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Critical Literature Review (ANTA602)

Protected Area Management: A Framework for Managing Cumulative Impacts in the Antarctic

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Abstract:

The Antarctic Treaty System is challenged with developing a strategic conservation approach for protected area management and with determining how cumulative impacts are addressed under the current regulatory framework. Key scientific and environmental values benefit from general protection under the Antarctic Treaty and a further system for designating protected areas was established under the Agreed Measures for Flora and Fauna 1964. With increasing human presence across the Antarctic the need for consistent implementation of environmental protection measures to minimise impacts is required. All visitors to the Antarctic, including tourists, scientific and support personnel of National Antarctic Programs and non-governmental organisations, have an obligation under the Protocol on Environmental Protection to the Antarctic Treaty 1991 to manage all environmental impacts, including those that are cumulative. The current protected area management system provides an existing framework in conjunction with the Environmental Impact Assessment process for managing cumulative impacts, but it has not yet been explicitly used for this purpose by the Antarctic Treaty Consultative Parties. This review will consider the established system for terrestrial protected area management in the Antarctic and examine whether this can facilitate improved management of cumulative impacts.

Introduction

The Antarctic and peri-Antarctic protected area system was established under the Agreed Measures for the Conservation of Antarctic Fauna and Flora 1964. With the enforcement of Annex V (Area Protection and Management) to the Protocol on Environmental Protection to the Antarctic Treaty in 2002 a system for designating Antarctic Specially Protected Areas (ASPAs) and Antarctic Specially Managed Areas (ASMAs) was established. With the increase in visitor numbers for both tourism and scientific purposes and expanding site accessibility a systematic approach to protection of environmental, historic, scientific, wilderness and aesthetic values has become increasingly significant.

Further to protected area management plans, Environmental Impact Assessment (EIA) under Annex I of the Protocol is a key instrument for managing human impacts in designated protected areas (Dalziell & de Poorter 1997). With increasing presence in Antarctica the need for consistent consideration and management of cumulative impacts, or past, present and reasonably foreseeable activities occurring over time and space, is required (de Poorter & Dalziell 1996; Kriwoken & Rootes 2000; Roura & Hemmings 2011). It is now widely recognised that changes to the environment caused by human activities are not simply a result of individual impacts occurring independently (Bastmeijer & Roura 2004; Tin et al 2014).

This review will examine a range of academic literature and Information and Working Papers submitted to the Committee for Environmental Protection (CEP) and Antarctic Treaty Consultative Meetings (ATCMs) on protected area management and cumulative impacts. Although the review does not present any academic papers specifically addressing the use of the protected area system to manage cumulative impacts this in itself highlights a significant gap in the use of existing environmental management practices in the Antarctic. Current provisions will be examined and common themes discussed with the aim of identifying general measures for improving the assessment of cumulative impacts in terrestrial protected areas.

Human Activity in the Antarctic

Although there is a prevailing view of Antarctica as a protected continent devoted to peace and science (Walton 2007; Hughes et al 2013) a common theme in the literature is that Antarctica's environmental protection measures must be strengthened (Chown et al 2012). It is also an accepted view that human activity, predominantly attributed to national government operations and the tourism industry, is growing rapidly (Kriwoken & Rootes 2000; Tin et al 2014; ASOC 2015a). There are currently eighty-two permanent research facilities in Antarctica and nineteen remote field camps (Council of Managers of National Antarctic Programs (COMNAP) 2015) with over 4000 annual national operator staff (Hughes et al 2013) resulting in significant environmental footprints (Figure 1; Braun et al 2012; Chown et al 2012; Tin et al 2009).

Figure 1. McMurdo Station, Ross Island – the largest research station in Antarctica (Piuk 2013)

Growth, expansion and diversification (Roura et al 2011) characterise Antarctic tourism and the continuing increase in visitation has raised concerns regarding impacts of activities on regional values (Enzenbacher 1992; Tin et al 2009; Roura et al 2011). The International Association of Antarctic Tour Operators (IAATO) report visitor projections for 2015/16 are likely to be in the vicinity of 40,029 people (inclusive of 28,304 landings) (International Association of Antarctic Tour Operators (IAATO) 2015). In the context of site visitation, IAATO have stated tourism has no significant environmental impact at landing sites or the Antarctic ecosystem (IAATO 2003). Contrary viewpoints suggest that cumulative environmental effects are of

particular concern (de Poorter & Dalziell 1996; Hofman & Jatko 2000; Bastmeijer & Roura 2004), particularly around the Antarctic Peninsula where high levels of concentrated activity is common at historic sites and wildlife colonies (Smith et al 1992; Kriwoken & Rootes 2000; Braun et al 2012; Hughes et al 2013).

Protected Area Management and the Environmental Protocol to the Antarctic Treaty 1991

A recurring theme throughout the literature is that the development of the Antarctic protected area management system has been a convoluted process since the Antarctic Treaty entered into force in 1961 (ASOC 2005; Prebble & Hemmings 1998). The Agreed Measures for the Conservation of Fauna and Flora 1964 provided for designation of areas of outstanding scientific interest to preserve unique biological ecosystems as 'Specially Protected Areas (SPAs). Under the SPA system the protection of unique biological fauna, flora and ecosystem values and scientific research conflicted and non-biological values were not addressed (Valencia 2000). In 1975 Sites of Special Scientific Interest (SSSIs) were purposefully developed to address scientific research.

The introduction of the Protocol on Environmental Protection to the Antarctic Treaty (The Madrid Protocol) in 1991 provided a further legally binding regime mandating comprehensive protection of the Antarctic environment and consideration of intrinsic values including wilderness, aesthetic, historic, environmental and scientific in the conduct of all activities. The first of five annexes to the Protocol established provisions for Environmental Impact Assessment (EIA), whereby proponents are required to consider Antarctic values in the planning and conduct of all activities to minimise adverse environmental impacts (Article 3). The level of EIA under the three tiered assessment process (Preliminary, Initial and Comprehensive Evaluation) is based on whether activities are likely to have 'less than, equal to or more than a minor or transitory impact on the environment or associated ecosystems' (Article 8).

Annex V Area Protection and Management to the Protocol was enforced in 2002 and provides the highest level of environmental protection for a site through designation as an Antarctic Specially Managed Area

(ASPA) or Antarctic Specially Managed Area (ASMA). ASPA entry requires a permit and activities must be conducted in accordance with the Management Plan for the area. ASPAs are designated to protect '*outstanding environmental, scientific, historic, aesthetic or wilderness values, any combination of those values, or on-going or planned scientific research*' (Article 4). ASMAs are a revised form of Multi-Use Planning Areas with designation required to '*assist in the planning and coordination of activities, avoid possible conflicts, improve coordination between Parties or minimise environmental impacts'* (Article 4). This reclassification occurred with the aim of adding a level of simplicity to protected area management (Goldsworthy & Hemmings 2008); however, it is also proposed that scientific values were compromised when SPAs and SSSIs merged into ASPAs (Hughes et al 2013).

Consideration of Cumulative Impacts

Annex I of the Protocol requires consideration of cumulative impacts for EIAs at the Initial and Comprehensive Evaluation levels only, not the Preliminary Assessment (PA) level. However, the level of analysis that 'consideration' dictates is not defined and legally binding standards have not been adopted, so coverage in EIA documents is superficial at best (Roura & Hemmings 2014). Article 3 of the Protocol requires that the cumulative impacts of the activity, both by itself and in combination with other activities in the Antarctic Treaty Area are taken into account when planning activities and preparing EIAs. The term cumulative impact is undefined in the Protocol and ambiguous, particularly when Article 3 refers to an activity having cumulative impacts by itself. Cumulative impacts also only require consideration at the IEE and CEE level of assessment.

Cumulative impacts have been discussed from a range of perspectives in the academic literature (e.g. Hofman & Jatko 2000; Tin et al 2008; Bastmeijer and Roura 2004; Roura and Hemmings 2011) focusing on mitigation and management, assessment methodologies and strategic environmental assessment. A key question is how in a continent where non-governmental and governmental operators run largely independent operations and where each government considers itself sovereign within its own area of

operation, can all Antarctic activities be effectively managed to avoid or mitigate environmental impacts? (Roura & Hemmings 2014; Bennett et al 2015. Consensus has not been reached on best practice for managing cumulative impacts (ASOC 2015a). It is acknowledged that methodologies (New Zealand 2006) adopted greatly influence the assessment of cumulative impacts but an in-depth review is outside the scope of this paper. The CEP is currently reviewing the EIA Guidelines and ASOC have recommended inclusion of a specific subsection addressing cumulative impacts rather than the sporadic references in the current guidelines (Australia 2014).

Scope for Assessing Cumulative Impacts in Protected Areas

A key outcome of the 1996 IUCN workshop on cumulative impacts was the recommendation to use ASMAs and ASPAs under Annex V (Area Protection and Management) of the Protocol as a tool for the management of cumulative impacts (De Poorter & Dalziell 1996); however the lack of literature addressing this management approach is a clear indication that it has not progressed perhaps as proactively as expected. The CEP has since adopted guidelines for preparing management plans for ASPAs only and an inspection checklist applicable to ASPAs and ASMAs which omit any reference to cumulative impacts (Valencia 2000; Secretariat of the Antarctic Treaty (ATS) 2015).

In 1992, just after Protocol negotiations, there were 19 SPAs and 35 SSSIs (ASOC 2008). In 2015, fifty-two years after the Agreed Measures were adopted there are 7 ASMAs and 72 ASPAs designated throughout the Antarctic and peri-Antarctic islands (Antarctic Protected Area Database 2015). Figure 2 shows the distribution of protected areas in 2008 (noting the absence of ASPA 171 Narebeski Point, King George Island and ASPA 172 Lower Taylor Glacier and Blood Falls, McMurdo Dry Valley designated in 2009 and 2012).

Figure 2. Location of Antarctic and peri-Antarctic protected areas

(British Antarctic Survey in Goldsworthy & Hemmings 2008)

In December 2015 a simple word search of the seven ASMA and seventy-two ASPA Management Plans identified all references to 'cumulative impact' (Secretariat of the Antarctic Treaty (ATS) 2009). Results indicate only seven ASPA Management Plans refer to cumulative impacts (appendix 1) with four sites designated for historical and three for scientific values. Cumulative impacts are briefly mentioned in relation to managing visitor numbers at the historic sites (eg ASPA 158, Hut Point, Ross Island) and with regards to the scientific value of geological, geomorphological and biological sampling (eg ASPA 148, Mount Flora, Hope Bay, Antarctic Peninsula). No guidance is provided on how cumulative impacts could be identified, assessed or managed in the context of past, present and future activities. Reference to managing cumulative impacts would be unexpected in the earlier management plans established after 1992 for sites that were previously designated SPAs (eg ASPA 101 Taylor Rookery) as the concept itself had received little attention from the ATCPs. However, even in the 2008 management plan for ASPA 169 Amanda Bay, East Antarctica the value in long-term population monitoring studies of Emperor Penguin colonies and the potential for human disturbance due to proximity of the research station is acknowledged and yet there is still no reference to management of cumulative impacts in the plan.

Of the 72 ASPAs over 56% are within 25km of the nearest research station and 28% within 3km of the station and this proximity to stations and populated areas provides opportunities for managing human activity (Hughes et al 2013). A comprehensive examination of reasons for ASPA designation was undertaken by Hughes et al (2013) and indicated that when management plans are ambiguous about the reason for protected area designation this in turn makes assessment of site values and potential impacts, including cumulative and the establishment of monitoring programs challenging and often unachievable. Unfortunately, the authors do not acknowledge that there are seven other areas protected under the Protocol as ASMAs, which cover a larger area individually than ASPAs and also potentially provide a higher level of protection.

Annex V clearly states that one of the requirements for ASMA designation in a multi-nation and multi-use site is to minimise environmental impacts, so ideally ASMAs should afford a higher degree of protection from adverse human activities given the Protocol requires development of a management plan, assessment of environmental impacts, coordination of activities, communication between Parties and tour operators, advance notification of activities and exchange of information. Of the seven ASMA Management Plans only four briefly refer to minimising, monitoring, addressing and investigating cumulative impacts but again no guidance on the assessment process is provided (appendix 2).

Designation as a protected area (ASMA/ASPA) is not sufficient to manage cumulative impacts unless there is effective cooperation and communication between parties, a view proposed by de Poorter and Dalziell in 1996 and still applicable to current practices (Roura & Hemmings 2011; Chown et al 2012; Bennett et al 2015). ASMA 2 McMurdo Dry Valleys (Secretariat of the Antarctic Treaty (ATS) 2015), a site jointly managed by the United States and New Zealand, is a good example of how management measures can be implemented to preserve regional values and to minimise the effects of cumulative impacts even though only minimal reference is made in the management plan. The Dry Valleys management plan incorporates five ASPAs (123, 131, 138, 154, 172) with individual management plans, a code of conduct and guidelines for

scientific research. The management plan establishes zoning including a Restricted Zones designated for high scientific value and sensitivity to human disturbance (Ayres et al 2008). A Visitor Zone is designated specifically to manage and monitor impacts. Kriwoken and Rootes (2000) and Holmes et al (2008) recognise the potential for ASMA designation to regulate tourist visitation to certain 'hotspot' areas in Antarctica such as regularly visited wildlife colonies.

How to Improve the Effectiveness of Protected Areas in Managing Cumulative Impacts?

Since the 1996 IUCN workshop (de Poorter & Dalziell 1996) on managing cumulative impacts in the Antarctic there have been fifteen papers submitted to the CEP/ATCM addressing cumulative impacts (eg ASOC 1999; New Zealand 2006) and over nine papers submitted on terrestrial protected area management (eg ASOC 2005; ASOC 2008; ASOC 2011) in addition to workshops organised by Treaty Parties and IAATO. Common themes from these papers and literature have been drawn upon to identify key deficiencies:

Representative Site Values in Protected Areas

The lack of representative values in the protected area network consistently arises as an issue in the literature (Chown et al 2012; Convey et al 2012; Hughes et al 2013, Shaw et al 2014; Bennett et al 2015). Hughes et al (2013) present a strong view that despite the ever increasing footprint of human activities within Antarctica the protected areas network has developed without any clear strategy and only protecting sites where significant scientific value is already established. Bennett et al (2015) support this proposition also noting the lack of protected areas designated for wilderness or aesthetic values. Shaw et al (2014) expand upon the challenges to Antarctic conservation (Chown et al 2012) and address protected areas in the context of Antarctic Conservation Biogeographic Regions proposing that currently only 1.5% of ice-free areas are protected and five of the fifteen ecoregions have no protection. The scientific understanding of how biological diversity varies across Antarctic will be fundamental in meeting the Protocol's requirement to protect representative examples of major terrestrial ecosystems and in shaping the network of protected areas and the management of cumulative impacts.

Harris (2000) suggests that given the slow pace at which protected areas are designated the precautionary approach should be applied to unrepresented areas not yet perceived as threatened, such as the Transantarctic Mountains, West Antarctica. Valencia (2000) also supports the designation of inviolate areas for the conservation of habitat at locations far from human activity. ASOC (2015b) further note the importance of expanding the protected area network to marine permanent no-take zones and to areas not protect values in areas at risk from human activities.

Establishment of Monitoring Programs

Monitoring site indicators likely to be impacted by human activities is a key tool in assessing cumulative impacts and COMNAP has produced guidelines to assist with the establishment of programs. Monitoring is not undertaken routinely within many protected areas and it is difficult to determine if existing levels of visitation are having adverse impacts upon the values being protected (Hughes et al 2013). However, Smith et al. (2005) note that rapidly increasing foot traffic from tourist boat landings have impacted important thermophilic bryophyte and marchantiophyte communities on ASPA 140 Deception Island, South Shetland Islands. Monitoring is also only required at the IEE and CEE level and so it is also unlikely that either tourism operators or National Antarctic Programs (NAPs) will monitor activities after an environmental assessment results in a finding of no significant impact (Bastmeijer & Roura 2008). Long-term monitoring programs are fundamental to assessing cumulative impacts.

Centralised Database and Exchange of Information

Exchange of information, submission of post-activity reports and availability of long-term monitoring data should ensure a consistent collective approach to managing cumulative impacts in protected areas but this is exceptionally difficult without a centralised database (Roura & Hemmings 2014; ASOC 2015a). Complicating exchange of information is that advance notification and post-activity reports are not always submitted to NAPs, management plans are bypassed and site guidelines and codes of conduct are not enforceable (Haase

et al 2009). ASOC (2005; 2015a) and IAATO (2002) reflect the common opinion that the availability of data for assessing cumulative impacts is one of the most challenging aspects of management.

ASOC (2015a) also suggest that to progress the assessment of cumulative impacts that data from the Antarctic Secretariat EIA database could be analysed to identify what activities have been carried out in a particular area previously and what the assessment of the impact of those activities has been. However, ASOC did not suggest who would be responsible for the database and information analysis nor acknowledge that the database only stores details of the 120 IEEs and 18 CEEs submitted to date (Secretariat of the Antarctic Treaty (ATS) (2015) and not the numerous projects approved at the PA level.

Joint Environmental Impact Assessments and Management Plans

A strategic approach to undertaking assessments of cumulative impacts would require replacing the national-based or project-based EIAs and moving towards strategic joint assessments covering large geographical areas (Dalziell & de Poorter 1997; Valencia 2000; IAATO 2000; Roura & Hemmings 2014) for scientific, logistical and tourism operations. Although joint management plans have been developed joint EIAs have not yet been undertaken for activities in the multi-nation ASMAs but would assist with sharing responsibilities for monitoring programs and submission of reporting requirements to the ATS Secretariat.

Temporary Antarctic Treaty Specially Protected Area Designation

For potentially valuable sites development of provisional codes of conduct or temporary ASPA designation are management tools that can be implemented to minimise potential cumulative impacts (Valencia 2000). True application of the precautionary principle would allow for temporary (5-10 year) designation of ASPAs while long-term management options are assessed, which would assist in establishing baseline indicator levels for site-specific monitoring programs and therefore allow for better assessment of cumulative impacts. Temporary ASPA designation could also assist in site remediation and recovery of degraded areas (Walton 2007).

Reporting Procedures, Inspections and Site Audits

Permitting and reporting procedures including site inspections required in ASPAs are an important procedural tool for tracking human activities within protected areas (De Poorter & Dalziell 1996; Roura & Hemmings 2014). The CEP adopted an ASMA/ASPA inspection checklist designed to provide guidance to observers conducting inspections in Antarctica in accordance with Article VII of the Antarctic Treaty and Article 14 of the Environment Protocol. However, the majority of questions require a closed (yes/no) response so the quality of the data collected is greatly influenced by the experience of the inspector. Environmental audits and inspections can be used more effectively as a tool for managing cumulative impacts (Valencia 2000; ASOC 2015a). This again would require appropriate consultation and collaboration between NAP and tourism operators to obtain and share reliable and useful data on site indicators.

Conclusion

This review has shown that assessment of cumulative impacts is a cross-cutting issue that affects a range of ATCM and CEP agenda items, including shipborne and land-based tourism, the establishment and operation of permanent and temporary research stations, Antarctic values, exchange of information, environmental monitoring and multi-year strategic project planning. Key literature has shown that the use of the protected area management system is inconsistent across the Antarctic region and not yet representative of values requiring protection under the Environmental Protocol. The ASMA/ASPA mechanism does provide an adequate framework for managing cumulative impacts as long as it is applied appropriately across a range of representative site values. Protected area designation does not need to be used explicitly for the purpose of managing cumulative impacts but it is a management tool that in conjunction with the EIA process can potentially provide long-term qualitative and quantitative data that will assist in the protection of the Antarctic and its dependent and associated ecosystems.

Table 1. Antarctic Specially Managed Area Management Plans and Cumulative Impact References
(Antarctic Treaty Secretariat (ATS) 2015)

ASPA No.	YEAR	TITLE	NATIONAL ANTARCTIC PROGRAM	CUMULATIVE IMPACT REFERENCE	VALUES NOMINATED
148	2015 (Measure 8)	Mount Flora, Hope Bay, Antarctic Peninsula	Argentina, United Kingdom	Terms & Conditions for Entry Permits: In view of the fact that geological sampling is both permanent & results in **cumulative impact** the following measures shall be taken to safeguard the scientific values of the Area…geological sampling is to minimise duplication & record sample location, type & quantity…	Historical Scientific
149	2005 (Measure 2)	Cape Shirreff & San Telmo Island, Livingston Island, South Shetland Islands	United States	Food, Access & Movement Within the Area: In view of the fact that geological sampling is both permanent and of **cumulative impact**, visitors removing geological samples from the Area shall complete a record describing the geological type, quantity and location of samples taken, which should, at a minimum, be deposited with their National Antarctic Data Centre or with the Antarctic Master Directory.	Scientific
151	2013 (Measure 11)	Lions Rump, King George Island (Isla 25 de Mayo), South Shetland Islands	Poland	Management Activities: Where appropriate, National Antarctic Programmes are encouraged to coordinate activities to prevent excessive sampling of biological and geological material within the Area, to prevent or minimize the danger of introduction and dispersal of non-native species, and to keep environmental impacts, including **cumulative impacts**, to an absolute minimum.	Scientific
157	2015 (Measure 12)	Backdoor Bay, Cape Royds, Ross Island	New Zealand	Terms & Conditions for Entry Permits: Avoidance of **cumulative impacts** on the interior of the hut requires an annual limit on visitor numbers. The effects of current visitor levels (average 767 per year between 1998/99 and 2013/14) suggest that a significant increase could cause significant adverse impacts. The annual maximum number of visitors shall be: 2,000 people.	Historical
158	2015 (Measure 13)	Hut Point, Ross Island	New Zealand	Terms & Conditions for Entry Permits: Avoidance of **cumulative impacts** on the interior of the hut requires an annual limit on visitor numbers. The effects of current visitor levels (average 1015 per year between 1998/99 and 2013/14) suggest that a significant increase could cause significant adverse impacts. The annual maximum number of visitors shall be: 2,000 people.	Historical
159	2015 (Measure 14)	Cape Adare, Borchgrevink Coast	New Zealand	Terms & Conditions for Entry Permits: Avoidance of **cumulative impacts** on the interior of Borchgrevink's hut requires an annual limit on visitor numbers. The number of visitors to the hut varies considerably from year to year (average 181 per year between 1998/99 and 2013/14) but the effect of visitors to other historic huts in the Ross Sea region suggests that similar limits should apply. The annual maximum number of visitors shall be: 2,000 people.	Historical

168	2015 (Measure 17)	Mount Harding, Grove Mountains, East Antarctica	China	Aims & Objectives: Facilitate long-term scientific research while avoiding direct or **cumulative** damage to vulnerable geomorphological features.	Scientific

Table 2. Antarctic Specially Managed Area Management Plans and Cumulative Impact References
(Antarctic Treaty Secretariat (ATS) 2015)

ASMA No.	YEAR	TITLE	NATIONAL ANTARCTIC PROGRAM	CUMULATIVE IMPACT REFERENCE	VALUES NOMINATED
1	2014 (Measure 14)	Admirality Bay, King George Island	Admirality Bay, King George Island Brazil, Ecuador, Peru, Poland, United States	Aims & Objectives: Avoiding or minimizing the risk of mutual interference and **cumulative impacts** on the terrestrial and marine environments; Management Activities: monitor the Area to investigate possible sources of environmental impact including **cumulative impacts**; Advance Exchange of Information: …enhanced cooperation and minimization of possible **cumulative impacts**;	Aesthetic Environmental Scientific Educational & Touristic* Historical
2	2011 (Measure 10)	McMurdo Dry Valleys, Southern Land	New Zealand, United States	Aims & Objectives: Ensure the long-term protection of scientific, ecological, aesthetic, wilderness and other values of the Area by minimizing disturbance to or degradation of these values, including disturbance to natural features and fauna and flora, and by minimizing the **cumulative environmental impacts** of human activities; Management Activities: develop strategies to detect and address **cumulative impacts**.	Scientific Historical Aesthetic & Wilderness
4	2012 (Measure 10)	Deception Island	Argentina, Chile, Norway, Spain, United Kingdom, United States	Management Activities: monitor the site to investigate **cumulative impacts** derived from science.	Natural* Scientific & Activities* Historical Aesthetic Educational*
7	2010 (Measure 14)	Southwest Anvers Island & Palmer Basin	United States	Aims & Objectives: Ensure the long-term protection of scientific, ecological, and other values of the Area through the minimization of disturbance to or degradation of these values, including disturbance to fauna and flora, and to minimize the **cumulative environmental impacts** of human activities; Management Activities: develop strategies to detect and address **cumulative impacts**.	Scientific Flora & Fauna* Educational & Visitor*

*not selection criteria under Annex V for ASMA designation

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