Dynamics in the global protected-area estate since 2004

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Abstract

Nations of the world have committed to a number of goals and targets to address the global environmental challenges humanity faces. Protected areas have for centuries been a key strategy in conservation and play a major role in addressing current challenges. The most important tool used to track progress on protected area commitments is the World Database on Protected Areas (WDPA). Periodic assessments of the world's protected area estate show steady growth over the last two decades. However, the current method, which uses the latest version of the WDPA, does not show the true dynamic nature of protected areas over time, nor does it provide information on sites removed from the WDPA. In reality, this methodology can only show growth or remain stable. This paper presents a novel approach to assess protected area change over time using twelve temporally distinct versions of the WDPA that quantify area added, and removed, from the WDPA annually from 2004 to 2016. Results show that both the narrative of continual protected area growth and the counter-narrative of protected area removal are overly simplistic. The former because growth has been almost entirely marine and the latter because we demonstrate that some areas removed are re-protected in later years. Analysis indicates that, on average, 2.5 million km^2 is added to the WDPA annually and 1.1 million km^2 is removed. Reasons for the inclusion and removal of protected areas in the WDPA database are explored and discussed. To meet the 17% land coverage component of Aichi Biodiversity Target 11 by 2020, which stands at 14.7% in 2016, the world will either need to reduce the rate of protected area removal or increase the rate of protected area designation and addition to the WDPA.

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Introduction

In the 21st Century, where humanity's footprint has touched upon 75% of the terrestrial world and much of the ocean (Halpern et al. 2015; Venter et al. 2016), protected areas are almost synonymous with conservation. Protected areas are defined as "…clearly defined areas that are recognised, dedicated and managed to achieve long-term conservation of nature…" (Dudley 2008), and are reported to cover 14.7% of the Earth's land and inland waters and 4.1% of the Earth's oceans (UNEP-WCMC and IUCN 2016), making protected areas one of the major land and sea uses in the world. As such, they are recognised as a key strategy to address some of the global environmental challenges the world is facing. This is reflected in a number of global biodiversity agreements that use protected areas data to assess progress towards a number of targets and goals. For example, protected areas are at the core of Aichi Biodiversity Target 11, one of the 20 Targets agreed by 196 countries through the Strategic plan for Biodiversity (Convention on Biological Diversity 2010), which aims to expand protection to cover 17% of land and inland water areas and 10% of the oceans by 2020 - while also complying with a number of other equally important qualitative attributes - such as effective and equitable management (Convention on Biological Diversity 2010). Protected areas data is also used to track progress towards at least three indicators of the United Nations Sustainable Development Goals (SDGs) (UNEP-WCMC and IUCN 2016; United Nations Statistics Division 2016). For example, SDG Goal 14 (conserve and sustainably use the oceans, seas and marine resources for sustainable development) includes Target 14.5, which aims to conserve at least 10% of coastal and marine areas consistent with national and international law, and which is underpinned by the WDPA. Additionally, protected areas are also relevant to regional and global biodiversity assessments carried out for The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES 2016). Indicators used to track progress towards these commitments benefit from analyses of temporal trends of protected areas, which illustrate how the protected area estate has evolved over time.

Focussing on Aichi Biodiversity Target 11, assessing the growth of protected areas coverage over time is fundamental, but still only a single element of the full target and therefore at best only a generalisation of overall progress, which incorporates factors such as effectiveness, connectivity and equity (Juffe-Bignoli et al. 2014). Moreover, some argue that the values merely represent political decisions that do not resemble any biologically meaningful number (Larsen et al. 2014; Locke 2014). This would echo the scientific literature that is demonstrating further biodiversity loss globally, despite strong progress in protected areas coverage (Butchart et al. 2010; Barnosky et al. 2011; Tittensor et al. 2014; Newbold et al. 2016), and evidence for the ability of protected areas to effectively conserve species (Joppa & Pfaff 2011; Laurance 2012; Barnes et al. 2016).

Understanding how protected area coverage has changed over time and understanding the nature of these dynamics will remain a fundamental part of any trends analyses on protected areas and key to assess progress towards targets in the future. All global scale protected area coverage analyses use the World Database on Protected Areas (WDPA). The WDPA is the most comprehensive database on terrestrial and marine protected areas, and is a joint project between UN Environment and IUCN, managed by UNEP-WCMC (UNEP-WCMC 2016). Following a 1959 UN mandate (United Nations Economic and Social Council (ECOSOC) Resolution 713 (XXVII)), and supported by 14 decisions by the Conference of Parties of the Convention on Biological Diversity, data on protected areas are collected from over 500 mainly governmental, but also non-governmental, sources and updated on a monthly basis at www.protectedplanet.net, thereby providing a picture of the current protected areas global estate. It is therefore the primary resource at hand to calculate the current coverage of protected areas globally; however, when being used to calculate coverage over time there are under-appreciated limitations.

Current approaches for estimating protected area coverage over time are based on the year in which areas were gazetted (referred to in this paper as the 'existing approach'), which is represented in the WDPA by the Status Year field. Using this field and eliminating overlaps to avoid double counting, the total protected area coverage is obtained by cumulatively adding the area of all designated protected areas for each year to the present date, and as such does not provide information on any change or reduction from year to year . Multiple reports and peer-reviewed papers that have used this approach contain the same narrative: continual protected area growth from the start of the time-series (Bertzky et al. 2012; Butchart et al. 2012, 2015; Juffe-Bignoli et al. 2014; UNEP-WCMC and IUCN 2016). This approach has two key limitations. First, through being a cumulative analysis, it cannot show a reduction in area. Second, because the WDPA is a snapshot of all designated protected areas at the time of its release, it does not include protected areas that have been degazetted. Reductions in the protected area estate have been shown to occur, for example using the PADDD tracker database on protected area Downgrading, Downsizing and Degazettement (PADDD) (http://www.padddtracker.org). PADDD highlights a counter narrative to the continual protected area growth narrative, namely one where the protected areas estate is being weakened and made smaller. Degazettement or downsizing events need not be damaging to conservation efforts (Fuller et al. 2010) and reviewing protected areas to assess their efficacy is a healthy process (Hochkirch et al. 2013), but the potential implications of wide scale degazettement or downsizing occurring without it being picked up in any existing time-series analysis could significantly undermine conservation efforts. This counter narrative is seen in reported protected area statistics, with a reduction from 15.4% to 14.7% in reported terrestrial protected area coverage between 2014 and 2016. This change shows that the protected area community needs a more sophisticated knowledge on the reasons behind protected area dynamics, and a clear understanding of where sites are being removed and added to the WDPA over time. Moreover, the separated narratives of protected areas expansion and reduction in conservation science literature hampers our understanding of the dynamic nature of the protected areas estate, which consists of the creation of new sites via gazettement, the removal of sites via de-gazettement, the expansion of existing sites, as well as the reduction in area of existing sites.

In this paper we: 1) Highlight the limitations of the existing approach to calculate protected areas coverage change over time; 2) Propose a new way to calculate protected areas coverage change over time (referred to in this paper as the 'temporal WDPA approach'); 3) Calculate gains and losses in the protected areas estate at the global and national scale using this new method; 4) Discuss these results against the observed increases in Aichi Biodiversity Target 11 coverage and the PADDD literature showing coverage decline, in order to balance the narrative and understand the nuances of protected areas expansion and reduction. It is hoped that by presenting a baseline methodological study of this kind, further, more refined attempts can be developed that better encapsulate the dynamic nature of the world's protected area estate.

Methods

Assessing the existing approach

To assess the widely used existing approach for tracking protected area cover change over time, we used an established methodology (Juffe-Bignoli et al. 2014; UNEP-WCMC and IUCN 2016) to calculate time series for two different versions of the WDPA: those used for the 2014 and 2016 Protected Planet reports respectively. This was done to demonstrate that even the existing methodology can produce quite different time series results depending on the version of the WDPA used. The methodology was the same for both time series (see SI 1): Protected areas in each version of the WDPA were split according to the year of their designation in their current form, as recorded in the Status Year field. The overlap between the protected areas was removed in GIS and then the sum of each year's area added sequentially until the year of the WDPA version used in the analysis. For those protected areas for which status year is unknown we added them to the first chosen year of the analysis, in this case 1990. This method results in the total area of the global protected area estate per year, as reported via the designation date of the current assemblage of protected areas that have been reported to the WDPA.

The temporal WDPA approach

To develop a new method to calculate protected area cover change over time that could show in more detail how the WDPA changes between years we created a novel database, the temporal WDPA. This database currently consists of 17 annual versions of the WDPA spanning 1998 to 2016, missing the years 1999 and 2001. Each annual version was created by combining multiple historic WDPA subsets into the current WDPA schema, which were enormously diverse in regard to format, spatial and tabular data quality. Combining these databases required standardising field metrics, field types (numeric/text), essential accepted values and checking for duplicate protected areas between intra-annual datasets. For the analysis undertaken in this study, the years 2004 to 2016 were used to give a snapshot of changes between the 2003 World Parks Congress in Durban and the 2016 World Conservation Congress in Hawai'i – two international events where the WDPA featured as a key global resource.

Each annual version was comprised of a point and a polygon feature class. Points were buffered in accordance to their reported area and merged to the polygons to create one definitive feature class per year. Buffering points has some important limitations (Visconti et al. 2013) but was incorporated into this analysis due to annual versions of the WDPA before 2007 consisting predominantly of points. Each annual version was flattened to remove overlaps between protected areas using GIS tools. It is common practice to remove certain sites from the WDPA; however, this study used the entirety of the WDPA in each version. This was because the tabular information required for identifying those sites for removal is not yet in every version of the WDPA. There are, therefore, sites incorporated into this analysis that are only 'proposed' or that have an unknown status. In order to compare protected coverage between the existing and temporal WDPA approach an additional time series was calculated. This third time series uses the existing approach however it does not omit the specific sites of the previous two (SI 1, Figure 2). In essence, it is the entire WDPA per year through the lens of a single WDPA version, whereas the temporal WDPA is the entire WDPA through the lens of historic WDPA versions.

Calculating area flux

To provide a sensitivity analysis for our current understanding of protected area change over time, an analysis was carried out to look at how the WDPA loses area (the negative footprint) and gains area (the positive footprint) between versions of the WDPA.

To quantify the negative footprint, each nation in year *x* (e.g. 2009) was iteratively erased from the entire annual version in year *x+1* (e.g. 2010), thus showing the unique area, per nation, that has been removed from the WDPA in that time. Conversely, calculating the positive footprint requires erasing year *x+1* from year *x*, thus demonstrating the unique area added to the WDPA in that time interval. For each time interval, all countries were merged together, indicating the overall global area for that footprint. The global positive and negative footprints for each time interval were then intersected by a base map of the world's coastline to further delineate whether the extent to which the positive and negative footprints were occurring over terrestrial or marine realms. The sum of the positive and negative footprints in each time interval is equal to the net change between the two versions of the WDPA because each represents the total gained and lost area (within an error margin of 0.05%).

The negative footprint was of particular interest, and had two additional analyses. Firstly, each negative footprint in each time interval was erased from the 2016 version of the WDPA, thus indicating how much of that time interval's negative footprint remains absent from the WDPA, and what proportion has become re-protected at some point in the last decade. Secondly, each negative footprint was repeated using solely polygons as input, thereby demonstrating the proportion of each negative footprint consisting of known and detailed protected area boundaries. The negative footprints were also compared to the sites recorded in PADDD tracker v1.1 (WWF 2017) . By comparing the spatial location of PADDD points and protected area boundaries a case study was created in Uganda demonstrating how the temporal WDPA can provide additional information on how the protected area network has evolved.

To calculate the extent to which the WDPA has changed, at both national and global scales over the last decade as a single time interval, positive and negative footprints were created using 2006 as year x and 2016 as year *x+1*. A decadal time scale was used because nations aren't updated every year, on average 60 nations are reviewed annually (Thomas et al. 2014; UNEP-WCMC 2016), therefore it was assumed that over the space of a decade a nation will have been updated at least once.

Results

Assessing the existing approach

Using the existing approach, the coverage of protected areas globally in 2016 is estimated to be 14.7% of terrestrial and inland waters and 10.1% of marine areas within national jurisdiction (0 – 200 nautical miles). The same methodology used two years previously calculated 15.4% and 8.4%, respectively (Figure 1). Despite a known reduction in global terrestrial coverage compared to 2014, the trend line using the existing approach still shows continual growth since 1990 because this approach cannot reflect declines. The growth to 2016 in the reported marine area since 2014 does not occur post 2014, where it plateaus, but rather from the late 1990's, so reflects reporting lag time. The terrestrial time series differs on average by 0.9 million km^2 per year (0.5 million km^2 – 1.1 million km^2 min/max); whereas, the marine time series differs on average by 1.5 million km^2 per year (0.08 million km^2 - 4.2 million km^2 min/max).

The temporal WDPA approach

In totality, the temporal WDPA grows from 120,883 protected areas covering 22.1 million km^2 in 2004 to 229,593 protected areas covering 38.4 million km^2 in June 2016. In comparison to the existing approach using the whole WDPA the terrestrial time series differs on average by 0.1 million km^2 per year (0.03 million km^2 – 2.1 million km^2 min/max); whereas the marine time series differs on average by 3.6 million km^2 per year (1.7 million km^2 - 5.8 million km^2 min/max).

Reporting area flux

The positive footprint within the temporal WDPA each year is on average 2.5 million km^2 (SD 1.9 million km^2), the vast majority of which is due to the addition of new protected areas to the database. There is also a negative footprint each year, which predominantly stems from the removal of protected areas from the WDPA, which on average accounts for the loss of 1.1 million km^2 (SD 774,000 km^2) per year (Figure 2).

Since 2004, there has been considerable variance in the positive footprint between years, with the smallest change being x7 times smaller than the largest change. Over the same time period there has been considerable variance in the negative footprint, though the smallest negative global footprint, between 2008 and 2009, still represented almost a quarter of a million km^2.

Since 2004, there have only been two years where the positive footprint did not outweigh the negative footprint (Figure 2). Only one of these occasions, between 2010 and 2011, is known to be largely due to data quality issues.

On average, the terrestrial realm accounts for 47.6% of the added area per time interval (14% - 86%, min/max), whereas it accounts for 71% of the removed area per time interval (31% - 99%, min/max). The majority of positive footprints arising in the marine realm stems from the inclusion of very large MPAs in recent years, see years 2013 onwards (Figure 2).

On average, 79% (42% - 98%, min/max) of each year's negative footprint since 2004 is still absent from the WDPA in 2016. The high level of re-protection between 2010 and 2011 (Figure 3) is due to the previously mentioned data quality issue. Counter to expectations, older negative footprints don't have a higher rate of re-protection. Half of the negative footprints were shown to consist of area derived from buffered points (Av: 52%, min: 1% max: 92%); however, negative footprints have also been shown to demarcate proven PADDD events (SI3).

From 2006 to 2016 most (69%) of the added area has occurred in the marine realm. Much of the positive footprints demonstrated annually in Figure 2 can be attributed to only a handful of countries and territories. These nations are particularly in the Asia & Pacific region, which accounts for 45% of the total reported global growth over the last decade and 57% of the reported marine growth. Many of the large contributors to the WDPA since 2006 are geographically large nations, but some of the largest contributors are small island states that owe the majority of their positive footprint to marine protected areas, some of which cover the entirety of the nation's territorial waters (0-200 nautical miles). For example, New Caledonia gazetted one protected area, the Natural Park of the Coral Sea, which is 1.2 million km^2.

By comparison, the negative footprint over the last decade is more diffuse. Although 223 countries and territories have lost some of their reported protected area estate between 2006 and 2016 this has not occurred predominantly in any single region. Similarly, the magnitude of the negative footprint at the national scale is significantly less the positive footprint.

Discussion

Comparison between approaches

Both timeseries agree that the amount of area that is protected globally is increasing but that this growth is effectively entirely within the marine realm, as the terrestrial realm continues to plateau. The temporal approach does not therefore question our overall understanding of progress towards the coverage components of Aichi target 11, but rather provides a framework with which to better understand how the current global network evolved.

The average annual difference between the existing approach and the temporal approach was 0.1 million km^2 and 3.6 million km^2 for the terrestrial and marine realms respectively; however, comparing two different time series using the existing approach resulted in an average annual difference of 0.9 million km^2 and 1.5 million km^2, demonstrating that we don't have a clear or fixed understanding of historic protected area coverage.

Neither approach is 'correct', as the existing approach underrepresents historic coverage by omitting degazzeted protected areas whereas the temporal WDPA underrepresents historic coverage by using versions that do not yet contain all protected areas gazetted to that date. Which bias is larger is still unknown, with both methods showing variations in the order of millions of km^2. Both methods have strengths and weaknesses (Table 1), and in a sense, excel in two separate ways. The existing methodology is currently still the best at demonstrating a wide-ranging time series using the most up-to-date data, but is constrained in its ability to demonstrate anything but rate of net growth of still existing protected areas and hence masks the dynamic nature of protected areas coverage change. Comparatively, the temporal WDPA has the capacity to quantify the additions, subtractions and modifications over time, though at the cost of depending on potentially incomplete previous versions.

Causes and implications of area flux

Both approaches agree that over the last decade the majority of the growth to the WDPA has been marine, the largest national scale additions have been in the marine realm, and the world's largest protected areas are overwhelmingly marine, all of which concurs with a growing literature reiterating this trend (Jones et al. 2011; Thomas et al. 2014). The fact that this growth has been disproportionately in the Asia & Pacific region, is due to a combination of large nations such as Australia and smaller nations such as the Cook Islands adding new protected areas particularly in the marine environment. Since finishing the analysis for this paper in 2016, marine coverage has increased by a further 6.5 million km^2, resulting in more marine protection than terrestrial protection for the first time in history (UNEP-WCMC 2017 unpublished data). The causative factors behind the terrestrial realm's plateauing coverage are poorly understood, though an obvious answer is that competing land use pressures prohibits creating terrestrial protected areas the size of Mexico, as happened in the marine realm in July 2017 (UNEP-WCMC 2017).

However, the undisputed overall growth in the world's protected area estate has hidden a counter flux of protected area removal – PADDD events. The scale of this removal is on average over 1 million km^2 a year, and this is mainly terrestrial protected area loss, though we've shown some of this is later re-protected. The USA has the highest negative footprint in the WDPA between 2006 to 2016. This is not due to protected areas being degazetted or downsized, but because these existing sites no longer comply with the IUCN protected area definition and are now referred to as Other Managed Lands (OMLs) (Stamper et al. 2013; NAWPA 2016). In total, this resulted in 1.3 million km^2 of terrestrial protected area in the USA being removed from the WDPA. Similarly, the expiration of a hunting ban in two very large (0.5 million km^2) terrestrial protected areas in Saudi Arabia led to their removal from the WDPA in 2016, a significant factor in reducing global protected area coverage on land between 2014 and 2016.

Some of the removed area in the temporal WDPA was never a reality on the ground as it is an artefact of data quality, e.g. a buffered point in year x becoming a polygon in year x+1 (SI 2). Omitting data when reporting to the WDPA in conjunction with data quality issues over time assuredly accounts for some of the lost area over the years, but not all of it. Since 2004, 4.3 million km^2 from protected areas with defined boundaries have been removed from the WDPA, and remain absent. As shown for the USA, this is not necessarily due to degazettement or downsizing, but these instances merit further investigation (SI3).

The growing literature on protected area degazettement or reduction has shown that the loss of protected area is a serious threat to conservation progress (Mascia et al. 2014; Forrest et al. 2015). Other studies have shown that degazettement and reduction is not an uncommon occurrence and is even set to potentially increase (Bernard et al. 2014). Even some of the biggest contributors to the WDPA, such as Brazil, are not immune from reductions in their protected area networks (Ferreira et al. 2014; McNeely 2015).

The temporal WDPA has the potential to be effective at not only identifying sites where degazettement or reduction has occurred, but also tracking them afterwards when the areas are potentially recovered by other protected areas, a phenomenon we have shown regularly occurs. A careful analysis of each protected area removed from the WDPA would provide a clearer measure of its real loss or data quality issues. To do this globally was outside the scope of this study, but it was undertaken for one nation to provide further evidence for the approach's utility. By matching the negative footprints of the temporal WDPA approach to proven PADDD sites in Uganda we were able to provide detailed boundaries of where was degazetted or downsized for twenty protected areas, 60% of the nation's recorded downgraded and degazetted sites with stated areas (SI 3). Crucially, the negative footprints broadly align with the reported PADDD area using PADDDtracker.

It is possible that a negative protected area footprint between year x and year *x+1* may be recovered by the same protected areas returning in year *x+2*. By demonstrating that the majority of area removed from the WDPA since 2004 remains absent in 2016 (Figure 3) we show that protected area turnover is not entirely due to the 'data churn' in the WDPA. However, because half of the negative footprints derive from buffered points these areas would likely not be re-protected anyway.

As demonstrated between the 2010 and 2011 versions of the WDPA, when protected areas are temporarily omitted from the WDPA through national reporting of different datasets, it can create very large false negatives (SI2). This kind of repeated flux may have occurred for some sites where the nation is uncertain of the status of a protected area, or where there is significant dispute between agencies managing protected areas in a county.

Conclusions and Next steps

The predominant narrative around the development of the world's protected area estate has until recently been one of steady and continual growth. This has been shown to be an oversimplification. Precisely delineating when and especially why reductions occur is still not entirely within our grasp, but it is paramount that as a community we recognise that it can and does occur, often hidden amongst a larger scale addition of protected area. The temporal WDPA does not yet have the ability to create a wide-ranging time series, and therefore we propose that in conjunction to the existing approach, a temporal WDPA footprint approach is undertaken that can provide context to the removals or additions in globally protected areas, thus explaining, should it occur, why protected area coverage is lower than previously recorded. The need for timely and precise reporting on protected area coverage is going to be increasingly important when reporting conservation progress towards SDGs, report within the various regional and global IPBES assessments and the achievement of the Aichi targets within the Global Biodiversity Outlook 5 in 2020. It is therefore imperative these metrics fully reflect the dynamism demonstrated in the protected area data in this paper.

In future work the authors aim to address some of the limitations highlighted in this analysis by: i) reducing the number of protected areas without known boundaries in the WDPA, ii) reviewing degazettement and downsizing events picked up through national reporting to the WDPA in more detail and iii) collating additional versions of the WDPA in the temporal WDPA. Further details on these proposed steps are in the supplementary information (SI4).

This paper set out to demonstrate how the WDPA changes, including where, when and by how much, thus showing the different degrees of positive and negative flux between the terrestrial and marine realms that has resulted in two very different growth trajectories. We did not provide thorough evidence on why these changes occur. It is hoped that the WDPA can be more fully integrated into PADDD research, especially in the context of a globally standard approach (Pack et al. 2016), by combining the temporal approach with the PADDD approach to disentangle the factors behind the protected areas dynamics over time. PADDD provides a good overview of why protected areas are being downgraded, downsized, and degazetted but the message could be fully strengthened if it could combine this with the latest spatial analyses techniques and investigating the full story of the evolution of a site through the WDPA. The temporal WDPA has enormous potential already but especially in the future, as with every passing year it becomes bigger, more robust and more accurate.

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Figure legends

Figure 1: Protected Area growth calculated from the 2014 (dotted line) and 2016 (continuous line) versions of the WDPA using the established methodology where the 'Status Year' field is used for analysis. This illustrates that when sites are either added or removed the entire time-series can change dramatically, but the details of the loss or addition of sites cannot be determined using this approach.

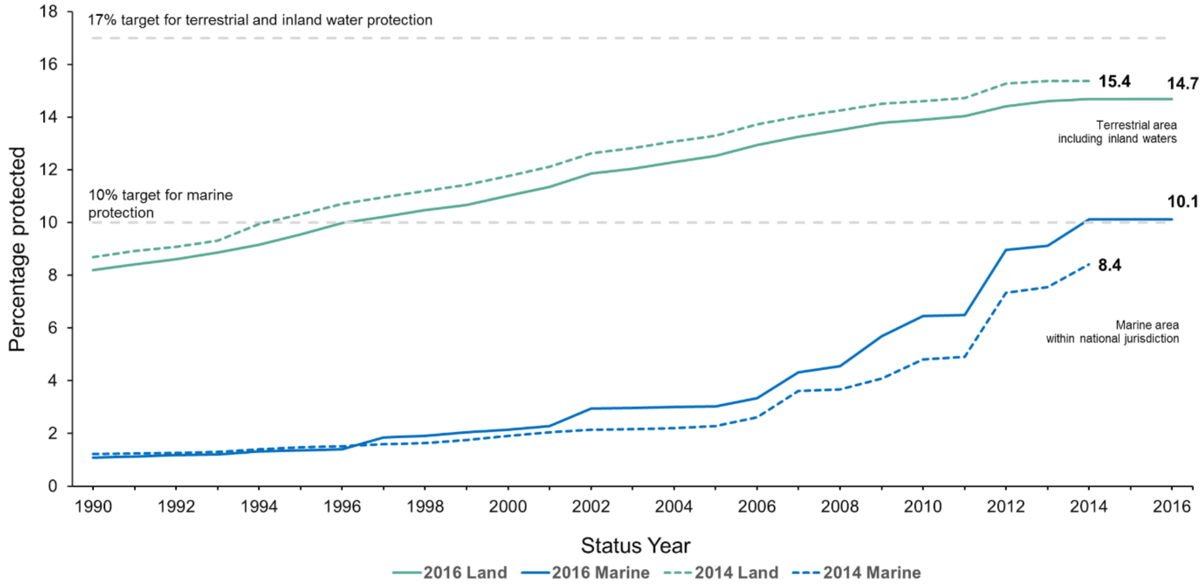

Figure 2: The total global protected area estate (terrestrial + marine) using the status year methodology misses the fluxes in area coverage witnessed every year. The bars represent the positive and negative footprints between each time interval.

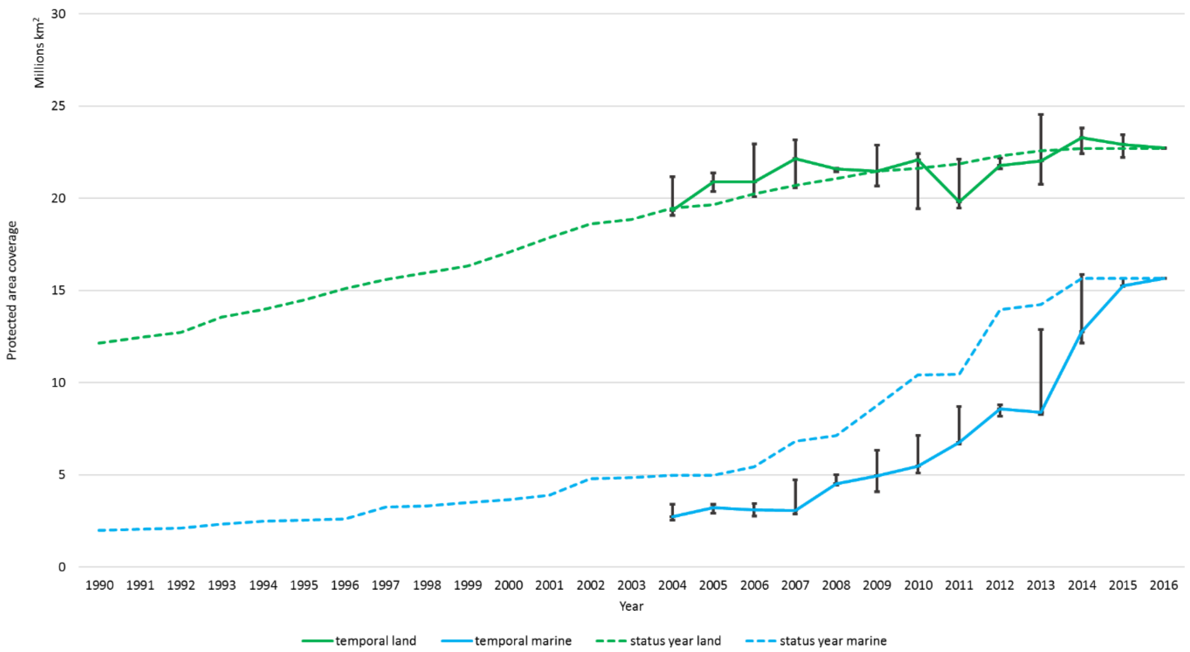

Figure 3: The negative footprint in every time interval since 2004 has had some of its area re-protected, though the majority remains absent from the WDPA in 2016.

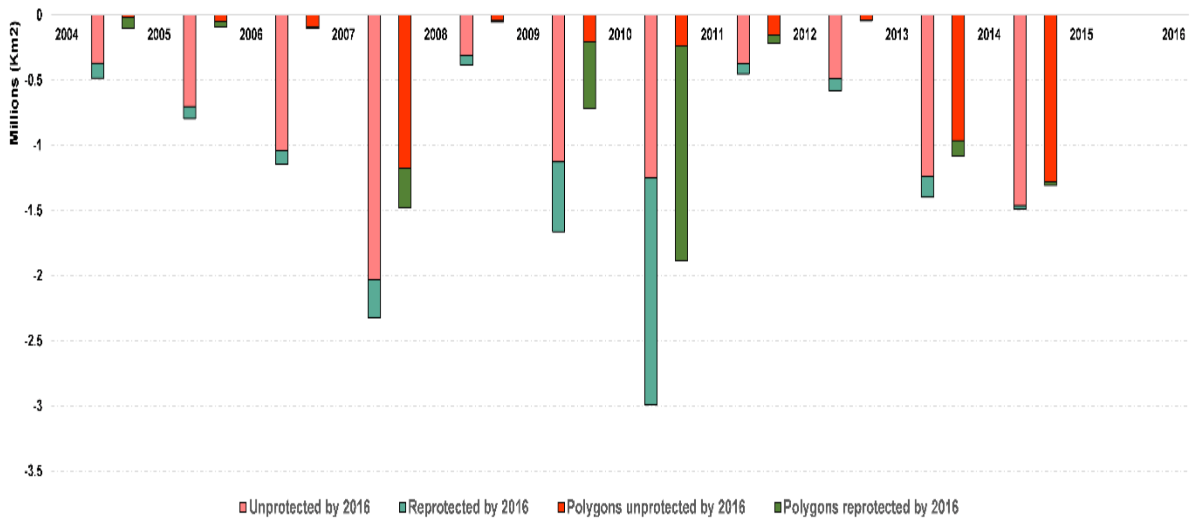

Table 1: Both approaches to creating a protected area coverage time series have distinct benefits and disadvantages.

Analysis method	Advantages	Disadvantages
Existing approach	• Can be used from the earliest year of designation (~1859) onwards. • Uses best available (current) data, which has a lower proportion of protected areas with unknown boundaries. • Quantifies additions at time of creation, not time of inclusion to the WDPA.	• It can only show a timeseries depicting stability or growth. Any decline isn't captured. • Can create markedly different historic coverage statistics depending on which version of the WDPA is used. • The time series is based upon a single field, status year, which only reflects the designation date of the current cohort of protected areas in their current form not those that have been degazetted in the past. • Computationally more intensive as each year has to be re-calculated for each analysis.
Temporal WDPA	• Can track how protected areas change spatially, e.g. their size or boundary. • Can track how protected areas change contextually, e.g. their type of designation or	• Earliest data starts in 1998, though accurate data starts in 2004. • Older versions of the WDPA are known to lack established sites due to reporting time lag. • Older versions of the WDPA are

	management type. • Historic coverage statistics are always the same, as a year's footprint is fixed in a specific WDPA version. • Will be an increasingly robust database as new versions of the WDPA are added. • Computationally quicker, only the current year's coverage to calculate as previous years are already calculated.	increasingly data poor, e.g. proportion of points to polygons, empty or non-existent fields due to limited sampling effort and lack of data standards. • Positive and negative footprints are associated with the WDPA versions rather than the dates in which they occurred on the ground.