



## **Pandemic impact on revenue loss and its relationship to animal welfare for animals in human care**

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**Simple Summary:** There are an estimated 10,000 captive wild animal facilities worldwide. Only a small fraction of these facilities are governed by meaningful national animal welfare legislation and/or national or regional animal welfare standards set by zoo and aquarium associations. Animal welfare standards could be improved in a great number of these facilities. The outbreak of COVID-19 and the subsequent pandemic caused national lockdowns and the temporary closure of many zoos and aquariums. The loss of revenue caused and magnified existing issues related to animal welfare standards and the management and governance within many captive wild animal facilities. It is likely that this has led to reduced animal welfare practices for potentially hundreds of thousands of animals. This paper addresses these issues and gives recommendations for maintaining good animal welfare standards during a crisis.

**Abstract:** During 2020 the COVID-19 pandemic caused the temporary closure of many zoos, aquariums, and other animal related facilities and a subsequent loss of visitors and income. Unlike many other businesses, zoos, aquariums, wildlife parks and sanctuaries have a limited ability to reduce overheads and staff costs due to ongoing care of the animals. We explore the effects of temporary closure and revenue loss on these facilities, the potential impact on animal welfare and existing internal and external factors and measures which could mitigate against a reduction in primary animal care. How facilities with animals in human care are structured and managed, how enclosures are designed and maintained, staff training and resources, and internal and external communication are factors which can impact animal welfare during temporary closure. We end with a summary of

recommendations which facilities should consider to mitigate against any reduction in animal welfare during a loss of revenue.

**Keywords:** animal welfare; animal care; revenue loss; pandemic; COVID-19; zoos; aquariums; animal sanctuaries

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## 1. Introduction

With the outbreak of COVID-19 on the global stage in March 2020, the primary focus of communities has been managing the social, financial, and political impacts of the pandemic. Whilst these impacts on human societies are likely to be considerable, the significant and long-term revenue losses experienced by zoos, aquariums, and related animal care facilities that are dependent upon visitation, may have a knock-on effect on the welfare of animals under care. Potentially the number of animals impacted is substantial. The Association of Zoos and Aquaria (AZA) alone holds around 800,000 animals within its 240 members. With a conservative estimate of 10,000 facilities with wild animals in human care worldwide, millions of individual animals could be impacted [1].

In this document we have classified the term facility to incorporate zoos, aquariums, wildlife parks, and animal sanctuaries. These facilities may fall under the following: Private for profit – corporate or individual; Private not for profit – trusts, foundations, societies; Private/Public enterprises – corporate partnerships/local and national government; Government-funded – funded by government bodies. Typical revenue sources for all these classified facilities are varied but can fall under the following broad categories: Admissions – visitor numbers; Internal commercial activities; Promotions, events and concerts; Subscriptions/memberships; Sponsorship/Donations and Subsidy. The percentage reliance on the different revenue sources depends on the facility classification and residing country.

Concern for animal welfare within facilities during the pandemic and consequent revenue loss has mostly focused on access to animal food, however the impacts are numerous and nuanced. The ability to provide adequate care is directly linked to the number and quality of animal care staff available and the provision of suitably maintained environments or enclosures. Certain species and individuals under prescribed care require specialist and expert management. A loss of staff could mean the loss of animal welfare standards and could result in acute or chronic welfare concerns. Most facilities ensure that there is a daily and consistent pattern to animal management that optimises good animal welfare standards

and works for the animals they hold and the appropriately trained staff caring for them. Practices such as environmental enrichment and the presentation of food that encourages natural feeding behaviours may have to be significantly reduced. Similarly, positive reinforcement training sessions may not be as frequent. A disruption in these practices could result in anxiety and stress for the animals [2].

The primary impacts that revenue loss have on facilities with animals in human care and the relationship of this impact on good animal welfare standards are considered below. This discussion also considers how a facility which has certain good animal welfare standards already in place, mitigates any future welfare impact a significant loss in revenue may have.

## **2. Document Assumptions**

This document has been created to describe the relationship between revenue loss and a facility's ability to provide a high standard of animal welfare. For the purpose of this document, a number of assumptions have been made.

Assumption 1 - Revenue loss is a result of a stochastic, unpredictable event that results in significant and/or long-term financial loss. What might constitute 'significant' revenue loss will differ from institution to institution. For the purposes of this document we assume the facility completely loses its visitation numbers and all associated revenue for a period of one month or more;

Assumption 2 - this revenue loss is national, regional and/or global and is occurring in the majority of facilities with animals in human care within that region;

Assumption 3 - As a result of revenue loss, a facility must make exceptional overhead expenditure cuts;

Assumption 4 - the facilities under consideration have an education, scientific research and conservation purpose and commitment.

## **3. Revenue loss impact on primary animal care**

The main impacts of revenue loss on the ability of a facility with animals in human care to provide a high standard of animal welfare are:

- 1) A reduction in available and expert personnel and finances that are needed to provide appropriate animal care and;
- 2) Reduced maintenance of facility infrastructures that support animal care [3].

Under significant, long-term or forecasted revenue loss, income will be reduced. In some cases, there may be government financial support that can mitigate the need to reduce staff overheads. However, unlike many other types of businesses or organisations which may have the ability to deploy government initiatives to financially support staff or maintain individual staff at a reduced capacity, facilities where staff must care for animals have a limited ability to reduce their staffing levels and wage budget to a minimum. The minimum position taken will be dependent on a number of factors, for example, specialist care may be required for high risk/dangerous animals, breeding, neonatal/infants, quarantine, socially-complex individuals and animals used within educational/engagement events on or off site. Staff qualified in animal emergencies and incident management and species-specific management (e.g. elephant keepers), contractors or equivalent staff that maintain infrastructure and life support systems are also necessary. Animal care and specialist staff must be kept employed in appropriate numbers to safely care for the animals and provide appropriate husbandry and veterinary care [4].

More labour-intensive practices that exist, such as shutting all animals in indoor enclosures overnight (for some species this is legally required dependent on country laws) will more seriously impact an animal's welfare if the usual timings and environmental enrichment are not met. A lack of qualified and competent staff to carry this out may result in individual animals being accommodated in sub-standard temporary facilities much longer than before. Social species that are rotated due to incompatibility or otherwise, may spend longer in sub-optimal enclosures, other individuals held in temporary enclosures for educational or entertainment purposes may not be moved into more suitable environments while these events are postponed (e.g. birds kept in small aviaries or holding areas when not being flown in demonstrations may not experience free flight or have the opportunity for appropriate exercise they would normally experience during educational displays).

Highly intelligent species with complex and sophisticated requirements such as great apes or elephants not only require specialist staffing, but often require staff that have a positive relationship with individual animals that enables the safe management of them. For example, elephants that are managed through free contact are extremely reliant on an established keeper/elephant relationship [5]. These individual relationships can often be a form of positive enrichment and interaction for the animals as well, and the removal of such a relationship could result in individual animals becoming anxious or stressed.

Animal husbandry training is reliant on a positive keeper-animal relationship and specific staff training and experience. Animal training is used as a tool to safely move animals between housing and enclosures, deliver veterinary care and medication, and as stimulation or enrichment for the animals. With staff time and/or the number of experienced staff limited due to a reduced budget these activities could be impacted and consequently the welfare of the animals [6] [7].

Preparation of specialist diets for the animals and review of the diet and nutritional content must be maintained. Presentation of the food and monitoring the feeding behaviours in individuals and groups of animals is important, with a reduction in staff, staff time or specialist staff this may be compromised. Species with a high metabolic rate are dependent on specific diets at regular intervals. For example, birds in a large, free-flight aviary, which holds several species, might be difficult to monitor and provide appropriate care and dietary needs if staff time has been reduced or there is a loss of specialist staff.

While on-site veterinary facilities may require more initial investment, this is balanced by the fact that the facility has on-site veterinary support and access to veterinary facilities and medicine rather than having to out-source this requirement. Facilities that are reliant on external veterinary support may have trouble accessing that support during periods of revenue loss dependent on the reasons behind the financial downturn. This will depend on the number of species held in the facility and the specialist care they need. It may not be financially viable to employ a full-time vet/s, but consideration must be made as to whether the veterinary service can continue through the period of revenue loss without impacting animal care and welfare. On site veterinary facilities must be maintained and appropriate use of equipment and medicines is needed to care for all the animals in the facility, including animals under veterinary care or in quarantine, alongside proactive and reactive veterinary actions.

Facility size and species diversity differ immensely and are closely linked to staff number and expertise and changes in staffing numbers or expertise could have an impact on animal welfare under significant revenue loss [5]. A diverse range of species in human care requires both specialist care and continued infrastructural overheads (e.g. enclosure temperature maintenance, water quality control, etc) and links back to personnel requirements that cannot be reduced even under unprecedented circumstances.

Aquariums and vivariums require specialist animal care staff and technical assistance to maintain the habitats and environmental conditions for the fish and reptile species. Continuous monitoring of life support systems and regular maintenance and servicing of equipment is essential along with monitoring

of food intake. With the reduction or loss of technical assistance the environmental conditions required for life could be compromised [8].

This is also the case for other overheads which cannot be frozen or minimised. Utilities to animal housing cannot be turned off where a species needs a specific thermal range, humidity, ventilation, light, water salinity or UV exposure. A suitably nutritious and balanced diet needs to be prepared and provided to each animal, often with specialist diets or supplements, along with a supply of clean drinking water or a filtered water supply. Access to and storage of appropriate medicine is essential, as are staff that can perform medical practices, including safe and humane euthanasia. Staff-intensive practices which result from enclosure design, number of animals or management practice, must be continued. Species in climates outside of their natural temperature/humidity requirements often require substantial overheads to maintain the artificial environments within the appropriate parameters. For facilities that hold a significant number of non-endemic species that require specialist environments, the consequences of revenue loss may be more serious.

How animals are managed within a facility before a downturn in revenue will impact a facility's ability to cope with reduced overheads. For example, facilities that do not have appropriate breeding protocols in place result in overcrowded facilities that often require the rotation of individuals between temporary or off-exhibit and public enclosures due to incompatible animals or limited space to safely introduce individual animals.

Limited enclosure environments, that are reliant on daily and/or complex environmental enrichment which cannot be achieved during a reduced income period, will result in species experiencing a significant compromise in care [9].

Good enrichment practices are managed through a structured programme but are reliant on expert staff. Even complex, naturalistic environments require some behavioural and environmental enrichment intervention, particularly for the more complex species that have complex requirements. Specific species environmental requirements (such as temperature/humidity or water quality checks/filtration systems) that cannot be effectively and consistently maintained as a result of revenue loss, could cause a significant impact on the animal's welfare.

The secondary impacts of revenue loss on the ability of a facility with animals in human care to provide a high standard of animal welfare are:

- 1) External resources and service and;

2) Visitor interactions and;

3) Restrictions on animal movements and conservation activities.

Sourcing appropriate and nutritional feed may be interrupted. Supplies of specialist foodstuffs and concentrated feeds may be limited. Fresh produce or feeds with a short shelf life which need regular deliveries may be reduced or be diverted. Food prices can increase if certain supplies are in demand which may increase feed bills.

Disease surveillance services which are carried out on-site or sent off site must be maintained. Staff who carried out on-site services may be impacted along with supplies and resources needed to carry out the screening. Off-site/external surveillance facilities may have a reduced or suspended service or there may be a delay in the delivery/transporting of animal samples and reporting of results

If visitor numbers are reduced or the facility has closed completely, any animals that may have been reliant on the visitors providing food in that facility will have to compensate for this and provide appropriate diets. The reduction in visitors buying food for the animals will have a two-fold effect: there will be a reduction in revenue from not purchasing the animal feed or the facility relies on externally purchased foods brought into the facility which will mean the facility has to purchase the shortfall in food previously provided by the visitors.

There are numerous different forms of animal-visitor interaction in facilities with animals in human care. An absence of visitors will often mean that such interactions are suspended, and this can have a significant impact on the welfare of animals normally involved in these interactions [10]. Species used in animal presentations or educational events may be housed in accommodation that would be considered substandard if permanently used. However, usually these conditions are often mitigated through activities within a presentation or event itself which may not be taking place. Positive interactions with visitors may be rewarding for some individual animals and the removal of such interactions may cause a depression in welfare.

Conservation management remains imperative for many facilities and key staff will be required to manage these programmes. A number of species will be part of national, regional or global population management plans with species-specific management goals, that if interrupted will impact the effect of long-term management plans for that species and consequently the conservation success. Financial loss or restrictions to normal operations (travel/transport) may result in the reduced capacity to transfer animals to other facilities.

The interruption of global or regional population management plans can have both a conservation and animal welfare consequence. Often individual animals are temporarily loaned or held within a facility for breeding or reintroduction/rehabilitation purposes. An inability to transfer these animals in a timely manner could result in individuals being held in facilities that had not planned to accommodate the species longer than necessary and could result in animals being held in temporary unsatisfactory enclosures. Overstocking as a result of successful breeding and the inability to transfer animals can also result in overcrowded conditions.

#### **4. Identified Mitigating Factors**

##### *4.1. Internal Factors*

Existing facility governance, financial and practical management will dictate how significantly this revenue loss will impact the animal's welfare. Management proficiency, leadership and governance methods will mandate the consequent management infrastructure, advance contingency planning, crisis planning, risk management and recovery strategies and welfare certification documentation and Standard Operating Procedures (SOPs).

Building strong relationships with facility donors, partners and members helps with financial security, as does appropriate governance that ensures effective cash reserves. Ensuring a facility is not reliant on a single revenue avenue and diversifying the funding avenues while investing in securing multi-year grants will also help with financial security.

Many facilities hold animals which are not normally found in their region or climate. This can have significant cost implications, for example, substantial indoor accommodation, climate control and strict management/husbandry protocols which increase staff time and resources.

The manner in which a facility has developed a species plan will influence how it can maintain good welfare standards for the animals under its care. The species selected will determine how they will be managed, the staff required, and the resources and infrastructure needed. Consideration to whole-of-life care costs for the animals and potential offspring requirements (staff, feed, medicine and enrichment) as well as construction, maintenance and running costs for each species enclosure and housing must be taken before a commitment is made.



Consideration of specialist care, diets, environments, and life support systems needed for each species, and having a long-term breeding plan, will help predict overheads and forecast budgets for animal care and maintenance costs.

A comprehensive species plan with the reasons for holding and breeding those species is critical, not only for public perception and support, but for the welfare of those animals. Not all species will have a direct or indirect conservation role, they may have an education or research role or more than one of the above, but it is important to be able to justify the role of each species [11]. Facilities which are members of an association or accredited members of an association follow best practice guidelines and animal welfare standards set by the national or regional association, to assist in implementation of good institutional species planning and ex situ programmes [12].

Staff numbers, expertise and engagement are all key factors that will support the mitigation of animal welfare risk under significant revenue loss. Closely associated with facility governance and external government support, access to competent and necessary personnel with relevant skills in animal care and facility and life support system management practices is critical.

Community perception and support of a facility will influence their response to any emergency financial appeals. Facilities that have provided programmes such as membership or sponsor an animal, will have a greater ability to draw on these relationships and secure emergency funding from loyal customers. A facility that is not considered an essential community need or has a poor or fractious relationship with its community will have a reduced chance of receiving support.

By showing the local community, organisations and governments that consideration to why species are kept in human care and how good welfare standards are practiced throughout the facility they are more likely to give support and respond when assistance is needed [13]. Appropriate and factually accurate external communication to all interested and affected parties is vital. Under normal circumstances, many facilities supplement income through visitor subscriptions and 'adopt an animal' schemes. Highlighting best practice animal welfare in communications will serve to uphold public trust and ensure the probability of these revenue streams remaining continuous. Additionally, opportunities are then afforded to solicit further, directed donations to maintain animal care.

#### *4.2. External Factors*

A country's response to an unprecedented event will impact revenue for a facility. Closure requirements can be catastrophic, especially when a facility can be entirely or significantly reliant on

visitors. A country's ability to respond swiftly and effectively to a crisis through novel regulations and their timely and efficient execution will dictate how long a closure may be required.

Existing legislation and governmental oversight pertaining to animals held in human care can impact animal welfare under revenue loss, simply due to the requirements of facilities to abide by these laws.

Consideration must be given to existing government legislation and insurance cover for mitigation against the impact on animal welfare, particularly relating to any sort of enforced closures of facilities and/or extreme revenue loss. As the insurance industry reacts to the impact of the pandemic, specific insurance cover may be unavailable or unaffordable to many animal facilities in the future. Type of cover and claimable limits within a policy must be considered. The structure of the organisation (e.g. private, government, charity) may influence access to grant schemes or alternative revenue sources.

A loss in income as a result of a facility closure to visitors can be offset by alternative income resources. Government subsidy and support and/or extraordinary government aid has been provided in a number of different countries at differing levels. For example, ZAA Australasia received access to a \$96 million support package from the Federal Government in Australia, [14] while in the UK the government launched a £14 million support fund, [15] that zoos could apply for to cover animal care costs that cannot be lowered, including, keepers' wages, animal feed and bedding, vet care and medicines, electricity and heating and waste removal.

#### **4. Discussion**

Over the course of the 2020 COVID-19 pandemic which forced zoos, aquariums, wildlife parks and sanctuaries globally to close to visitors and consequently undergo revenue loss, social media posts indicated a general concern for animals in these facilities. However, for the most part, these concerns predominantly centred on an apprehension that the animals were going hungry [16]. Whilst this certainly may have been the case in some facilities, the overall impact on general animal welfare in these situations are often less obvious and multifaceted.

From this perspective animal welfare under crisis must be regarded as being paramount. Other natural disasters that have historically impacted on facilities with animals in human care around the globe have taught the lesson that prior preparation through disaster/crisis relief and/or mitigation protocols are essential [17]. The advent of a global epidemic causing extended disruptions to visitation and ensuing revenue loss is - to use a much-coined term - unprecedented across the international

animal care community. Although, some facilities which have undergone extremes of climatic disaster such as floods and hurricanes (which also impact visitation for extended periods) have demonstrated that prior consideration and development of crisis protocols and risk assessments can have a considerably mitigating effect upon a decline in animal welfare under such circumstances [13].

Such crisis protocols however are not necessarily simply projected courses of action in an emergency. From an animal welfare perspective, prior preparation rests upon the development and implementation of documented standards for animal welfare during normal operation. Effective SOPs will ensure all staff are aware of best practice standards. During a reduction in personnel as a result of revenue loss, animals within a facility that lacks appropriate SOPs and/or does not ensure all their staff are well trained will be at a greater risk of having poor welfare.

## 5. Conclusions

For facilities to maintain good animal welfare standards and to mitigate against any reduction in animal welfare standards during a crisis the following recommendations must be considered [Figure 1].

**Legislation.** Effective and enforceable national or regional animal welfare legislation to regulate continued standards of animal care. Where this is lacking, facilities, national associations and NGOs should work together and lobby for appropriate legislation which supports good animal welfare.

**Governance.** The governance of a facility will set out how an organisation prepares, maintains, and manages its operations and how it is perceived internally by staff and associates and also externally by government, non-government organisations and the public. Reviewing current governance or implementing appropriate processes and structures may help mitigate against a crisis.

**Finances.** Consider the revenue streams a facility relies on and how it structures its finances. Diversify income sources and access government and non-governmental grants to make finances more robust.

**Association Membership.** Align with other facilities' standards and with national or regional association policies and procedures. Associations may engage in lobbying activities for increased assistance or supportive legislation.

**Species Planning.** Justifying the roles and goals for every species held in a facility will assist in designing and planning the whole of life care for those individual animals. Consideration of the conservation, education and research roles for each species and the enclosure build and long-term

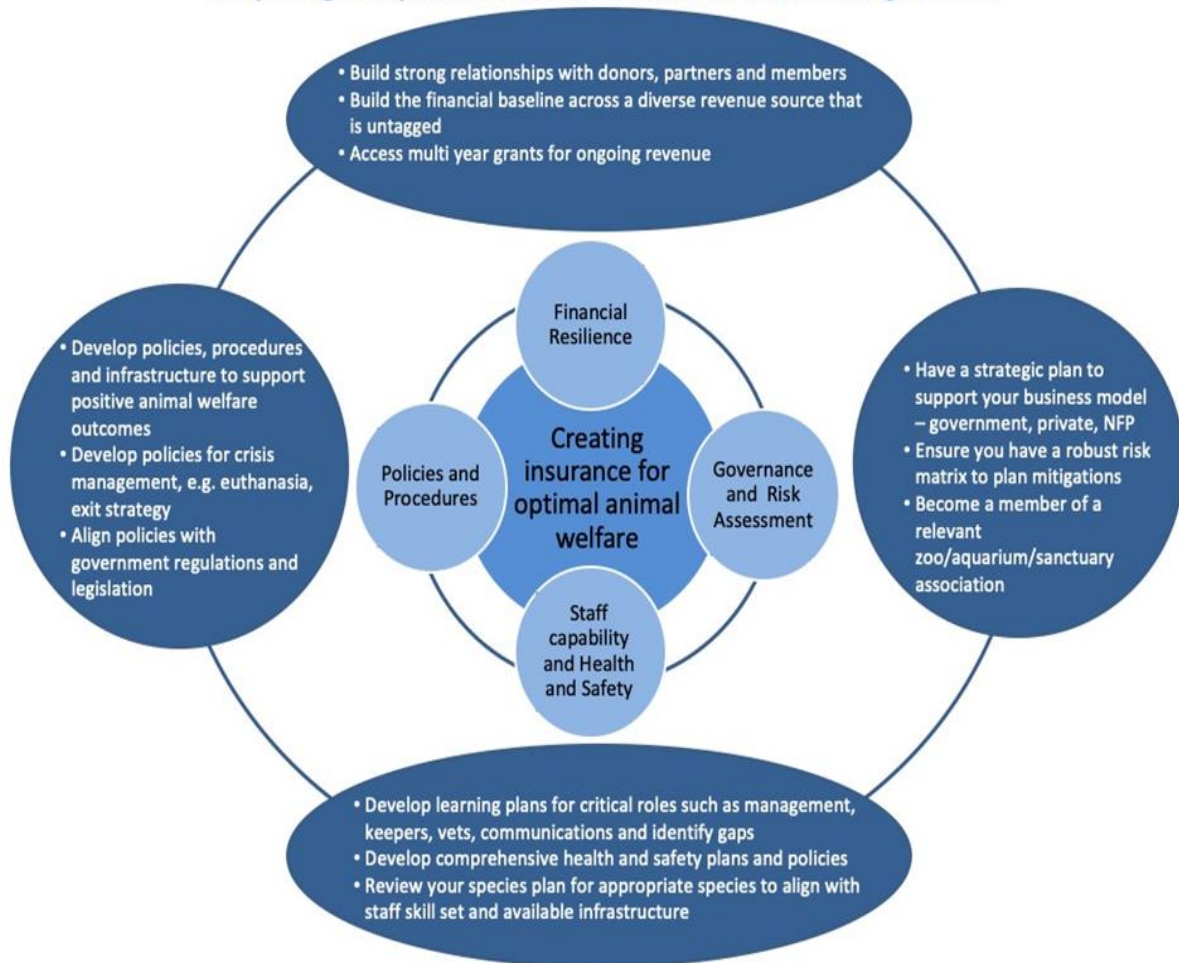
maintenance/running costs must be taken. National or regional associations may have guidance or standards in place to assist facilities to address species planning.

**Staffing.** Investment in staff training and increased capabilities of staff. Address staff-intensive husbandry practices and enclosures which require increased staff time and management. These measures may help reduce overhead costs and potential instances of reduced animal welfare during periods of closure and during normal facility operation. Species-appropriate enclosure design with species-specific habitats, allowing animals to exhibit natural behaviours (environmental enrichment), maintains good animal welfare while staff time may be reduced.

**Standard Operating Procedures (SOPs).** SOPs can ensure best practice animal care is provided within a facility. They describe how a practice should be carried out and the standard that should be met. From enclosure/habitat cleaning to euthanasia, a well-managed facility will describe who, when and how certain practices pertaining to animal care are carried out. Implementing or reviewing current animal husbandry and health and safety standards will help maintain good animal welfare during a crisis. Having SOPs which allow for species-specific natural behaviours (e.g. free movement throughout the on and off exhibit enclosures), may reduce staff-intensive management practices during a period of reduced staffing.

**Communication.** Public support for a facility's values and goals is critical during a crisis and during normal operations. Clear and factual messaging to the public and other external organisations and authorities will assist with local, national, and international campaigns and funding opportunities. Internal communication is also important.

## Preparing to Optimise Positive Animal Welfare During a Crisis



**Figure 1.** Preparing to Optimise Positive Animal Welfare During a Crisis.

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