Stray Dogs Mauritius

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"The greatness of a nation can be judged by the way its animals are treated." ~ Mahatma Gandhi

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1.Executive Summary & Introduction

In August 2018, EARTHwise Centre was contracted by the Ministry of Agro Industry & Food Security to support the Government of Mauritius in finding ecologically sustainable and humane solutions for reducing and managing the stray dog population in Mauritius. Prof Pim Martens, Anneloes Smitsman, Dr Kurt Barnes, and Karen Soeters became the project team from EARTHwise Centre to facilitated the agreed deliverables:

1. **Facilitate a multi-stakeholder dialogue** to receive broad input regarding the perceived issues and suggested solutions concerning the stray-dog population and management in Mauritius.
2. **Provide a report that includes**: Stakeholder dialogue summary and recommendations, scenario analysis relevant to Mauritius based on the data provided by the Ministry, overview of best practices and strategies with comparative analysis that have a high success rate concerning human and ecologically sustainable reduction and management of stray dogs, key recommendations with proposed next steps.

The multi-stakeholder dialogue was facilitated on Tuesday 25 September 2018, Appendix 1 provides a list of the stakeholders that were invited by the Ministry and present for this dialogue to share their inputs. Stakeholder inputs and Dialogue synthesis is provided and discussed in section 3 and 4 of this report.

The scenario analysis has been carried out based on the data provided by the Ministry. It was understood that these data are only a rough estimate, with large margins of uncertainty due to lack of available data concerning the: a). Counting of stray dog population size and fluctuations therefore as a result of past stray dog management strategies; b) Lack of data concerning the amount of strays sterilized[1]; c) Lack of available data concerning the rate of stray dog euthanasia in proportion to overall stray dog population size; and d) lack of data regarding some key biological parameters (e.g. the maximum carrying capacity). Nevertheless, the analysis does indicate some patterns and directions for a sustainable transition, as mentioned in Section 6 and 7 of the report with an overview of different scenarios. An integrated approach is provided that can potentially map out the way for a transition phasing to the most ideal outcome: zero-stray dogs and healthy dog-people relationships and sustained animal welfare of dogs kept in Mauritius. The zero-strays objective is in the same spirit as zero-waste and zero-emission strategies and policies. By putting the benchmark high, we can support Mauritius to model the way for the kind of leadership and implementation that it aims for as an exemplary Small Island Developing State (SIDS). The recommendations made in section 7 are based on: the stakeholder inputs, analysis of success of previous strategies, comparison with other best practices of other countries, the scenario analysis, and the unique situation in Mauritius as a SIDS.

We have been contracted to support the Government in seeking, facilitating, and implementing ecologically sustainable and humane solutions for its stray dog population and reduction thereof. This also brings to the fore the sensitive issue of humane stray dog euthanasia. Since humane euthanasia is already part of the official stray dog reduction strategies, and has proven not to be effective enough for numerous reasons (further discussed in the report), it is therefore not included in this report as a

[1] When we mention 'sterilization', in general we refer to both sterilization of female dogs as well as castration of male dogs.

main strategy in our scenario analysis. Instead, we have put emphasis on how other strategies with the right embedding and multi-stakeholder approach could provide long-term solutions that will also support the image of Mauritius as an animal friendly and humane destination for tourists and investors.

The report provides an overview of various strategies from an integral perspective that also takes into account the carrying capacity of the land and its communities. We respect that in specific cases and for specific conditions humane euthanasia may be required. This is also mentioned by several international organisations such as: the World Society for the Protection of Animals (WSPA), the Humane Society International (HSI), the International Fund for Animal Welfare (IFAW), the international arm of the Royal Society for the Prevention of Cruelty to Animals (RSPCA International), the World Small Animals Veterinary Association (WSAVA) and the Alliance for Rabies Control (ARC). Their recommendations and criteria are laid out in the ICAM Coalition report: “The welfare basis for euthanasia of dogs and cats and policy development” (ICAM, 2007).

2. Mauritius Context - Straying Dogs

According to the data provided by the Ministry via the Humane Society International (HSI), it is estimated that in 2013 on the basis of several surveys on street and owned dog population, the total owned dog population accounted to approximately 246,000, with a roaming street dog population of approximately 57,000. It was also estimated that a large percentage of straying dogs are in fact owned dogs, and that the sterilization rate for owned and stray dogs amounts to approximately 30% of the total dog population. It was also indicated in the same report that for sterilization to be an effective strategy for reducing the strays, it needs to be effectuated for at least 65-70% of the total dog population. It was furthermore indicated in the report that attitudes and cultural beliefs about “sterilization” were a main factor for this low percentage and a major barrier to reduce the dog population, including strays, effectively (HSI, 2013).

According to the PAWS, it is estimated that there are approximately 200,000-300,000 stray dogs in Mauritius and that the situation is out of control due to lack of sterilized dogs (PAWS, 2018). It is also mentioned on their website that since 1999, they have attended to more than 200,000 animals (dogs and cats). There is a huge difference in numbers in how both organizations report and view the problem.

MSAW mentions on their website that: "*The population of dogs and cats currently exceeds the capacity of our society to care and provide homes for them as companion animals. As a result, thousands do not have homes and are left on their own without food and contract diseases. Dogs and cats that are not adopted can become victims of trauma, starvation, or disease. Dog and cat population control is a primary welfare concern of our society.*" (MSAW, 2018). Irrespective of the difference in estimated numbers of straying dogs in Mauritius there is a general consensus, also confirmed by the stakeholder inputs, that:

- There are too many straying dogs (and cats) in Mauritius and this is providing several problems, further elaborated on later in the report; and
- There are too few sterilized dogs, accordingly the problems identified are challenging to manage sustainably and humanely.

MSAW has adopted a three-pronged approach to control street dogs in Mauritius, namely: mass sterilization of owned dogs; catching and humane euthanasia of straying dogs in accordance with the Animal Welfare Act 2013; registration of dogs; and education of owners on "responsible pet ownership". MSAW is responsible for the control of straying dogs and operates in strict compliance with the provisions of the Animal Welfare Act 2013 and the rules set out by the World Organization for Animal Health (OIE). MSAW further mentions on its website that it has launched: "*..a "Free Mass Sterilization Campaign" since September 2015 [in] order to control the canine population from proliferation. This long-term project is basically to solve the problem of stray dogs spreading around the island more specifically in urban and coastal regions*." (MSAW, 2018). During our site-visit at MSAW it was mentioned to us that MSAW only sterilizes owned dogs, not stray dogs.

It is understood that the Ministry of Agro-Industry and Food Security, signed a Memorandum of Understanding (MoU) with HIS on 20 February 2018 to start the pilot project to sterilize and vaccinate 10,000 stray dogs as an alternative to euthanasia. Our project team visited HSI on Wednesday 26 September 2018. We recommend that the Ministry reviews the scenarios and phasing recommendations of this report after the data from this pilot project become available later this year, or in early 2019. HSI mentioned during our site visit that community

engagement and cooperation with the Hotels are essential for successful implementation of the agreed strategies as per this MoU. We highly recommend this. It is also noted that sustained funding and would be required in order for this approach to be successful at the longer-term. Furthermore, as was noted also during the stakeholder dialogue, the current dog registration system is not able to measure and coordinate the various efforts from the Government and the relevant stakeholders to be monitored and evaluated effectively.

As a final note for the overview of the Mauritian context we like to mention that the stray dog issues are not separate from the stray cat issues. There is a danger in focussing only on straying dogs and not simultaneously applying similar strategies to straying cats. The issues are interrelated and changes in numbers of dogs can impact on cats and vice versa, as they often share the same habitat. Since it is beyond the scope of our what we were asked to do in the context of this project to include stray cat issues and solutions, we have thus solely focussed on the stray dog problems.

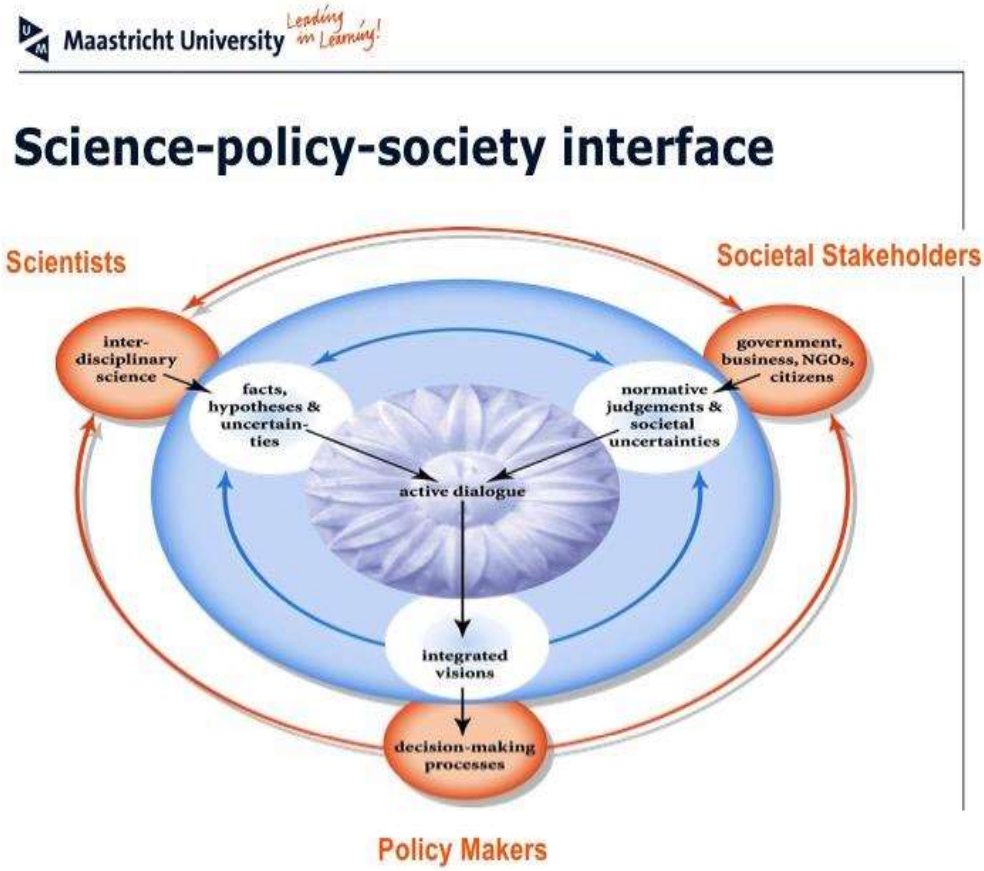
Our recommendations for the implementing team from the Ministry is to explore how the recommendations made through this report can be simultaneously applied to straying cats as well, including owned cats that stray. The definition of “stray dog” in this report is based on the Animal Welfare Act 2013 of Mauritius :“...“stray”, in relation to an animal, means to be at large and not under the control or charge of any person” (p.7), and the implications thereof as outlined in Article 41 of the Animal Welfare Act 2013.

3. Inputs from Stakeholder Dialogue

3.1. Stakeholder Dialogue Purpose & Design

On Tuesday 25 September 2018 a stakeholder dialogue was facilitated by EARTHwise Centre on behalf of the Ministry. We recommend to the Ministry to invite as many stakeholders as possible to form a broad multi-stakeholder coalition, including: those involved in the protection, management, and caring of dogs, straying dogs, and Animal Welfare, the veterinary community, relevant academic representatives for research, evaluation and monitoring purposes, relevant legislators, educators,

representatives of the Hotel and Tourism sector, the private sector from representatives that could potentially provide CSR funding opportunities, religious and faith leaders and other key influencers from civil society representatives for Animal Welfare, and local and national government representatives responsible for the leadership and implementation of related policies. The Ministry proceeded to invite the stakeholders by its selection. The list of stakeholders who participated in the dialogue are presented in Appendix 1 of the report.



The purpose of this stakeholder dialogue was three-fold:

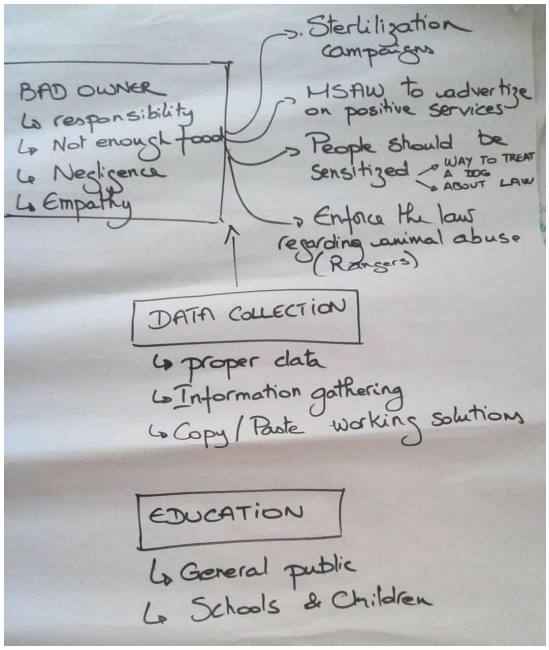
1. To ensure that multi-stakeholder representation was honoured for the drafting up of follow-up policy guidelines, in line with good governance practices and the SDG recommendations.
2. To foster collaboration and mutual understanding between the various stakeholder groupings in Mauritius in good relation with the Mauritius government, acknowledging that only through collaboration can the stray dog issue be resolved successfully.
3. To provide for brainstorming and “thinking outside the box”, to harvest suggestions and possible solutions that have not yet been applied that can contribute to the a integral sustainability approach for resolving the stray dog issues. This also includes awareness of how the stray dog approach can be piloted and then applied with further contextualization to stray cats and other animals as well, if need be.

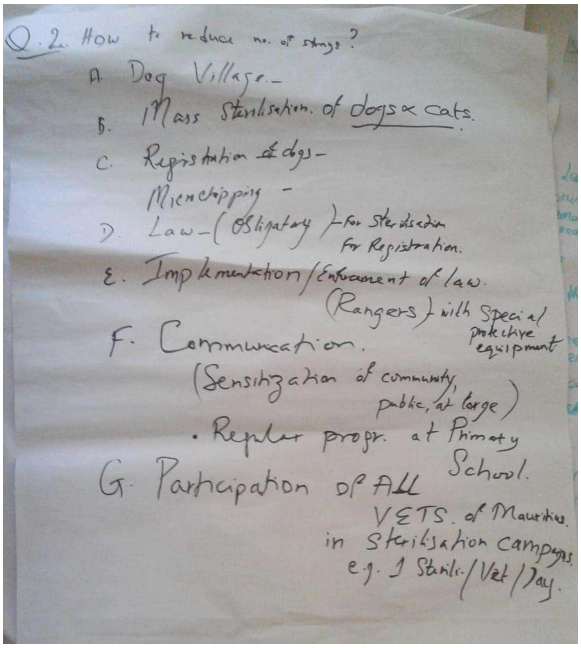
The dialogue questions for the stakeholders were:

1. How to reduce the amount of stray dogs in Mauritius in a sustainable and humane way? Identifying short and longer term solutions.

2. How to better care for the stray dogs in Mauritius?
3. What are possible barriers to achieving these solutions that we need to be aware of?
4. Any suggestions or questions you like to share that has not yet been included in the conversations?

The summary below provides an overview of the main inputs that are of most value for this report. Since the purpose of this report is to provide strategic high-level recommendations, the summary here below only includes the most important points that we extracted from the dialogue, and not a word-by-word documentation of the conversations. These summaries are open to further input from the stakeholders, if the Ministry so decides.

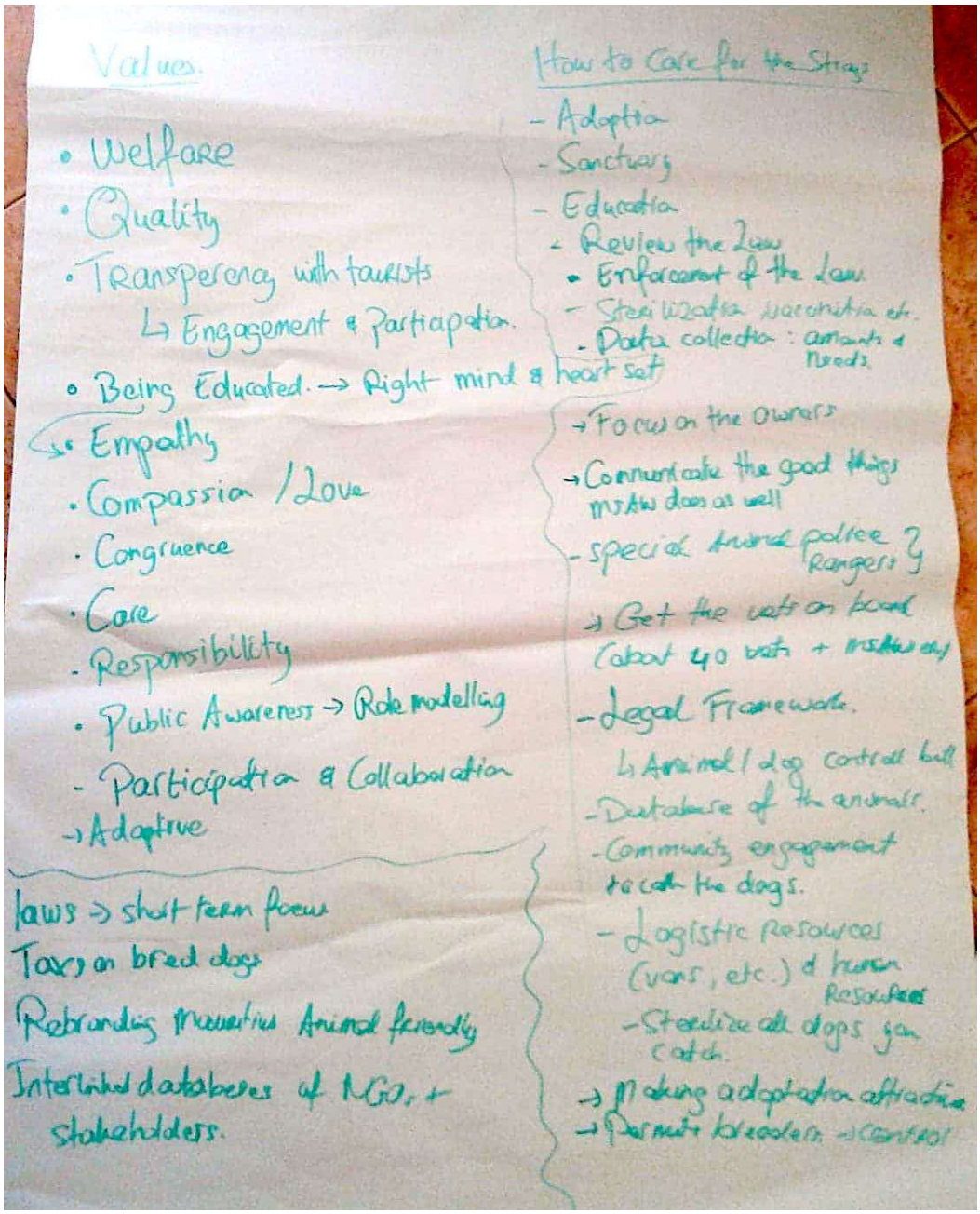




Question 1 and 2 are here combined in the write-up of the stakeholder inputs since there was much overlap between the answers to both questions. We were also able to extract the following common

values from the dialogue, which are identified here below and can be used for a higher level policy documents and for educational and outreach materials.

3.2 Common values that were identified through the dialogue



Based on all the inputs that were provided by the stakeholders during conversation and in writing, the following core values were extracted that can provide a framework for the development of educational campaigns, multi-stakeholder partnership development and media and outreach:

Welfare, Quality, Transparency, Engagement, Participatory Governance, Mind & Heart-sets, Awareness, Empathy, Compassion, Love, Congruence, Responsibility, Role Modelling, Collaboration, Adaptability.

3.3. Stakeholder inputs and recommendations

Below is an overview of the main stakeholder inputs in the context of the questions that were explored in small groups. These inputs were shared in the large group by representatives of each of the small groups for the purpose of synthesizing all inputs and learning from each other. This also fostered mutual understanding and healthy foundations for further collaboration and partnership. The dialogue approach is based on the EARTHwise dialogue methodologies for SIDS inputs into the UN Conferences on Sustainable Development, for which Mauritius took a leading role in the SIDS UN Conference in 2014 and for which training was provided in 2013 by Anneloes Smitsman through the ISLANDS project of the Indian Ocean Commission (IOC) in collaboration with the Government of Mauritius.

1. How to reduce the amount of stray dogs in Mauritius in a sustainable and humane way and how to better care for the strays in Mauritius?

REGULATION, POLICY & LAW ENFORCEMENT

- Mandatory registrations applied on an annual basis. This database would need to have the following features: It can be used via census and all stakeholders working with dogs in Mauritius (like the registered vets, MSAW, HSI, the dog sanctuaries, and others) can input their data in a coded way in this Database.
- Mass sterilization for owned dogs.
- Stricter regulation and enforcement of the breeding laws.
- Stricter implementation of catching strays.
- Microchipping of all dogs, with special labelling systems for all dogs who have been sterilized.
- Data collection of dogs and cats needs to be better regulated, which includes online data-input and conversation from manual to electronic data-inputs. Better coordination also of the gathering of information required for law enforcement as well as educational purposes.
- Integrated monitoring dogs (and cats) in an integrated framework (including changes in tourism, policies etc.) to keep track of progress and offering opportunities to steer future transitions.
- Stronger law enforcement to reduce and stop animal abuse, through specially trained (local) Animal Rangers who are part of the Mauritius Police Force.

EDUCATION

- Explain to dog owners that it is recommended for ALL dogs in Mauritius, with exception of breeding dogs, to be sterilized. Educate people about the official policy of only 1 dog allowed that is not sterilized, with recommendation that all dogs ought to be sterilized unless kept for breeding purposes for which a license is required. If people want to keep more than 1 dog, it needs to be made very clear that this dog automatically needs to be sterilized as per the law.

- Provide education via community centers, schools, media (including TV and radio), and social-media on the stray dog issues in Mauritius. This needs to include engaging information for people how to take better care of their dogs to prevent them from straying and multiplying, as well as understanding the legal implications for not adhering to the Animal Welfare Act. People also need to be made aware that getting a dog is a long-term commitment of care and responsibility.
- Bring trained human resource persons to the communities to give seminars and free workshops for how to care for your dog, with immediate option for follow-up sterilization at the communities. A more decentralised approach to raising awareness and providing solutions for people that work in their area.
- Education should have an empowering tone - not telling people what they should do, but rather educating in a way that creates engagement by asking people what they feel should be done and provide the opportunity to show their best practices. Give the community ownership to become part of the solution, celebrate people who take great care of their dogs.
- Education of healthy nutrition for dogs - many people do not know how to properly feed their dog, including those who take care of strays in shelters.
- Involve and engage the community in educational objectives and outreach.
- Involve respected influencers and celebrities in the educational campaigns to reduce strays, and take better care of our dogs.
- Educate via regular programs through primary schools.
- Value based education to improve human-to-animal relationships. Special emphasis on empathy training in schools to educate children and adults (via the children) to take better care of their dogs and cats to reduce negligence, staying, animal abuse and cruelty, lack of healthy nutrition, and more.

DOG SHELTERS & DOG VILLAGE

- Several stakeholders indicated the idea and practice of creating dog shelters for strays, and possibly even a dog village where the strays can roam within safely guarded boundaries.

MEDIA

- Rebranding of MSAW. Currently MSAW has a negative reputation in the eyes of many. There is the perception that MSAW will only kill the dogs, not care for them. Work with the media - TV, Radio, Newspapers, Facebook, Twitter, etc - to showcase the good work of MSAW, and work with 'influencers / celebrities' showing their support for MSAW to make short campaigns that education people of their responsibilities and the solutions.
- Publish articles in Air Mauritius Magazine and those of other major airlines who fly into Mauritius that features what the government is doing about the stray dog problem.
- Create campaigns of "adopt a stray, care for the dogs of Mauritius" to make adoption more attractive in the eye of the general public. Involve celebrities and influencers in those campaign efforts to create a new trend whereby adoption of strays creates social credits.

PARTNERSHIP & COLLABORATION

- Get more stakeholders involved, and facilitate multi-stakeholder meetings on regular basis. Also include the Ministry of Tourism and the Hotels. Link this with media campaigns and education, to inform tourists that 'Paradise Mauritius' does not imply that there are no stray

animals. Have greater transparency to the outer world about these issues, else tourists will complain and express their grievances via negative press reviews about Mauritius. Involvement of community and stakeholders in the solutions should be an overall strategy at all levels. This also includes involving tourist in the problem, explaining why not to feed the dogs and open options for donations for dog-friendly solutions.

- Participation of ALL vets of Mauritius in sterilization campaigns.
- Interlinking of the various databases of all organizations who are involved in sterilization, euthanasia, catching and sheltering strays, breeding dogs, and selling dogs.
- Collective learning processes - facilitating the means for stakeholders to share their best practices, and apply tested and approved strategies for the collective pool of knowledge and expertise for working on reduction of strays and improving animal welfare of dogs and cats.
- Seek collaboration with communities and stakeholders in the following areas to collective trap and catch the strays for sterilization purposes and otherwise: beaches, markets, hospitals, hotels, and schools.
- Seek better collaboration with the hotels of Mauritius who often create their own strategies for handling strays due to lack of coordination at the national level with the hotel stakeholders.

2. What are possible barriers to achieving these solutions that we need to be aware of?

- **Financial** - Too little funding resources to look after strays through shelters and strays that have been sterilized. Funding constraints also imposes barriers on the rate and amount of sterilization that could be carried out effectively.
- **Human Resources** - Lack of trained HR persons to: 1. Communicate the issues and the solutions, 2. Catch strays, 3. Facilitate intervention with the public when necessary. It was suggested that there should be special Animal Police units, officers who can come to help yet are dressed in a more casual uniform that does not scare the people, and who know how to work with dogs.
- **Cultural bias** - In many religious there is a bias towards male sterilization in particular, and female sterilization to a lesser degree. Accordingly in some communities people are not willing to sterilize their male dog, or think that it is unfriendly to the dog to sterilize their female dog. Religious and community leaders need to be involved to explain the issues and solutions well to people.
- **Lack of collaboration between major stakeholders** - Government such take a greater coordinating role to facilitate collaboration between the various stakeholders, to seek alignment in the various and sometimes diverging objectives.
- **Reputational damage of MSAW** - In the public opinion and the eyes of several stakeholders, MSAW has been labelled as being dog-unfriendly and is associated with dog-killing practices. This makes has created a barrier for the government to successfully communicate its stray dog efforts and results, and facilitate collaboration. Reputational damage has also influenced how communities perceive government interventions and the perception of tourists coming to Mauritius and leaving the island after having spent time here.
- **Technological and scientific** - lack of streamlining between the various data base in and outputs. Lack of an integrated monitoring/modelling system to keep track of progress made and to (re)define solutions and policies.

3. Any suggestions or questions you like to share that has not yet been included in the conversations?

- Explore additional sources for financing stray dog sanctuaries: Taxation of revenues in Hotel Sector to be donated as grants to NGOs for running the sanctuaries. Use of solar power for sanctuaries to reduce the costs and ecological footprint of the sanctuaries.
- Dog registration should be done via microchipping to keep track of the amount of dogs in Mauritius.
- More regular multi-stakeholder meetings.
- Should cats also be registered? How many times do people need to pay for their pet registration, is this once only or via annual or periodic renewal?
- Should Animal Control Act be included in the Animal Welfare Act?
- Public transport facilitation for dogs with their owner for sterilization at MSAW facilities.
- Stop catch and kill of dogs in Mauritius by better regulation and law enforcement with aims of mass sterilization. Apply C.N.R for strays - Catch, Neuter, and Release.
- A piece of land for foster care with funding for food & treatments of dogs and cats for the NGOs and other organizations who are fostering the strays.
- Better regulation of dog owners to ensure that dogs don't stray or multiply. Law enforcement needs to become more inclusive, not only via the Ministry also via trained human resource persons in key strategic positions.
- More advocative role of the media to showcase what is happening.

The Animal Welfare Unit of the Livestock and Veterinary Division, via the Ministry, also sent the following inputs to be included in this report:

"The Animal Welfare Unit is able to attend only up to 50% of different types of complaints received. From January to July 2018, thirty four dog breeders' permits have been issued, some new breeders' licenses have been processed and approved by Breeder's committee and are awaiting clearance from the Ministry for delivery of license. Investigation and enquiries have also been started to be done by our officers where there are suspected cases of illegal breeding. Future improvement can be achieved with additional resources:

- **Dog Breeders** – Dog breeders should be visited regularly to check the dogs' welfare instead of only when a request is made for obtaining or renewing a license/permit.
- **Timely follow up** is often lacking due to a scarcity in manpower and transport.
  So, for a more efficient and proactive response from Animal Welfare Unit, the following are needed urgently:
  - ✓ Manpower + one skilled person to type reports and register complaints with their actual status on an Excel sheet.
  - ✓ Transport to be attached to the Unit.
    Creation of a website.
  - ✓ At least two cell phones for Animal Control Officers for better communication when on site of work.

Apart from what has been described above, the Animal Welfare Unit needs to propagate its mission through:

- Primary/Secondary/tertiary schools
- Radio/T.V, Press etc.

In order to inculcate a new vision concerning the relation between human and animals (not only dogs), which will in the future stay as the basis of a responsible society. Improvement to be achieved with Policy decision:

The Animal Welfare Act 2013 is now outclassed and needs an urgent replacement to vet new challenges arising, concerning not only dogs but Animal Welfare as a whole. The 2013 Act deals mainly (if not exclusively) with dogs. Even dog issues have to be reviewed and other urgent issues to be added:

1. Pet Animals/ dogs, cats, birds, rabbits, rodents, fish etc. – [concerning individuals]
2. Exotic Animals (same as above excluding dogs and cats) – [concerning Pet shops and Natural Parks]
3. Farm animals (Cows, sheep, goats, pigs etc.) – [concerning small, medium and large breeders]
4. Primates – [individual keeping, collective breeding]
5. Aquatic animals – [kept in ponds, aquarium etc.]
6. Competition animals [mainly represented by horses]."

4. Synthesis - Key Suggestions from Stakeholders

The stakeholders explored short and long-term approaches to reduce the amount of strays and take better care of all dogs, owned and strays.

4.1. Short term Strategies & Solutions

For the short-term solutions strong emphasis was placed on improving the laws, updating policies, and stricter enforcement of an updated Animal Welfare Act and corresponding policies. Stricter enforcement was also envisioned by introducing a better fining systems and better collaboration with the Police force of Mauritius and special dog Rangers from the Police force trained for such purposes.

Mass sterilization of ALL dogs in Mauritius, except those kept for breeding purposes, was recommended by all Stakeholders. Furthermore mass registration and micro-chipping was strongly recommended through better collaboration between all the relevant stakeholders.

Many stakeholders also indicated that for the short-term solutions a specified amount of dogs would need to be humanely euthanized for which there are no other options. In such cases it was identified that those dogs were too old, too sick, and in areas where living with humans in safe and healthy conditions was not possible. A couple of stakeholders recommended including those dogs in stray dog shelters and dog villages, yet two foreseen issues were not properly anticipated: 1. The group behaviour of dogs when they are allowed to roam in large areas without human intervention, and 2. Cyclonic and other rain conditions on the island that can risk the health and safety of dogs in shelter

places with inadequate structural support for these extreme weather events that are becoming more frequent.

"Dogs are very social animals." ~ quote from participant of dialogue

The key words from the short-term proposed strategies and solutions are: Stricter law enforcement, better regulation, more effective sterilization campaigns through collaboration with all relevant stakeholders, financial incentives for vets to be included in the mass sterilization campaigns, more effective collaboration between stakeholders, fund-raising with private sector to generate more financial resources for the various activities, and humane euthanasia for the most extreme cases.

4.2 Long term Strategies & Solutions

The long-term emphasis was on educating people, continued mass sterilization, and stronger regulation regarding the breeding laws, and rebranding. The long-term objective was reduction of dogs via achieved infertility of the dogs, and less incentives for dogs to stray.

The key words from the short-term proposed strategies and solutions are: Education, rebranding of Mauritius regarding Animal Welfare of dogs and cats, improved behaviours in human-animal relationships.

"We need to agree on how we save our animals." ~ quote from participant of dialogue

It was understood that the current problem is so large, that only catching and sterilization of strays will not suffice in the shorter term. Hence, some stakeholders proposed humane euthanasia for cases of dogs where no owners could be found and the quality of living for the dogs would become too low. It was also considered that to stabilize the dog population, humane euthanasia and sterilization needed to work together. This requires a specific facilitation between stakeholders who are polarized on such issues. According to various stakeholder inputs, MSAW has gained a negative reputation in the eyes of the general public and some tourists that it would endorse the euthanization of strays without differentiating between straying dogs that have no owner, and are a potential health hazard, and those strays that are owned dogs and healthy. Hence, it is recommended that the Government explains clearly to the public and all relevant stakeholders how the combination of both strategies can be applied in the most humane ways taking all factors into consideration. Our scenario analysis further highlights the effectiveness of sterilization and vaccination combined with a robust education and communication strategy and better implementation of the appropriate Animal Welfare regulations.

5. Comparative Analysis - Best Practices & Main Issues

5.1. Dogs and stray dogs

Dogs are the most popular pet animals and probably are the most numerous carnivores worldwide (Butler and Du Toit 2002, Butler et al. 2004, Jittapalapong et al. 2007). Dogs have been introduced wherever man has settled (Butler et al. 2004, Daniels and Bekoff 1989). The beneficial effects of human and dog interactions are well documented in the literature (Barker and Wolen 2008, Hart 1995, Nicholas and Gullone 2001, Virués-Ortega and Buela-Casal 2006). For instance, a good relationship between humans and dogs (especially companion dogs) can lead to a variety of beneficial outcomes

that can alleviate human suffering and increase psychological well-being (Merrill 2012). Companion dogs can provide unconditional love, physical contact, social stimulation, and a sense of safety and security to their owners (Prosser and Staiger 2008, Turner 2006). Besides companionship, dogs have many other complex roles in human communities, for example as sacred icons, or working animals used for protection and waste disposal (Clutton-Brock 1995, Hughes and Macdonald 2013).

Stray dogs are a global problem involving countries of all degrees of economic development, but especially poor counties (Dalla Villa et al. 2010). These animals often live with little or no veterinary care, consuming refuse and feces to survive (Butler and Du Toit 2002, Butler et al. 2004, Yoak et al. 2014). They pose a variety of negative impacts to the economy, environment, natural conservation, human health and society development.

5.2 Common reasons for straying dogs and health risks

Salman et al. (1998) summarized the main reasons for straying dogs, which include; house relocation, landlord issues, lack of time and financial resources to properly care for the dog, inadequate facilities, too many dogs in one place, pet illness, personal problems, biting due to lack of education how to live with dogs, and no home for littermates (Amaku et al. 2010). Among the owned dogs that become stray due to negligence of their owners, the most common factor is due to lack of education and understanding of the owners regarding responsible dog ownership and continuous care demands (Flores and Abascal-Mena, 2018). Other factors indicated in the research on straying dogs include; inadequate cooperation in management of urban stray dogs between Governments and other organizations, inadequate collaboration between the associated management agents, people's lack of responsibility, too many breeding opportunities and ineffective dog control policies (Reece, 2007; Zhuang et al., 2017). Contributing factors that can worsen the situation are; inadequate sanitation and waste-management systems in less-developed countries, which increases the availability and accessibility of food to stray dog populations (Kato et al., 2003; Fielding and Plumridge, 2005; Childs et al., 1998; Di Nardo et al., 2007).

Common contributing factors in many countries regarding challenges in managing stray dog populations are: limited or inadequate legislation and policy enforcement regarding abandonment of pets, ineffective humane mechanisms to collect abandoned animals, lack of proper fencing and other means to keep the dogs within premises, uncontrolled breeding amongst staying dogs (including those from owned dogs). The UK, for example, has a reputation as an "animal lover nation" because almost half of its households own a pet. However, the country has a great number of stray dogs. The unattended free-roaming owned dogs are also common. The Local Authorities in the UK are expected to deal with over 100,000 stray dogs. In 2013, more than 111,000 dogs were handled across the UK (Siettou 2015). There are also many visible (living on the street) and invisible street dogs (to be picked up from the street) in the mainland of Europe, and the estimated number of stray dogs in Europe is 100 million (Pirnay 2017). Stray dog problems in Asian and African countries like India, and Thailand are generally more commonly known. India, for example, has about 30 million stray dogs, and an estimated 20,000 people die each year from rabies infections in India. According to the WHO report, an estimated 95% of global rabies cases occur in Asia and African out of which 99% of rabies transmissions to humans are caused by dogs. Therefore, stray dogs have become one of the most serious public health problems, and are widespread concern by the public worldwide (Kartal and Rowan 2018, Lyu 2015). It is fortunate that Mauritius does not (yet) have serious or uncontrolled cases of rabies. This, however, can change and Mauritius too is at risk of the spreading of diseases

by straying dogs it humane and ecologically solutions are not found and implemented consistently over longer periods of time.

Stray dogs have become increasingly important in bacterial and parasitic zoonotic pathogens (Chen et al. 2012, Chou Chum-Hung et al. 2014). De Liberato et al. (2018) conducted a research in central Italy in order to underline the importance of stray dogs control to prevent and minimize parasitic spread and zoonotic transmission. Their findings indicate that stray dogs are highly related to Echinococcus granulosus, which is the most relevant zoonotic parasite in Europe. Stray dogs often act as reservoirs of a large number of pathogens of parasitic zoonoses, such as giardiasis, toxoplasmosis, toxocariasis and ancylostomiasis. The prevalence of important zoonotic diseases including Lyme disease, Q fever, heartworm disease, leptospirosis and toxoplasmosis is also found to be significantly correlated with stray dogs (Chou Tsung-Hung Feng1 Chi-Chuang et al. 2015). Stray dogs often roam freely in urban environments or rural settings. Accordingly uncontrolled health management of strays can pose potential health hazard risks. This places even more emphasis on the requirement public sensitization in dog management care, and facilitated access to veterinary resources.

5.3 Stray dog population control and animal welfare

Stray dogs have a legal status in many countries as part of National Animal Welfare Acts and Policies (Blomley and Blomley 1994). Previous studies indicated that large scale euthanasia of stray dogs is not a sustainable solutions (Creţan 2015). Especially due to the negative public impacts this attracts in the view of many people and how this is often associated with a perception of animal cruelty. This becomes even more problematic when dog registration verification is not carried out adequately, resulting in the euthanization of straying dogs that are in fact owned dogs of people. Similar damaging public opinion and negative press reviews also occurred in Mauritius due to earlier policies and practices of mass euthanization in Mauritius.

Stray dog population management and control has been an issue that societies all over the world are faced with. The welfare of the animals is often ignored in short-term knee-jerk reactions through campaigns of poisoning, shooting, electrocution, drowning, starvation and other cruel methods have been adopted in many countries to reduce stray dog populations quickly without a sustainability and humane approach (Creţan 2015). Cross country comparative research has indicated that such methods do not provide long-term solutions, raise ethical concerns, and are not effective (Amaku et al., 2010).

Comparative research has evidently shown that the most successful programs for reducing stray dog populations integrate three key components: legislation, education, and sterilization (LES). Animal shelters, both public and private, that follow this formula have reported a significant decrease in the number of dogs they handle after a few years of successful implementation of these combined strategies (FAO, 2014; Amaku et al., 2010).

The WHO advises that euthanization of stray dogs as a main strategy is not successful to reduce the stray dog population. The solutions are not straight forward and required an integrated approach. Sheltering of strays, for example, requires sufficient financial and human resources that can be challenging for developing countries in particular (Lyu, 2015). Mass sterilization is considered the best solution on the longer-term according to many researchers (Herbert et al. 2012), as long as this is part of an integrated approach. For example, catching of strays without vaccination and management of remaining strays can cause all kinds of unforeseen challenges. When territories become vacant

and non-sterilized straying dogs from neighboring areas move in to occupy those areas it can lead to an acceleration of breeding. Movement restriction and habitat control are therefore also discussed by some scholars as part of an integrated stray dog population control (Hughes and Macdonald, 2013; Kahn et al., 2008). Amaku et al. (2010) proposed that the combined effects of sterilization of owned dogs (especially female dogs) with humane euthanasia of un-adopted dogs have demonstrated to effectively reduce the stray dog population to safe and ecologically sustainable margins. With regards to dog sterilization of male and female dogs, studies show that sterilized animals live longer, healthier lives with fewer medical and behavioral problems (Lyu 2015).

Besides the sterilization and humane euthanasia programs, waste collection to reduce the possibility for straying dogs to find food and water is another way to control their population according to Amaku et al. (2010). As attitudes are important predictors of dog-related behavior, knowledge of what influences and affects people's attitudes to dogs can make an important contribution to improving the relation between dogs and human and animal welfare (Serpell and Hsu 2016). Educational campaigns also therefore essential to help avoid abandonment of dogs (Amaku et al. 2010). This requires effective collaboration between Animal welfare and human health organizations with the Government, civil society and educational institutions. This approach in various countries has proven to be an effective way to improve human and animal health and reducing the dog straying conditions (Hughes and Macdonald 2013, Jackman J et al. 2007).

Prof Martens indicated to the Ministry during the his visit to Mauritius, the possibility of survey research to better understand the particular dynamics of the attitudes of people in Mauritius with regards to animals in general and stray dogs in particular, animal welfare, and relationships between people and dogs. For this research, validated questionnaires can be used, such as the Animal Attitude Scale (AAS) (Herzog et al., 1991), and the Animal Issue Scale (AIS) (Meng, 2009). This attitudinal research can contribute to more effective education and sensitization campaigns. Other research findings demonstrated that the level of economic development of a country is likely to influence its capacity to manage stray dog populations (Dalla Villa et al. 2010). Research also indicates the need to perfecting legislative mechanism, strengthening departmental linkage and introducing multi-stakeholder collaboration to solve the problem of management funds, adoption and post-processing of stray dogs (Zhuang et al. 2017).

Concerning stray dog welfare policies, including reduction of risk of spread of diseases, the following methods have been identified as most successful: continuous vet training, vaccination, de-worming and other veterinary care, encouraging a culture of adoption, enrolling societal influencers in adoption and education campaigns, supporting and facilitating collaboration between animal welfare groups, shelters, and civil society, and adequate governmental support that include public-private partnerships (ICAM Coalition, 2007). It is also widely recommended for rabies vaccination to be enforced as an essential part of all sterilization programs. Furthermore, regulating the populations of dogs and cats, especially stray dogs and cats, promoting the significance of deworming dogs and cats, and improving the sanitation and hygiene of dogs and cats are among the recommended strategies and measures that can be taken to control canine and feline parasitic zoonoses worldwide.

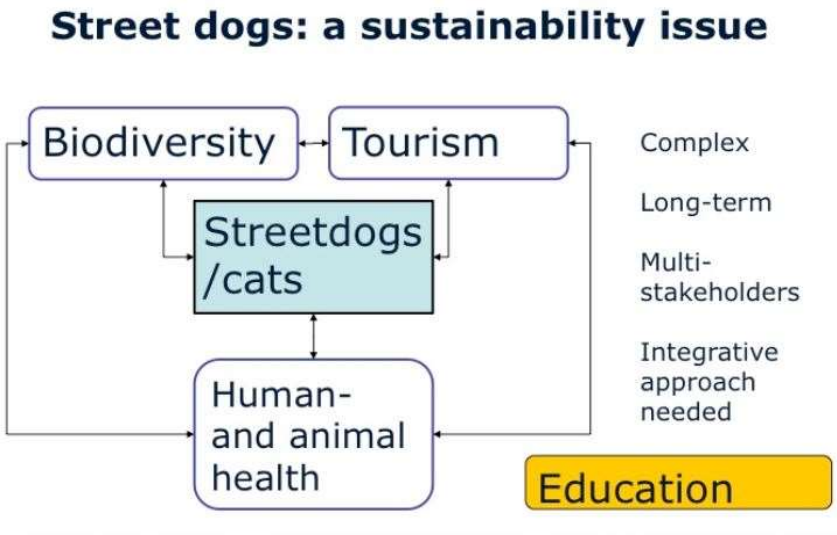
5.4 Strengths and weaknesses of each option

Evaluative research on the various dog population control and Animal Welfare policies from numerous countries clearly show that there is no single solution to address these challenges, which are worldwide (ICAM Coalition, 2007). An integrated sustainability approach is required, that needs to be embedded

ecosystemically within a larger context of multi-stakeholder partnership development and public-private partnership. This approach aligns with the implementation of Sustainable Development Goal (SDG) 17 - Partnership. To better understand the barriers and success factors of each strategy and their combined effect, we provide here a short strength and weakness analyses of the various options. Although the various solutions above can deal with the stray dog problem, there also exists weakness in each option.

- STRAY DOG SHELTERS - This option may sound promising at first, however, there are numerous challenges that need to be taken into account. Stray dogs need adequate medical care, which requires funding. Moreover, appropriate infrastructure that can withstand the impact of cyclones and torrential rain, common in Mauritius, is essential to safeguard the health and live for the animals that are sheltered. Furthermore, shelters need to provide quarantine possibilities, regular vaccinations, and deworming, in addition to appropriate food sources. Shelters also have an increased risk of the spread of diseases. Another factor that needs to be taken into account is dog behaviour when the animals are kept in larger packs. This risk factor was clearly indicated by some of the stakeholders during the stakeholder dialogue session. Sheltering does not address the cause of the problem. It can, however, be integrated as a transitional strategy integrated within a larger context of the sustainability approach recommended here in this report.
- EUTHANASIA - Although euthanasia may appear as a quick solution, it is not a sustainable solution. Unless the causes for the increase in dog populations are addressed, reducing them at the outcome level has proven ineffective. Furthermore, there is the factor of which dog to euthanize. As our site visit at MSAW showed, there are challenges regarding the identification of dogs, especially when they are brought in in large numbers. This has also resulted in the euthanasia of owned dogs that strayed when people did not discover quickly where their dog was kept, or in fear of having to pay a large fine opted for the dog to be euthanized rather than collected. MSAW explained that they have taken considerable care to find the most humane forms euthanasia to avoid unnecessary suffering, it remains however a very delicate issue, and there is still a negative public view on the methods that MSAW may have adopted previously that were less humane.
- STERILIZATION & VACCINATION - Sterilization (neutering) and vaccination are essential strategies for controlling the dog population and health management. In order for this strategy to be effectively implemented it requires sustained and effective educational and social-media campaigns. Currently in Mauritius there are still cultural and religious barriers that are prohibiting the uptake of large-scale sterilization and registration campaigns. It is for this reason that Dr Kurt Barnes indicated several times the necessity of including religious leaders in spreading the message of the need for large scale sterilization and better dog management care. We have understood that the pilot project with HSI will provide important data regarding the effectiveness of sterilizing strays that are later returned to their previous habitat. As mentioned earlier in this report, we highly recommend the strategies proposed in this report to be evaluated in light of the data that will come out of that pilot project with HSI. Sterilization and vaccination of strays is resource intensive, and it is recommended that this is undertaken through public-private partnership models that would open the possibility of co-funding schemes, including CSR. This also requires better collaboration with the Hotel and Tourism Sector. Unfortunately, those stakeholders from the private sector were not represented during the stakeholder dialogue session. For the sterilization of strays to be effective, the question has also arisen during the stakeholder dialogue whether the Animal Welfare Act needs to be amended where this concerns legal responsibility for sterilized strays that are relocated to their previous habitat without human ownership. In other words, who is responsible for these dogs in case of biting incidents after sterilization?

6. Scenario Analysis for a sustainable transition



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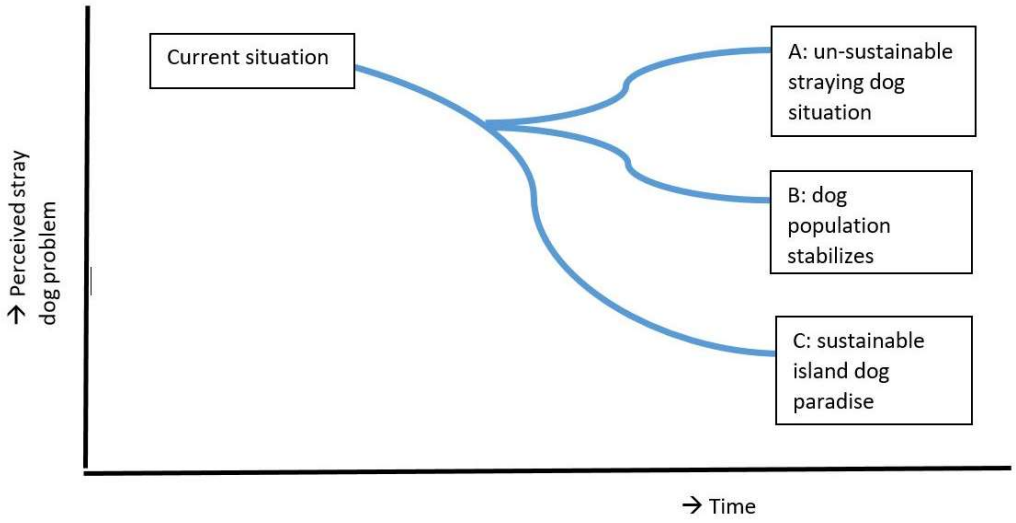
Transition management is an approach for tackling the complex issue of sustainable development. Sustainable development in itself is a dynamic, multi-dimensional, multi-actor and multi-level problem that is in a constant state of flux. Transition Management will seek to steer development in a more sustainable direction by identifying and fundamentally restructuring the unsustainable systems that underpin our society. The goal of transition management is geared towards enabling, facilitating and guiding the social, technical and political transformations required by embedded societal systems to bring about sustainability. From a conceptual point of view, you can envision the future transition regarding the management of stray dogs according to these three potential futures:

A: Failed transition – Not integrated in mainstream policies related to tourism, (sustainable) development – no Animal Welfare Acts and Policies implemented – public remains unknown and unaware of the need to sterilize/vaccinate the dogs – risk of rabies being introduced into the island. This unsustainable situation, we refer to as an “un-sustainable straying dogs situation”.

B: Partly successful transition - Recognition that dogs are part of the Island’s ecosystem – through education about the need for sterilization, capture and release practices, number of dogs are reduced to a manageable number. In this scenario, the dog population numbers stabilizes (but is still higher than the desired state). We refer to that here as, “dog population stabilizes”.

C: Successful transition – Dog population management is imbedded into educational practices – public attitudes and behavior towards dogs are transformed – Animal Welfare is integrated into policies related to e.g. tourism, biodiversity, and climate change - we refer to this sustainable situation as “sustainable island dog paradise”.

“A dog is a friend forever.” ~ quote from participant of dialogue



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This sustainability transition management approach is the main methodology applied here to synthesize all the key inputs from the various stakeholders, as well as the literature review to provide a robust analysis and understanding of how to move forward to achieve the desired objectives:

1. Reduction of stray dog (and cats) population to ultimate zero-strays.
2. Improve Animal Welfare for the dog population in Mauritius - owned and straying dogs.
3. Improved animal-human relationships in view of the larger commitment of Mauritius as a Sustainable Island State within the larger UN SIDS context.
4. Better collaboration between the multiple stakeholders and public-private partnership on key sustainability objectives, that include Animal Welfare and healthy peaceful communities.

In order to get an idea about future trajectories, we used a simple mathematical model to illustrate the sensitivities of certain decisions (Amaku et al., 2010). The results presented below are by no means predictions. A more detailed analysis with improved data, extensive sensitivity and uncertainty analysis, will be needed for as more precise estimate (this may be something for a more detailed and geographically explicit, future study). The research of Amaku et al., indicates that the effectiveness of dog population control strategies depends heavily on effectiveness of reducing straying conditions (p.77, 2010). In our analysis we restrict ourselves to the relevant ***sustainable*** control measures and management strategies that were discussed during the stakeholder meeting (excluding euthanasia, as many studies showed that this is not a solution - see FAO 2011, pp.21-22; ICAM, 2007).

Dog Population Growth

Let us assume that the dog population density $N(t)$ at time t follows a logistic growth:

$$N^{\wedge\prime}(t) = rN(t)(1 - N(t)/K), 0 \leq N(t) \leq K$$

where K is the environmental carrying capacity, $r = a - b$ is the rate of natural increase with a the crude birth rate, and b the crude mortality rate. In further calculations, we assume that sterilization is lifelong; dog population is subjected to density dependence; and all young are born fertile.

Control by Sterilization

Let $Q(t)$ be the proportion of sterilized female dogs, then the number of dogs becomes $N^{\wedge\prime}(t) = rN(t)(1 - N(t)/K) - aN(t)Q(t)$

Dogs put permanently in shelters

Putting dogs in shelters intervenes through the number h of sheltered dogs per unit of time and unit of area:

$$N^{\wedge\prime}(t) = rN(t)(1 - N(t)/K) - h$$

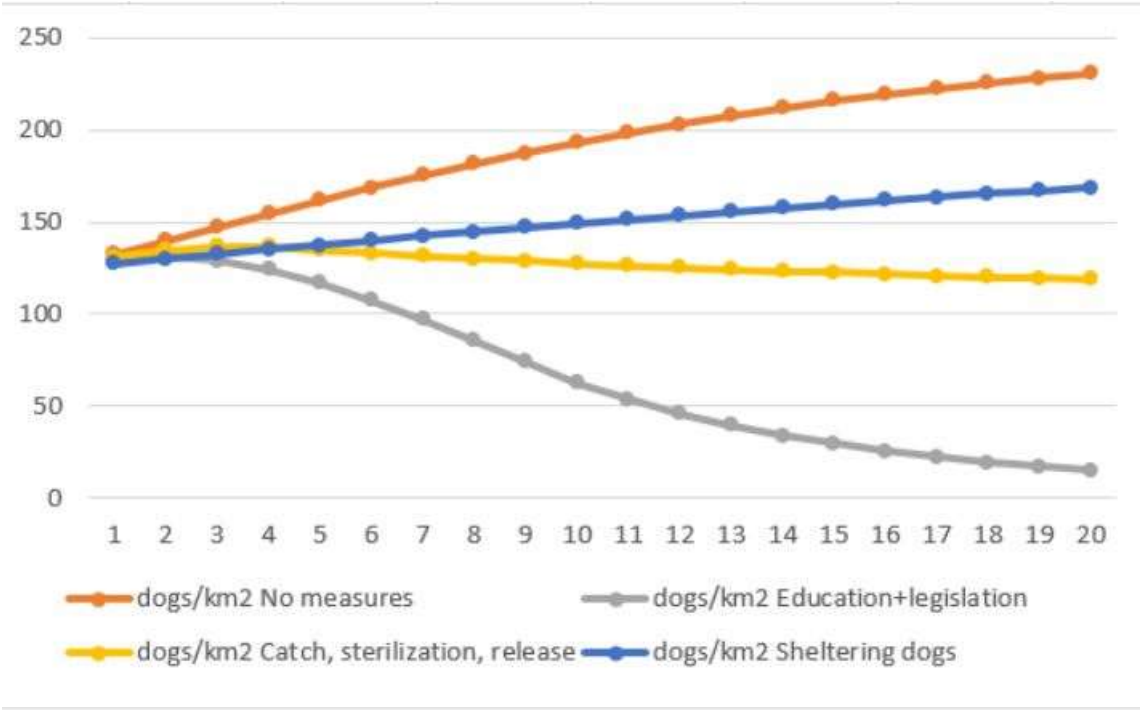
Parameter Estimates

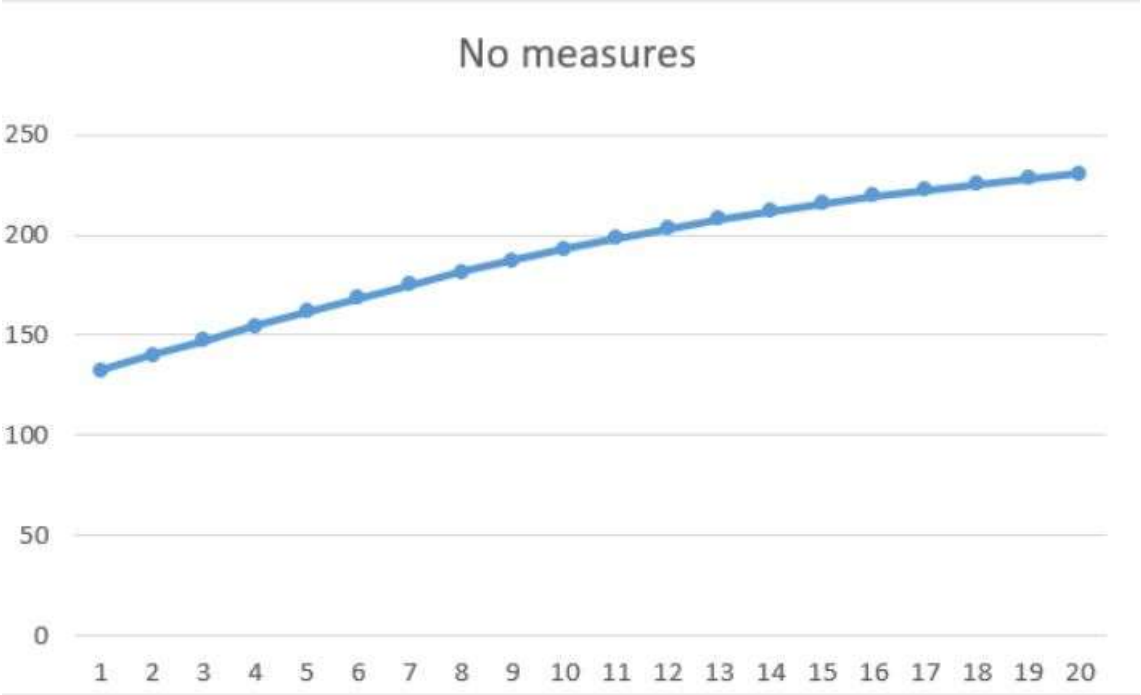
The birth (a) and mortality (b) rates were as a □ 0.34 year^{-1} and b □ 0.22 year^{-1}.

We used these same numbers for Mauritius as Beck (2002), assuming a carrying capacity of 250 dogs per kilometer square. Based on the estimate of ~ 250,000 dogs on the Island of Mauritius, the current density equals about 125 dogs/km$^{2.}$

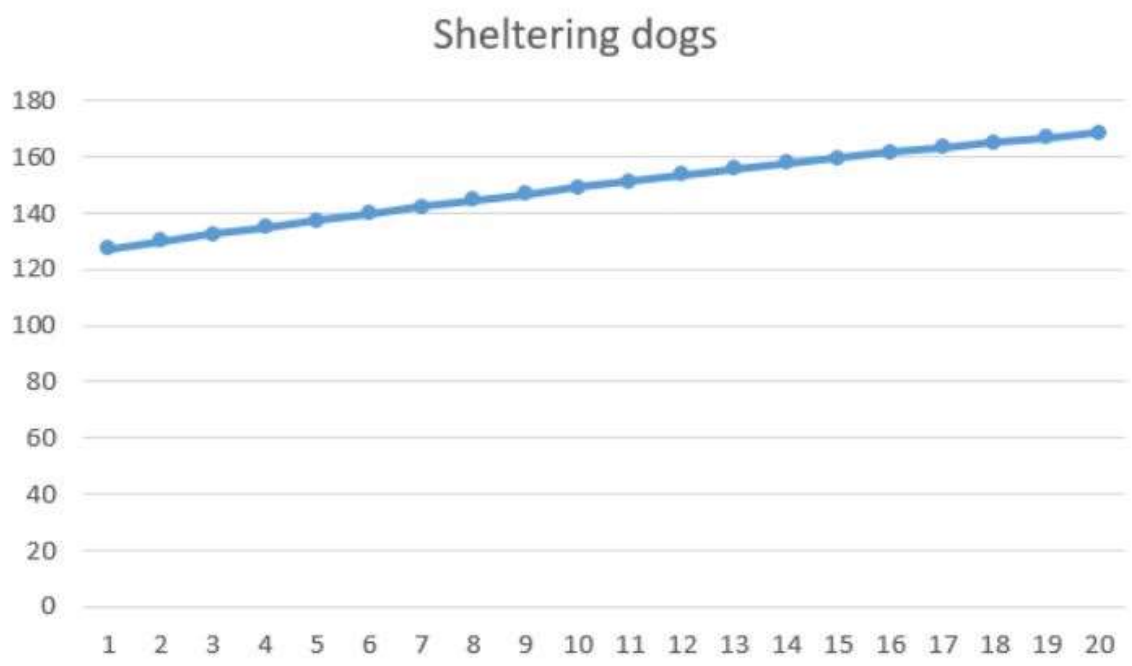
Results

Several measures can be taken to reduce the numbers of stray-dogs. In the figure below, we display them all - they will be explained in separate graph further in the text.



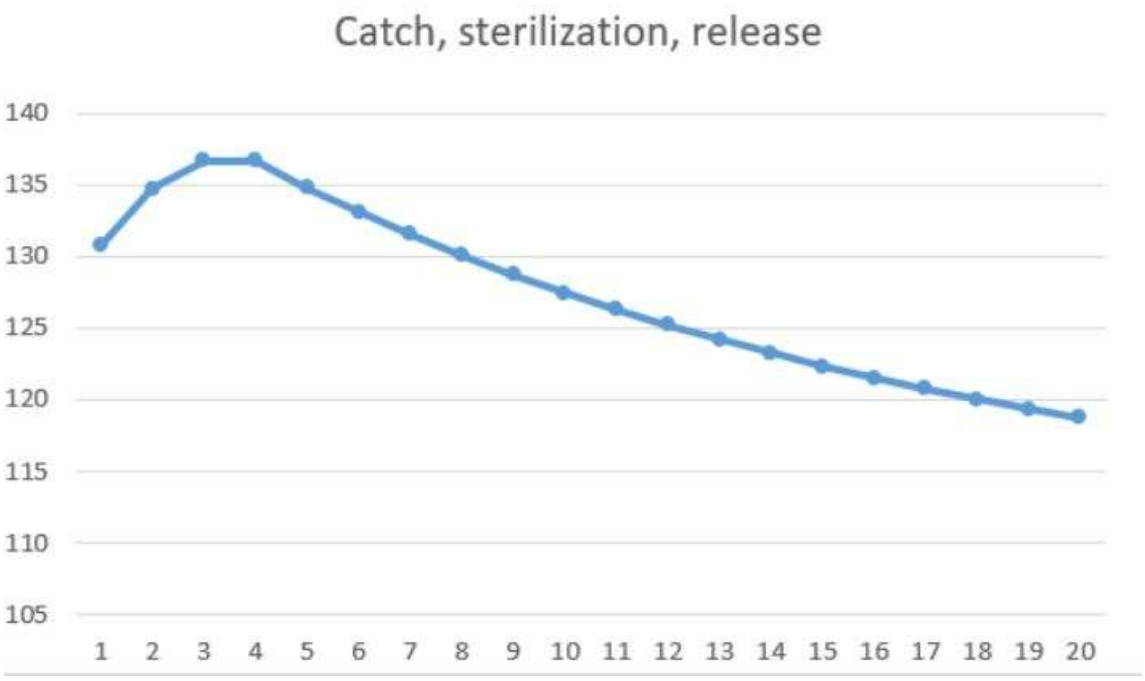


Scenario 0: No Measures. Without any measures taken, the dogs population will grow up to the point where the carry capacity (K) / km^2 is reached. (X-axis = time in years; Y-axis = #dogs/km^2)



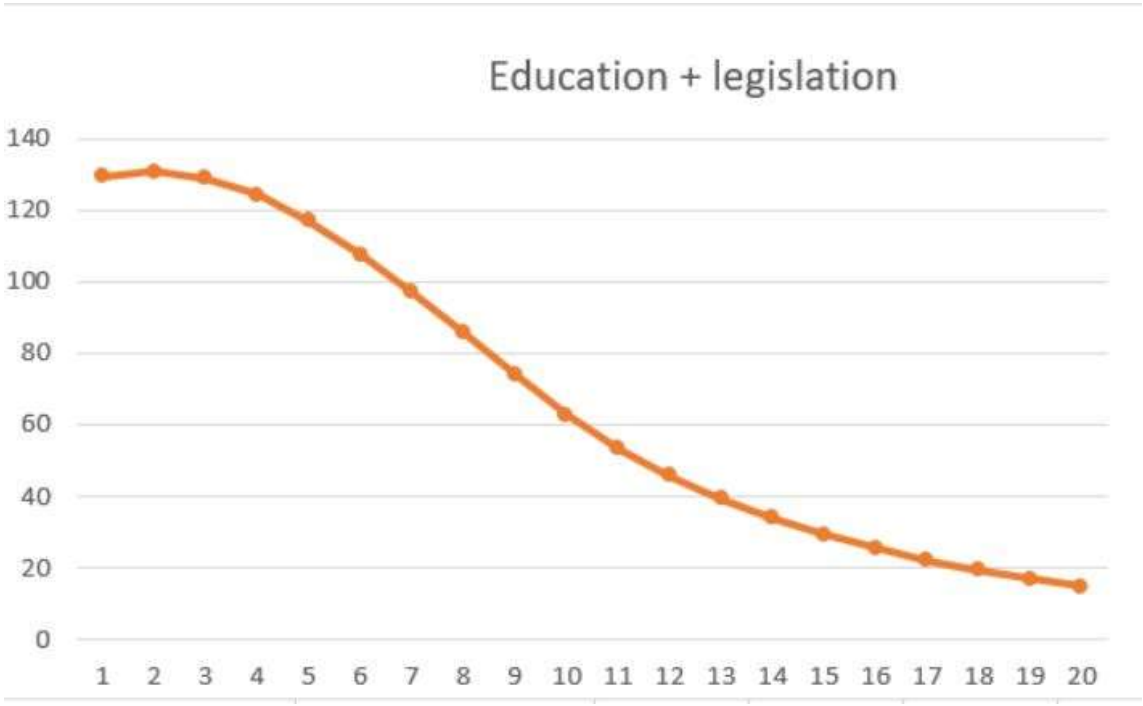
Scenario 1: This scenario assumes catching dogs and putting them in shelters (assuming 10,000/year (5 /km^2)). (X-axis = time in years; Y-axis = #dogs/km^2)

"When sheltering animals, bio-security and animal welfare go hand-in-hand." ~ quote from participant of dialogue



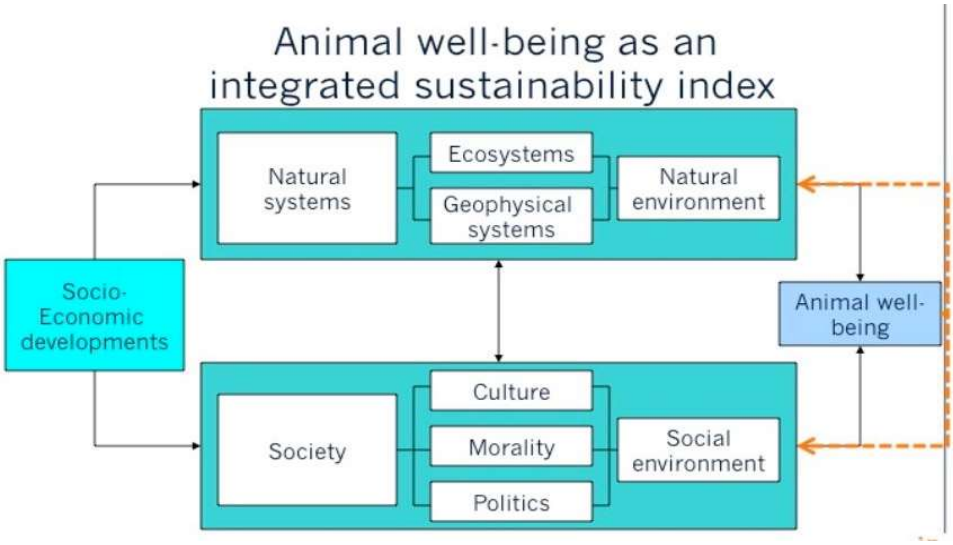
Scenario 2: Catch and release (catch-neuter-release): each vet sterilizes 1 dog/day for 200 days/year (assuming 50 active vets) = 10,000 dogs/year (~ 4% of the total population, cumulating till 20% and then at constant 20%) (X-axis = time in years; Y-axis = #dogs/km^2)

"Get the vets on board; one dog a vet." ~ quote from participant of dialogue



Scenario 3: Implement an effective education (+legislation) strategy with all private dogs (70% ~ 90/km$^{2)}$ being sterilized (unless kept for breeding), assuming 10 years needed to reach the full 70% (incremental increase 7%/year) (X-axis = time in years; Y-axis = #dogs/km$^{2)}$

7. Key Recommendations & Possible Next Steps



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As was mentioned during the presentation by Prof Pim Martens during the launch of the project on 25 September 2018, Animal Well Being is a Key Sustainability Indicator for Nations. This reflects also the quote of Mahatma Gandhi at the beginning of this document. Not only can we see how well we manage our natural, economic and social systems by looking at the health and well-being of our animals, their well-being also will directly and indirectly influence the health, natural- and social environment, as well as the economic status of individuals, communities and Mauritius as a whole. The recommendations below summarize the key inputs of the stakeholders, literature reviews, and the scenario analysis of section 6:

1. **Multi-Stakeholder review of legal and regulatory frameworks**: Review of the Animal Welfare Act (ACA) through multi-stakeholder dialogue, expert review, and additional research on comparative analysis of similar Animal Welfare Acts from other countries with highest success rate. It is beyond the scope of this project to review the Animal Welfare Act 2013. We have noted, however, the feedback of various stakeholders concerning the need for urgent review of the ACA to provide the appropriate legislative and policy-based regulations for dealing with many new challenges that are arising, beyond dogs alone. It is also questioned whether Article 41 provides sufficient protection for the Animal Welfare of straying dogs, including straying dogs that are owned dogs. If the Government decides to adopt a fully sustainable and integrated dog population management scheme, Article 41 might need to be rewritten to align with such. Furthemore, for mass sterilization campaigns to be effective it may require a revision of Article 31 of the Animal Welfare Act 2013, under which it appears that sterilization is currently not mandatory for non-breeding dog owners who own no more than 1 dog. Article 31 (d, ii) reads: “Where the owner of a dog declares that —he has no objection to the dog being sterilised, the dog shall be sterilised at such time and in such manner as the Council may determine”. This clause would prohibit mandatory sterilization of all dogs, with exception of those kept for breeding purposes as it does allow dog owners to object to sterilization in which case it cannot currently by law be enforced.
2. **Registration & Data management**: Effective data-input of owned and straying dogs, and labelling of sterilized and vaccinated dogs for easy identification is essential. Several stakeholders indicated that this is currently lacking, and also requested the possibility of data-sharing. We highly recommend mandatory identification and registration of dogs using a standardized microchip system, and/or ear clipping as is currently done by HSI, through a national databases with links localized databases and those from all the relevant stakeholders.
3. **Sterilization & Vaccination**: Early sterilization of female dogs in particular, and male dogs in addition, combined with vaccination is a KEY strategy for dog population management and control that shows up in all the research across countries worldwide. In order for this to be effective, it is required that people understand why this is urgent, and the implications for not complying. Currently the Animal Welfare Act 2013 allows people to own 1 unsterilized dog; this too may need to be reviewed. For sterilization to be effective at the dog population rate currently in Mauritius it needs to be effectuated nation-wide and for as many female dogs as possible. This also requires an effective communication and media strategy, better regulation, community involvement, vet incentives, and effective collaboration between all the relevant stakeholders.
4. **Education & Research**: performing an analysis of the attitudes towards animals in general and stray dogs in particular of the population at large in Mauritius (together with the University of Mauritius). This, coupled with the development of an integrated policy decision framework (simulation model), will provide a tool to steer, manage and calculate in more details various strategies in an integrated, sustainable way. Furthermore, the role of education campaigns via primary and secondary schools was mentioned by several stakeholders as an effective measure.

5. **Communication, Social Media & Outreach**: A coherent and well designed communication plan for various campaigns is important. Details of such were provided in section 3.3 of the report. Outreach campaigns should also include involvement of key influencers to make stray dog adoption more attractive and popular in the eye of the general public. HSI recommended several strategies in addition for how to better involve local communities in the design and sharing of such communication & outreach initiatives. We also recommend to involve youth in the development and implementation of such strategies, including options of challenges, awards, and games. Mauritius has various active Youth Networks, which can be enrolled to reach people who may otherwise not be open to the message of better caring for our dogs in Mauritius.
6. **Collaboration & Partnership Development**: We have noted a lot of goodwill from all the stakeholders who were present during the dialogue. The shared concern for the Animal Wellbeing is an effective way to build community and develop strategic partnerships that can also provide a foundation for further sustainability initiatives in the larger context of the SIDS SDG implementation. Implementing an online platform was suggested as a means to keep each other abreast of the latest developments and to communicate effectively.
7. **Prototyping the Stray Dogs project:** This is especially relevant for input in SIDS UN Conferences and SDG implementation updates. This Integrated Sustainability Approach can serve as a model for Sustainable Island Living, especially when the Sustainable Human-Animal relationships is used as one of the sustainability indicators, as is now common in many other countries. This will also strengthen the Mauritius leadership with the SIDS concerning Sustainable Development.
8. **Capacity Development:** Several stakeholders expressed the need for further development of adequate Human and Financial Resources. Public-Private sector partnerships are key mechanisms for shared financial capacity development. There are several key private sector sustainability initiatives that can be interlinked with sustainable dog management strategies, which are worth to explore through further specific dialogue sessions on those topics. Furthermore, involvement of the tourism sector, and especially those working in the Hotels who are faced with such issues on a daily basis can prove a key success factor for the further design, development and implementation of Animal Welfare and Dog Population Management policies and interventions.

Acknowledgements

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Appendix 1 - Stakeholders who attended the Dialogue

1. Assistant Director, Livestock and Veterinary Division
2. Principal Veterinary Officer, Livestock and Veterinary Division
3. Chairman, Council Mauritius Society for Animal Welfare
4. Director, Mauritius Society for Animal Welfare
5. Communications Officer, MSAW
6. Animal Inspector, MSAW
7. Officer in Charge, Animal Welfare Unit LVD
8. Carla Prayag, Africa Manager, Humane Society International
9. Sameer Golam from Second Chance Animal Rescue (SCAR)
10. Sophie de Chaslain from Lions Club Mauritius (Animal Village Project)
11. Priscilla & Linley Mootien from 4 Tilapat (LaBrasserie Dog Shelter)
12. Representatives from Ministry of Agro-Industry and Food Security
13. Representatives from Ministry of Health and Quality of Life
14. Representatives from Ministry of Tourism