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Public Administration of Zoos in the Sustainable Development Goal

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Article History	Abstract
	Within the framework of the effects of climate change, the public administration of zoos is a scenario to observe the relationship between sustainability and Human Development. Based on the analysis of risks and vulnerabilities, the management of recreational centers makes its visitors aware of the importance of Sustainable Development Goals (SDG). The objective of this work was to establish the network of perceptions around the public administration of species in captivity and for investigative or cultural purposes. Exploratory, correlational and cross-sectional work was carried out with a sample of 100 professional practitioners and social servants from centers of the captivity of endangered species. The results show that the dimensions of public administration were associated with SDGs 1, 5, 7, 12 and 15 related to the end of poverty, gender equality, affordable and clean energy, responsible production and consumption, and life in terrestrial ecosystems. About the studies of Comprehensive Disaster Risk Management (GIRD), lines of study are recommended for the analysis of risks and vulnerabilities in scenarios of captivity of species.
	Keywords: *Public Administration, Human Development, Sustainable Development Goals, Zoos*

1. Introduction

The history of public administration is an account of how societies have organized and managed their public affairs over time (Henderson, 1960). The main milestones in the history of public administration:

Antiquity: In ancient civilizations, such as the Egyptian, Mesopotamian, Greek, and Roman, administrative structures were established to manage matters such as tax collection, construction of public works, and maintenance of order (Sibley, 1994). Imperial governments, such as the Roman Empire, developed bureaucracies to manage vast territories.

Middle Ages: During the Middle Ages, public administration was strongly influenced by the Church and the feudal system (Rajamani, 1993). The administration focused on maintaining social order and collecting taxes.

Renaissance and Industrial Revolution: The Renaissance brought with it a revival of rational and humanistic thought, which also influenced administration (Riley, 1931). With the Industrial Revolution, new administrative needs arose due to urbanization and industrialization.

19th century: With the consolidation of nation-states and the rise of government bureaucracy, theories of public administration emerged. Frederick Taylor developed "scientific management," focusing on efficiency in production (Curtis, 1918). Woodrow Wilson advocated a merit-based, professionalized civil service.

20th century: Various theories of public administration emerged, including Max Weber's theory of bureaucracy, which emphasizes formalization and hierarchy (Maienschein, 1988). During this century, there was an increase in government regulation and the growth of public services.

New Public Management: Beginning in the 1980s and 1990s, the "New Public Management" (NGP) emerged, which sought to apply private sector principles to public administration (Jang et al., 2020). This included decentralization, performance measurement, and the introduction of competition in some government sectors.

21st century: Public administration in the 21st century faces challenges such as globalization, information technology, and the need for greater transparency and accountability (Andrews, 2008). The approaches of electronic governance, citizen participation and management of knowledge are gaining importance.

The history of public administration is an evolutionary process in which societies have sought more efficient and effective ways of managing public affairs and responding to changing needs and challenges (Rose and Finley, 1976). Theories and approaches have been changing over time, adapting to the circumstances and demands of each era.

The Sustainable Development Goals (SDGs) are a series of global targets set by the United Nations to address a variety of global challenges, including poverty, hunger, gender equality, education, health, environmental sustainability, and more. (Reed et al., 2020). The SDGs were adopted in September 2015 as part of the 2030 Agenda for Sustainable Development, and their history goes back several decades:

1972 - Stockholm Conference on the Human Environment: It was one of the first international conferences on the environment, and laid the foundation for global concern for environmental problems (Rosin, 1976). Although it did not result in the creation of the SDGs, it was an important precursor.

1987 - Brundtland Report: The World Commission on Environment and Development published the report "Our Common Future", also known as the Brundtland Report (Lindenfeld, 1997). This report popularized the term "sustainable development" and called for action to balance economic growth with environmental conservation and social equity.

2000 - Millennium Development Goals (MDG): Established at the United Nations Millennium Summit, the MDGs are eight specific goals aimed primarily at reducing poverty and improving health and education by 2015 (Beck et al., 2005). Although progress was made on some objectives, shortcomings, and limitations were also recognized.

2012 - Rio+20 Conference: At this conference, the need for a more comprehensive and balanced approach to address global challenges was recognized (Gecíková and Papcunová, 2014). It was agreed to develop the Sustainable Development Goals (SDGs) as a continuation of the MDGs.

2015 - Adoption of the 2030 Agenda and the SDGs: In September 2015, world leaders adopted the 2030 Agenda for Sustainable Development at the United Nations Summit on Sustainable Development. This agenda includes 17 SDGs with a total of 169 specific goals. The SDGs address a wide range of issues, from poverty eradication to climate action and gender equality.

Since their adoption in 2015, the SDGs have gained wide acceptance at the international level and have served as a guiding framework for the policies and actions of governments, international organizations, the private sector, and civil society around the world, to achieve sustainable development in all its dimensions (Akhrorov, 2022).

The history of zoos is long and has evolved over the centuries (Lombard, 1995). Zoos, also known as zoological parks or zoological gardens, are facilities designed to house and exhibit a variety of animals, both for entertainment and education.

Ancient background: The ancient Egyptians and Romans kept collections of exotic animals for the entertainment of royalty and the aristocracy (Vorhies, 1943). These animals were exhibited in cages and improvised enclosures.

Middle Ages and Renaissance: During the Middle Ages, some European monarchs began to maintain private collections of exotic animals (Jull, 1946). However, these animals were often mistreated due to a lack of understanding of their needs and care.

18th century: As scientific knowledge increased, "beast gardens" arose, places where animals were kept with more attention to their natural needs and studied for scientific purposes (Huggins et al., 1968). The Garden of Plants in Paris (founded in 1793) is one of the earliest examples of this type of installation.

19th century: Modern zoos began to emerge in the 19th century with a focus on education and conservation. The London Zoo, founded in 1828, is considered one of the first truly scientific and educational zoos. More zoos sprang up around the world, including the San Diego Zoo in 1916, which was noted for its focus on conservation and research.

20th century: During the 20th century, zoos continued to evolve (Inamdar,1993). They focused on providing more natural environments for the animals, mimicking their natural habitats as much as possible (Shipman, 1962). In addition, there was a growing emphasis on conserving endangered species and educating the public about the importance of biodiversity.

21st century: Modern zoos are increasingly oriented towards conservation, research and education (Fagerstone et al., 2010). Many participate in captive breeding programs for threatened species and work on reintroduction projects into the wild. They have also focused on environmental education and public awareness of the conservation of wildlife and ecosystems.

However, the history of zoos has also been the subject of controversy. There has been criticism regarding animal welfare, the ethics of keeping animals in captivity, and the need to provide environments more suitable for their health and well-being. In response to these concerns, many zoos have adopted more ethical and conservation-focused practices in recent decades.

Public administration plays a fundamental role in the implementation of the Sustainable Development Goals (SDGs). The SDGs are a set of global goals established by the United Nations to address a variety of social, economic and environmental challenges, to achieve sustainable development throughout the world (Pettigrew et al., 2012). The public administration has a key role in the planning, coordination and execution of policies and programs to achieve these objectives. The following details how public administration is related to the SDGs:

Planning and Public Policies: The public administration is responsible for policy formulation and strategic planning to address the SDGs at the national and local levels (Sawchik et al., 2005). This involves identifying priorities, allocating resources, and designing strategies to achieve goals in areas such as poverty eradication, gender equality, quality education, and climate action.

Coordination and Collaboration: The SDGs require the collaboration of various actors, such as governments, non-governmental organizations, the private sector and civil society (Palomero et al., 2018). The public administration must coordinate and facilitate these alliances to guarantee effective joint action in the implementation of sustainable projects and programs.

Resource Management: The public administration is responsible for the efficient allocation of financial, human and technological resources to achieve the SDGs (Bigalke and Skinner, 2002). This involves making informed decisions about how to invest in key sectors such as health, education, sustainable energy, and infrastructure.

Monitoring and Evaluation: The public administration should establish monitoring and evaluation systems to measure progress towards the SDGs (Brown et al., 2008). This involves collecting relevant data, analyzing indicators, and measuring the impact of implemented policies and programs.

Transparency and Accountability: The public administration must ensure that efforts to achieve the SDGs are transparent and subject to accountability (Wedeen, 2009). This implies effectively communicating the progress, challenges and results to society and other stakeholders.

Innovation and Adaptation: The public administration must be open to innovation and constant adaptation to face the changing challenges in the implementation of the SDGs (Yurievna, 2021). This can include the adoption of new technologies, participatory approaches, and creative solutions to complex problems.

Public administration plays an essential role in transforming the SDGs into concrete actions and tangible results (Tzoumis and McKinley, 2002). Their ability to design effective policies, coordinate efforts, appropriately allocate resources, and ensure transparency and accountability is crucial to achieving sustainable development in line with the goals set out in the 2030 Agenda.

The Sustainable Development Goals (SDGs) have implications in several areas, and zoos can contribute to a number of these goals in different ways. Zoos can be related to the SDGs:

Education and Awareness (SDG 4 and 15): Zoos can play an important role in educating society about biodiversity, conservation and the importance of ecosystems. They provide opportunities for people to connect with wildlife up close, which can inspire greater interest in and commitment to protecting nature.

Wildlife Conservation (SDG 15): Zoos are often involved in the captive breeding of endangered species and conservation programs. By breeding and caring for endangered animals, zoos contribute to the preservation of biodiversity and may eventually reintroduce individuals to the wild.

Scientific Research (SDGs 9 and 17): Many zoos carry out scientific research on the biology, behavior and health of animals. These investigations can provide valuable information for the conservation of species and the understanding of ecosystems.

Climate Change Awareness (SDG 13): Zoos can be effective platforms to educate the public about the effects of climate change on wildlife and ecosystems. They can also demonstrate sustainability practices and promote carbon footprint reduction.

Gender Equality and Diversity (SDGs 5 and 10): Zoos can be inclusive environments that foster gender equality and diversity. They can also promote respect for all forms of life and the importance of harmonious coexistence between species.

Responsible Consumption and Production (SDG 12): Zoos can influence people's behavior by promoting responsible consumption and informed decision-making about products that affect wildlife and ecosystems.

Partnerships for Development (SDG 17): Zoos often collaborate with government, non-government, and civil society organizations to achieve conservation and education goals. These alliances are essential to address the broader challenges related to biodiversity and the environment.

Importantly, while zoos can have a positive impact on education and conservation, they have also been the subject of criticism about animal welfare and the ethics of keeping animals in captivity. Many zoos are working to improve the living conditions of animals and adopt more ethical and sustainable practices.

Public administration of zoos refers to the management and operation of zoos by government entities. Public zoos are those that are owned by the government or run by government agencies at the local, regional or national level. Public zoo management involves several unique responsibilities and challenges. The key areas of focus in the public administration of zoos:

Planning and Policies: The public administration of zoos involves the formulation of policies and strategies for the effective management of zoos (Glaubrecht, 2008). This includes long-term planning, the definition of objectives and the creation of guidelines for the operation of the zoo in line with the needs of conservation, education and animal welfare.

Financial Resources: Public zoos must manage their financial resources efficiently to ensure financial sustainability. This involves the allocation of funds for the care and maintenance of animals, infrastructure, education and research.

Animal Welfare: The public administration of zoos should ensure the welfare of animals in captivity (Li et al., 2023). This includes the provision of suitable habitats, quality veterinary care and environmental enrichment to promote the natural behavior of animals.

Education and Conservation: Public zoos play an important role in educating and raising public awareness about wildlife conservation and environmental issues (Cummings et al., 2003). The administration must develop educational programs and interactive activities for the public, schools and community groups.

Research and Conservation: Public zoos are often involved in research and conservation programs, including captive breeding of threatened species and scientific research to better understand the biology and behavior of animals (Freitas and Balutski, 2009).

Safety and Visitors: The public administration of zoos must ensure the safety of both visitors and animals (Nakagawa et al., 2018). This implies the implementation of adequate security measures, the design of secure rooms and the training of personnel.

Community Participation: The management of public zoos should encourage the participation and commitment of the local community (Ueoka et al., 2009). This may include collaboration with schools, community groups, and non-governmental organizations.

Transparency and Accountability: Public zoos must be transparent in their operation and management, as well as accountable to citizens and government authorities for their performance and achievements in terms of conservation, education, and animal welfare (Ziegler and Barr, 2018).

Ultimately, the public administration of zoos is a balance between the goals of conservation, education, and animal welfare, and the need to operate in a financially and ethically responsible manner. Consideration of best management practices, scientific research, and collaboration with other organizations is important for successful public zoo management.

However, the public administration of zoos within the framework of the SDGs follows a diversified agenda if it is considered that they are global objectives with local incidents. Such a process from the global to the local can be demonstrated from a systematic review of the dimensions that explain the determinant variables of a public administration of zoos. Therefore, the objective of this study was to establish the axes and themes of the research agenda around the public administration of zoos within the framework of the Sustainable Development Goals.

Are there significant differences between the guidelines of public administration and the SDGs in the evaluations of students at a public university in central Mexico?

Hypothesis 1. Given that the public administration conforms to the SDGs, the dimensions that explain the management of zoos will conform to the guidelines 4, 5, 9, 10, 12, 13, 15 and 17.

Hypothesis 2. Since the public administration of zoos conforms to the guidelines of the SDGs, the perceptual differences of the students should not be significant.

Hypothesis 3. If the expectations of the students regarding the public administration of zoos are similar, then the SDGs would demonstrate their importance as academic axes around the care of species.

2. Materials And Methods

A cross-sectional, exploratory and correlational study was carried out with a sample of 100 students (M = 21.23 SD = 2.4 age and M = 8'978.00 SD = 1'456.00 monthly income) professional practitioners and social workers from a public university in central Mexico.

The SDG Public Administration Expectations Inventory was used. It includes six dimensions related to 1) planning and public policies, 2) coordination and collaboration, 3) resource management, 4) monitoring and evaluation, 5) transparency and accountability, and 6) innovation and adaptation. The items that make up the instrument are answered with five response options ranging from 0 = "not at all in agreement" to 5 = "quite likely". The reliability and validity of the instrument reached alpha and omega values between 0.767 and 0.780, as well as factor weights between 0.432 and 0.654.

Students were contacted through their institutional email. The objectives and those responsible for the project were reported. The homogenization of the concepts was established using a focus group and the Delphi technique. The application of the instrument was carried out remotely: https://meet.jit.si/FollowingPathsUndermineHappily

Data was captured in Excel and processed in JASP version 16. Centrality, clustering, and structuring parameters were estimated. The contrast of the hypotheses was established with the proximity of the values to unity, which suggests the prevalence of nodes as moderators of the entry and exit of other nodes.

3. Results and Discussion

The nodes that make up the public administration and the SDGs are distributed according to node 15 corresponding to the life of terrestrial ecosystems. This finding corroborates the theoretical assumption that the public administration of zoos directs its capacities and resources to this SDG as it consolidates as an area of development of local sustainability. In other words, SDG 15 regulates the other nodes related to public administration and the SDGs in the context of the management of species in captivity for research, recreation, and appreciation (see Table 1).

Table 1. Centrality measures per variable			
	Network		
Variable	Betweenness	Closeness	Strength	Expected influence
SDG1	-0.650	-0.396	-0.696	-1.271
SDG2	-0.650	-2.029	-1.596	0.120
SDG3	-0.650	-0.147	-0.470	0.344
SDG4	-0.650	0.104	0.172	-0.618
SDG5	0.200	0.272	0.438	-1.203
SDG6	3.235	0.587	2.506	-1.793
SDG7	0.200	0.970	0.304	-0.963

SDG8	-0.528	0.674	0.049	0.395
SDG9	-0.286	0.156	-0.601	0.454
SDG10	-0.528	-0.691	-0.948	0.174
SDG11	0.443	1.383	0.818	0.600
SDG12	-0.650	-1.663	-0.916	0.413
SDG13	0.200	0.962	0.255	0.676
SDG14	-0.407	-0.548	-0.065	-0.050
SDG15	-0.528	-0.594	-0.785	0.161
SDG16	1.414	1.633	1.639	2.621
SDG17	-0.164	-0.673	-0.105	-0.061

Very different from the centrality of the node that represents SDG 15, is the node that symbolizes SDG 5 related to gender equality. A grouping of the dimensions of public administration concerning the SDGs can be seen in the first Barrat coefficient. Next, the grouping is established according to the node linked to SDG 12 corresponding to responsible production and consumption. In other words, SDGs 5 and 12 suggest that the public administration of zoos is established around gender equality and production with responsible consumption. The two remaining parameters Ws and Zhang indicate that SDG 7 linked to affordable and clean energy, as well as the distinctive node 1 for the end of poverty are the SDGs on which the public administration of zoos is configured. In other words, the diversification of nodes to which the configuration of a structure is attributed is different according to the coefficients that measure them. Unlike the centrality where ODS 15 is the node in charge of regulating the other nodes, the cluster has four different nodes that attract the other nodes (see Table 2).

Table 2. Clustering measures per variable				
	Network			
Variable	Barrat[a]	Onnela	WS[a]	Zhang
SDG1	0.000	-0.219	0.000	-0.479
SDG10	0.000	-1.222	0.000	-1.234
SDG11	0.000	1.225	0.000	-0.758
SDG12	0.000	-1.024	0.000	-0.372
SDG13	0.000	0.367	0.000	0.532
SDG14	0.000	-0.014	0.000	-0.616
SDG15	0.000	-0.966	0.000	-1.307
SDG16	0.000	1.841	0.000	0.838
SDG17	0.000	0.037	0.000	0.150
SDG2	0.000	-1.783	0.000	-0.106
SDG3	0.000	-0.532	0.000	0.376
SDG4	0.000	0.217	0.000	2.507
SDG5	0.000	0.175	0.000	1.568
SDG6	0.000	1.725	0.000	-0.287
SDG7	0.000	0.686	0.000	0.540
SDG8	0.000	0.155	0.000	-0.318
SDG9	0.000	-0.665	0.000	-1.035
[a] Coefficient could not be standardized because the variance is too small.				

The nodes related to security and planning begin and end the learning process of the public administration of zoos within the framework of the SDGs. It can be seen that node 15 regulates the other nodes and nodes 1, 5, 7 and 12 group them together. In other words, the zoo management network is represented as part of the SDGs associated with the end of poverty, gender equality, affordable and clean energy, as well as responsible production and consumption (see Table 3). The values of centrality, grouping and structuring suggest the non-rejection of the hypotheses. The public administration of zoos is associated with SDGs 1, 5, 7, 12 and 15.

Table 3. Weights matrix

Variable									Network								
	SDG1	SDG2	SDG3	SDG4	SDG5	SDG6	SDG7	SDG8	SDG9	SDG10	SDG11	SDG12	SDG13	SDG14	SDG15	SDG16	SDG17
SDG1	0.000	-1.502	-1.492	-1.664	-1.340	-1.860	-1.442	-1.947	-1.864	-2.026	-1.700	-1.813	-1.799	-1.865	-1.190	-2.056	-1.848
SDG2	-1.502	0.000	-0.031	1.257	1.210	0.848	-1.908	0.989	-0.809	1.264	0.468	0.376	-0.514	-0.893	0.437	1.490	-1.684
SDG3	-1.492	-0.031	0.000	-0.882	1.083	-2.870	-0.340	2.277	-0.411	1.388	5.887	-0.602	2.954	3.083	2.240	-1.139	-3.683
SDG4	-1.664	1.257	-0.882	0.000	-1.366	-9.948	-2.453	-3.349	2.381	-0.240	2.778	1.327	0.465	1.388	-1.512	6.491	-1.222
SDG5	-1.340	1.210	1.083	-1.366	0.000	-13.965	-3.811	-2.010	-2.762	-1.292	-1.616	0.302	0.379	-5.650	-0.373	3.581	1.445
SDG6	-1.860	0.848	2.870	9.948	13.965	0.000	7.179	1.206	-1.135	0.459	2.017	1.796	5.253	1.093	-0.228	13.746	5.522
SDG7	-1.442	-1.908	0.340	-2.453	3.811	7.179	0.000	2.644	-1.991	-3.389	2.895	1.288	-2.174	-3.125	-2.409	2.456	-0.938
SDG8	-1.947	0.989	2.277	-3.349	-2.010	-1.206	2.644	0.000	0.584	-0.108	-3.790	3.758	3.628	1.127	0.290	4.494	-4.920
SDG9	-1.864	-0.809	-0.411	2.381	-2.762	1.135	-1.991	0.584	0.000	-0.306	4.289	4.072	-2.430	0.274	3.346	-1.403	-0.588
SDG10	2.026	-1.264	1.388	-0.240	1.292	0.459	-3.389	0.108	0.306	0.000	1.990	2.427	-0.560	0.665	-3.627	3.677	0.708
SDG11	-1.700	0.468	5.887	-2.778	-1.616	2.017	2.895	-3.790	4.289	1.990	0.000	-1.458	5.288	5.354	1.315	4.140	2.152
SDG12	-1.813	0.376	-0.602	-1.327	0.302	-1.796	1.288	3.758	4.072	2.427	-1.458	0.000	0.407	0.327	-0.746	-3.142	0.709
SDG13	-1.799	0.514	-2.954	-0.465	0.379	-5.253	-2.174	3.628	-2.430	-0.560	5.288	0.407	0.000	2.052	3.727	5.132	3.040
SDG14	-1.865	-0.893	3.083	1.388	-5.650	1.093	-3.125	1.127	0.274	0.665	5.354	0.327	2.052	0.000	-2.593	1.485	4.660
SDG15	-1.190	0.437	2.240	-1.512	-0.373	-0.228	-2.409	0.290	3.346	-3.627	1.315	-0.746	3.727	-2.593	0.000	1.821	0.405
SDG16	-2.056	1.490	-1.139	6.491	3.581	13.746	2.456	4.494	-1.403	3.677	4.140	-3.142	5.132	1.485	1.821	0.000	1.582
SDG17	-1.848	-1.684	-3.683	-1.222	1.445	-5.522	-0.938	-4.920	-0.588	0.708	2.152	0.709	3.040	4.660	0.405	1.582	0.000

4. Conclusion

The contribution of this work to the state of the art consists in the establishment of a learning neural network in which the surveyed sample associates the dimensions of public administration with the SDGs. In this sense, the results show that SDGs 1, 5, 7, 12 and 15 are binding nodes with the dimensions of public administration related to 1) planning and public policies, 2) coordination and collaboration, 3) resource management, 4) monitoring and evaluation, 5) transparency and accountability, 6) innovation and adaptation. These findings correspond to the theory of public administration within the framework of the SDGs, although the studies do not associate sustainable development with human development or public administration. Therefore, it is necessary to extend the study towards the link between sustainable development and human development. That is, the analysis of the interaction of humans with other species can clarify the barriers or the reasons for humanity to develop sustainably. In addition, the Comprehensive Disaster Risk Management (GIRD) studies warn that both sustainable development and human development are binding if the dangers, threats and risks that make individuals, groups and societies more vulnerable, and resilient are considered, helpless and happy. The GIRD studies also point to the possibility of communicating to reduce and prevent risks, threats and dangers, although in this paper it is noted that public administration is linked to five SDGs. Such a relationship between SDGs and public administration can be analyzed as risk prevention since the awareness of zoo visitors can indicate preventive risk communication. In this way, the area of opportunity of the study lies in the establishment of a preventive relationship of the public administration of zoos in the face of the challenges of the SDGs.

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