can be directly interpreted and we plot simulated marginal effects of the key explanatory variables in figure 2. We find strong and robust support for our argument. Either when looking at mission allocations as such or actual mission size, the coefficient is positively signed across the models in table 2, which suggests that peacekeeping is indeed linked to lowering the DALY rate due to unsafe water and sanitation and, hence, better environmental quality. For the first model, we obtain a coefficient estimate of 0.023, which translates into an improvement of 1.023 life-years per 100,000 persons for any UN mission intervening, all else equal. For model 2, the marginal

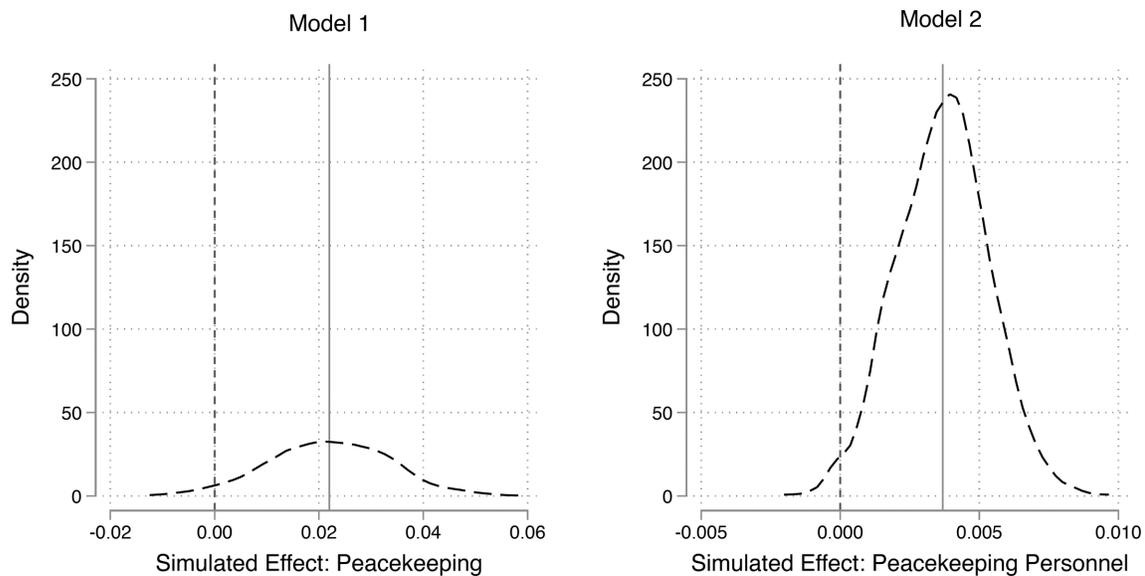


Figure 2 Peacekeeping and environmental quality: simulated marginal effects.

Note: Graph displays distribution of simulated marginal effects ($N = 1,000$ simulations); left panel pertains to model 1 where grey dashed vertical line refers to marginal effect of 0 and grey solid vertical line stands for simulated mean marginal effect (0.022); right panel pertains to model 2 where grey dashed vertical line refers to marginal effect of 0 and grey solid vertical line stands for simulated mean marginal effect (0.004).

effect highlights that for a 10 percent increase in mission size, we expect to see an improvement of about one life-year per 100,000 persons. While the overall size of the reported effects may not seem that substantive, recall that we focus on a series of less-developed, African states with conflict experience. Hence, the total DALY rate is likely higher than, e.g., for industrialized Western countries, to begin with.

To assess the validity of the estimates for our core variables, we also simulate their marginal effects 1,000 times using the method in King, Tomz, and Wittenberg (2000). Figure 2 summarizes the results of this simulation exercise. The left panel is based on model 1, where the mean value of the simulated parameter is close to our estimation in table 2 (0.022 here versus 0.023 in table 2). Moreover, out of these 1,000 simulations, only a small share of about 2.3 percent is linked to a coefficient estimate of smaller than or equal to 0. The right panel captures the distribution of the simulated parameter for *peacekeeping personnel* and, thus, is based on model 2. In this right panel, the mean simulated marginal effect is 0.004, which is identical to our estimation in table 2. And out of the 1,000 simulated coefficients of *peacekeeping personnel*, only 0.5 percent are smaller than or equal to 0. Hence, there is robust evidence across the two simulations emphasizing that the impact of PKOs on environmental quality, in fact, positive and statistically significant.

Table 3 mirrors the specifications of model 1, but we now rely on a pre-processed, matched sample to address concerns about the non-random assignment of peacekeepers. Following Di Salvatore (2019), we employ CEM and match states based on pre-deployment levels of battle-related deaths and state fragility. Matching on these two variables maximizes the balance in the post-matched sample between treated and control cases. And, theoretically, we address one of the most important drivers behind peacekeepers' self-selection, i.e., conflict intensity (e.g., Fortna 2004; Gilligan and Sergenti 2008; Howard 2008;

Table 3. Peacekeeping and environmental quality—matched sample

	<i>Model 3</i>
Peacekeeping	0.018** (0.007)
Conflict deaths	−0.000* (0.000)
Ceasefire	0.008 (0.011)
Rebel strength	−0.076*** (0.026)
Population	0.023 (0.015)
GDP per capita	−0.147 (0.124)
GDP per capita ²	0.008 (0.008)
Energy use	−0.034 (0.027)
DDR	0.001 (0.010)
Post conflict	0.015** (0.007)
Observations	191
Country fixed effects	Yes
Region-year fixed effects	Yes
Prob. > χ^2	0.000

Notes: Constant included, but omitted from presentation. Standard errors in parentheses; * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$.

Hultman, Kathman, and Shannon 2013, 2014), while ensuring that our results of changes in the DALY rate are not driven by the (economic) collapse of the state. As described by Di Salvatore (2019, 849), “CEM coarsens the sample on a set of variables; once observations are divided into

strata, weights balance the number of treated (with peacekeeping) and untreated (without *peacekeeping*) observations in each stratum. This alleviates selection bias and model dependence.” The impact of *peacekeeping* in model 3 does not differ much from earlier results as we still obtain a positive and significant estimate for the coefficient. The overall substance is also similar to what we report in model 1. Linking these results back to our theory, we find support for the argument suggesting that peacekeeping leads to better environmental quality. Many mandates, UN bodies, and policies now comprise principles and activities that potentially promote environmental quality. If effectively implemented by peacekeepers, the environment does benefit from such approaches.

In terms of the control variables, only *rebel strength* and *post conflict* are associated with significant estimates, although not fully consistent across models. First, stronger rebels are linked to less progress in water quality and, indeed, increases in the DALY rate. Second, in post-conflict periods, progress in water quality are more strongly pronounced than in active conflict years. The effect of *post conflict* is not statistically significant in model 2, though. We do not obtain evidence for a curvilinear relationship between GDP per capita and environmental quality (e.g., Grossman and Krueger 1995; Selden and Song 1994). Recall, however, the ambiguity about the precise functional form between income and environmental quality. More importantly, our sample of countries does not comprise the full, global range of national incomes, but focuses on a set of African states that are less developed and characterized by lower incomes than many other countries in the world.

In the SI, we assess the robustness of our core finding by changing a variety of model specifications. Specifically, table 1 of the SI additionally incorporates a temporally lagged dependent variable to control for likely path dependencies in the outcome. The impact of UN PKOs on environmental quality remains statistically and substantially significant. Second, we employ two alternative outcome variables to capture environmental quality. One of these alternatives is based on research on the carbon efficiency frontier (e.g., Böhmelt, Vaziri, and Ward 2018) (table 2 of the SI), the other (table 3 of the SI) relies on forest degradation. We further weigh the impact of PKOs by their “environmental friendliness” at home (table 4 of the SI) and jackknife the standard errors of the regression (table 5 of the SI). In tables 6 and 7 of the SI, we implement two changes to the sample: first, we focus on post-conflict periods of up to five years only; second, we extend the lagged effect of UN missions to 5 years. In table 8 of the SI, we estimate a model that also considers “green” PKO missions, i.e., those interventions with environmental goals in their mandates. Finally, we link our empirical setup to a differences-in-differences design (table 9 of the SI). All these additional analyses support our main result and the underlying theoretical arguments.

Conclusion

Peacekeeping does keep peace. There is robust and consistent evidence that UN peace missions are effective in restoring security, lowering political violence, and protecting civilians (e.g., Doyle and Sambanis 2000; Fortna 2004; Gilligan and Sergenti 2008; Howard 2008; Beardsley 2011; Kathman and Wood 2011; Balas, Owsiak, and Diehl 2012; Hultman, Kathman, and Shannon 2013, 2014; Autesserre 2014; Bove and Ruggeri 2016, 2019; Haass and Ansorg 2018; Fjelde, Hultman, and Nilsson 2019; Hegre, Hultman, and Nygård

2019). While these impacts of peacekeepers have been rigorously studied in the literature, scholars began only recently to explore the less obvious side effects of PKOs.

We contribute to this latter series of works by examining whether and how UN peacekeeping interventions promote environmental quality in their host countries. Theoretically, we have developed the argument that PKOs enhance environmental quality in the host countries via three avenues: the environmental goals formulated in mission mandates, the cooperation with and activities of other UN bodies, and the principles of general UN policies such as the “Declaration of Shared Commitments.” The empirical evidence we present, in the main analysis and in the SI, strongly and robustly supports our theoretical expectations. We employ quantitative data on water quality and peacekeeping missions in Africa between 1995 and 2012. When focusing on the regular sample or the matched data set, which controls for the likely non-random assignment of UN PKOs to (post-) conflict countries, peacekeeping missions help making progress regarding safe water access and sanitation.

The contribution of our work is, first and foremost, one to the literature on PKOs and their externalities. Earlier research finds that crime is also affected by UN peace missions (Di Salvatore 2019), as are non-violent protests (Belgioioso, Di Salvatore, and Pinckney 2021), women’s access to medical services and education (Gizelis and Cao 2020), or the economic well-being of households (Bove, Di Salvatore, and Elia 2021). Our article underlines that another important, but previously unknown implication is linked to UN PKOs, namely, better environmental quality for host countries at large. In light of this, there are several additional, crucial consequences for other streams in the literature. On one hand, there is the literature on environmental politics and outcomes (e.g., Shafik 1994; Scruggs 1999; York, Rosa, and Dietz 2003; Caviglia-Harris, Chambers, and Kahn 2009; Farzin and Bond 2006; Ward 2008; Bernauer and Koubi 2009; Bernauer and Böhmelt 2013; Jahn 2016; Böhmelt, Vaziri, and Ward 2018). UN peace missions have not been considered as a decisive factor in promoting environmental quality. Moreover, the works on “green peacekeepers” (e.g., Maertens 2019) merely focus on the environmental footprint of missions as such and have not explored that an impact of PKOs on host nations as a whole is possible. We address both of these aspects, shedding new light on what drives environmental outcomes and clarifying that peacekeepers’ environmental influence extends far beyond their own mission’s footprint. On the other hand, climate change is one of the most pressing policy issues of our time and it has been linked to conflict, if only indirectly (Nordås, and Gleditsch 2007; Hsiang, Burke, and Miguel 2014; Theisen, Gleditsch, and Buhaug 2013; Buhaug et al. 2014; Mach et al. 2019). And PKOs may increasingly respond to conflict precipitated by climatic changes (Diehl 2018). However, research suggests that conflict can be overcome by cooperation over environmental projects (Conca et al. 2002; Ide and Detges 2018; Ide 2019; Ide and Tubi 2020; Ide 2020; Ide et al. 2021). We show that these two avenues are more strongly linked to each other than scholars and policymakers may have thought before: UN peace missions can improve environmental quality, thereby inducing cooperation over environmental projects; in turn, this is likely to lower conflict risk as well—the primary goal of an UN intervention. Moreover, the failure to respond to environmental needs of war-torn societies could greatly complicate the difficult task of peacebuilding (Conca and Wallace 2009; Conca 2015; Ratner et al. 2013).

There are important policy implications following our work and key avenues for future research. First, policymakers require a better understanding of the (side) effects of peacekeepers other than the direct promotion of peace and security. This is necessary not only to fully make use of the true potential of UN PKOs, but also to address any negative implications early on (see, e.g., [Ide 2020](#)). Second, without discarding the main goal of peacekeepers, environmental aims and policies may warrant a more prominent role in PKO mandates if their influence—as we show—is already pronounced, but could be strengthened. Third, a potentially important factor we cannot account for due to the lack of data is the role of non-UN actors. Other organizations besides the UN work in host countries and are probably likely to produce positive externalities as well. For example, there are QIPs implemented by non-governmental organizations or aid agencies, which can be explicitly designed to educate about sustainability or improve environmental quality. Finally, studying the moderating influences and scope conditions could be a research area well worth pursuing. While we explored one of those via our analysis on peacekeepers' environmental behavior in their home countries (SI), many others potentially exist.

Supplementary Information

Supplementary information is available at the *International Studies Quarterly* data archive.

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