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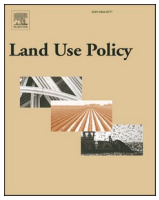

Land use and environmental degradation in the island state of Mauritius: Governance and problem conceptions

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ABSTRACT

Biodiversity and natural ecosystems underpin human life and wellbeing, yet they are systematically degraded by anthropic activity, with land use change being the direct driver most impacting terrestrial ecosystems. Since scholars argue that solving the biodiversity crisis hinges on the problem conceptions that steer governance, and since land use is governed predominantly at the national level, we seek to identify the problem conceptions expressed through the governance of the land use – environment nexus in a country where ecosystem degradation persists despite tenure security: Mauritius. Through interviews with key informants, corroborated by documentation review, we investigate the current governance systems across legislative, policy, and institutional frameworks to elicit the main governance issues that may reveal underlying problem conceptions. Our results point to weak commons and compromise approaches, which systematically enable land use changes for financial maximization at the expense of natural ecosystems. Economic optimization and ecosystem prioritization approaches were not observed despite recognition of nature's role in the wellbeing of citizens. In this context, which may be similar in many developing countries, the introduction of biophysical and monetary natural capital accounting is recommended to provide commensurate data on the benefits derived from ecosystems and those derived from economic activities, in order to better inform compromise and prioritization.

1. Introduction

The biosphere is the living and life-sustaining layer of the Earth: "everyone in the world depends completely on Earth's ecosystems and the services they provide, such as food, water, disease management, climate regulation, spiritual fulfilment, and aesthetic enjoyment" (MA, 2005). As of 2005, however, approximately 60 % of global ecosystem services (ES) reviewed by the Millennium Ecosystems Assessment were reported as being degraded or used unsustainably (MA, 2005). Indeed, maximum sustained yield modes of extraction and production have attempted to control so-called target variables, e.g., fish catch, meat production, and water level, among others, where uncertainty in nature (a complex system) was "presumed to be replaced by the certainty of human control" (Holling, et al., 2002). The stabilization of these target variables over time, however, has caused unexpected changes elsewhere in the complex social ecological system (SES) (Marten, 2001; Chaffin, et al., 2016; Holling, et al., 2002). Crucially, it is well established that ecosystems can only withstand a certain degree of damage before collapsing (Holling, et al., 2002; Bergstrom, et al., 2021), incurring the potentially irreversible loss of their services, which may in socio-economic terms have disastrous ripple effects on livelihoods, supply chains and commodity prices, among others (IPBES, 2019; WWF, 2020; Bergstrom, et al., 2021). As of 2019, natural ecosystems had declined by 47 % on average, relative to their earliest estimated states (IPBES, 2019), and as of 2020, global natural capital - the planet's stock of renewable and non-renewable natural resources had declined by nearly 40 % since the early 1990s (WWF, 2020). At the global scale, we are reaching or exceeding environmental limits (Steffen, et al., 2015; Broman and Robèrt, 2017; IPCC, 2021; Persson, et al., 2022), including in terms of land system change and biosphere integrity (Richardson, et al., 2023). In these regards, Holling et al. (2002) highlight that land use transformations affect the landscape at the scale where plant- and animal- controlling interactions unfold in ecosystems, and IPBES (2019) reports that "land-use change is the direct driver with the largest relative impact on terrestrial and freshwater ecosystems".

Cognisant of these dynamics and recognising that "the direct and indirect drivers of land degradation and biodiversity loss are substantially the same" (UNCCD & CBD, 2019), the global response to nature loss has identified land use related processes as critical solutions. The

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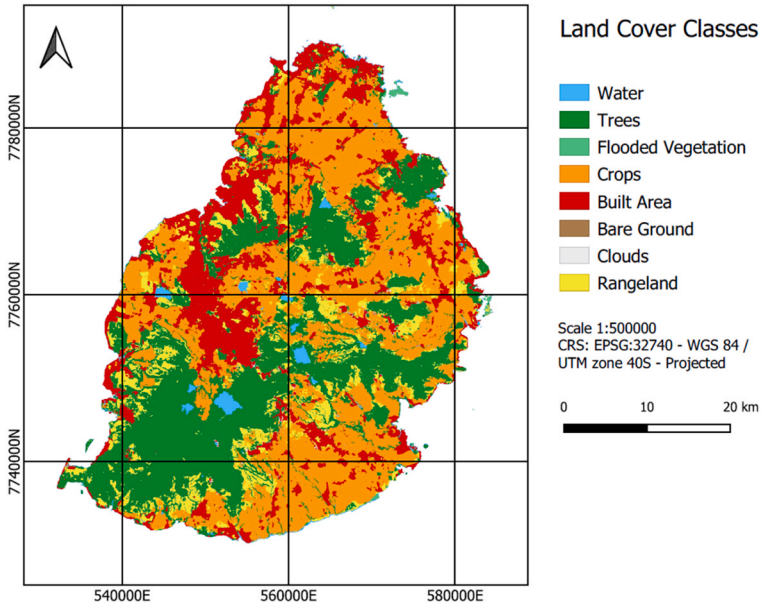
List of acronyms

BLUP	Building and Land Use Permit
BOI	Board of Investment
CBD	Convention on Biological Diversity
CCD	Convention to Combat Desertification
CSO	Civil Society Organization
EDB	Economic Development Board
EIA	Environmental Impact Assessment
ELUAT	Environment and Land Use Appeal Tribunal
ENCA	Ecosystem Natural Capital Accounting
EPA	Environment Protection Act
ES	Ecosystem Services
ESA	Environmentally Sensitive Area
KMGBF	Kunming-Montreal Global Biodiversity Framework
LDN	Land Degradation Neutrality
MAAS	Multi-Annual Adaptation Strategy
MAIFS	Ministry of Agro-Industry and Food Security
MESWMCC	Ministry of Environment, Solid Waste Management and Climate Change
MHLUP	Ministry of Housing and Land Use Planning
NBSAP	National Biodiversity Strategy and Action Plan
NDS	National Development Strategy
NGO	Non-Governmental Organization
NLDS	National Land Development Strategy
OPS	Outline Planning Scheme
PANES	Protected Area Network Expansion Strategy
PDA	Planning and Development Act
PPG	Planning Policy Guidance
SCM	Supreme Court of Mauritius
SDG	Sustainable Development Goal
SEA	Strategic Environment Assessment
SEIA	Strategic EIA
SM	Statistics Mauritius
UNDESA	United Nations Department of Economic and Social Affairs
UNDP	United Nations Development Programme

United Nations (UN)' Sustainable Development Goals (SDGs), adopted in 2015, include Target 15.3 which reads: "By 2030, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land degradation-neutral world" (UNDESA, 2023). Land Degradation Neutrality (LDN) is defined under the UN Convention to Combat Desertification (UNCCD) as being achieved "when the quantity and quality of land-based natural capital is stable or increasing, despite the impacts of global environmental change", according to a minimum set of globally agreed indicators (Cowie, et al., 2017; UNCCD, 2024). In addition, under the UN Convention on Biological Diversity (CBD), the Kunming-Montreal Global Biodiversity Framework (KMGBF)'s first goal (Goal A) reads: "The integrity, connectivity and resilience of all ecosystems are maintained, enhanced, or restored, substantially increasing the area of natural ecosystems by 2050", with Target 1 being to "ensure that all areas are under participatory, integrated and biodiversity inclusive spatial planning and/or effective management processes addressing land- and sea-use change […]" (CBD, 2022). Thus, since land is governed under the sovereignty of individual countries according to their needs and circumstances, land governance represents a potential window of opportunity for producing positive (or net-positive) outcomes for nature at the national level. In this respect, scholars have identified land tenure security as a pre-condition to land restoration (Chigbu, et al., 2022; Chigbu, 2023), as tenure insecurity was shown to lead to land degradation in a variety of countries characterized by weak contractual law, and where claims on land or resource rights



	Water	Trees	Flooded Vegetation	Crops	Built Area	Bare Ground	Clouds	Rangeland
Extent (km²)	23	586	2	712	355	1	4	177
Share of Total Area	1%	32%	0%	38%	19%	0%	0%	10%

Fig. 1. Land cover of Mauritius island in 2022. (Karra, et al., 2021; ESRI, 2023).

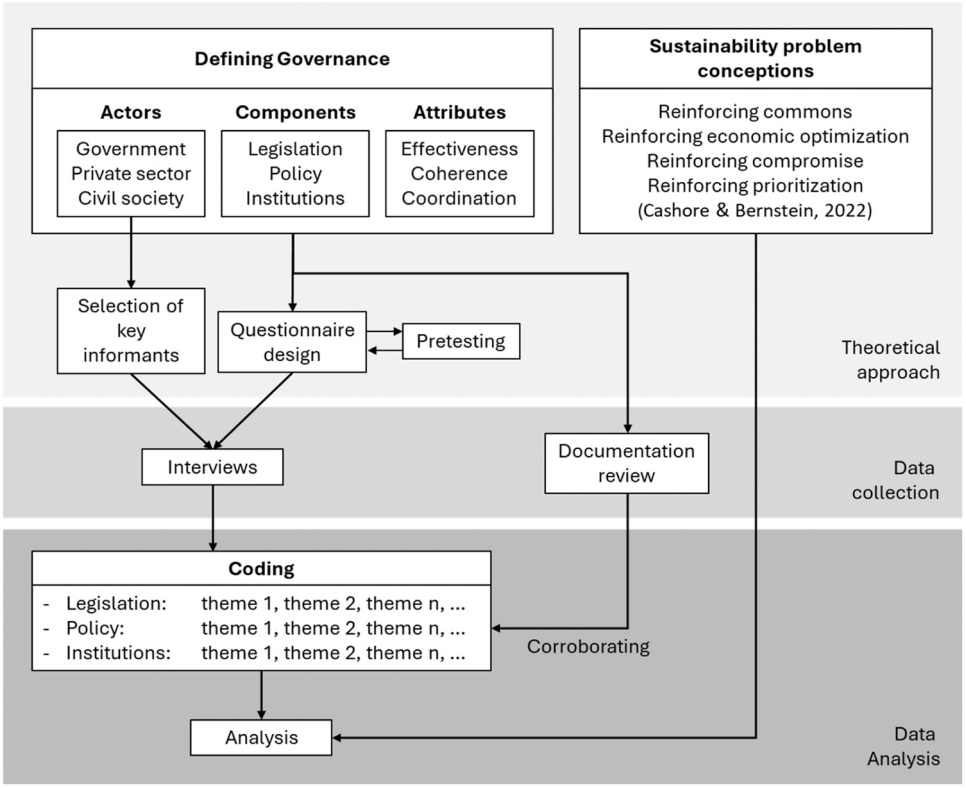


Fig. 2. Methodology flow chart.

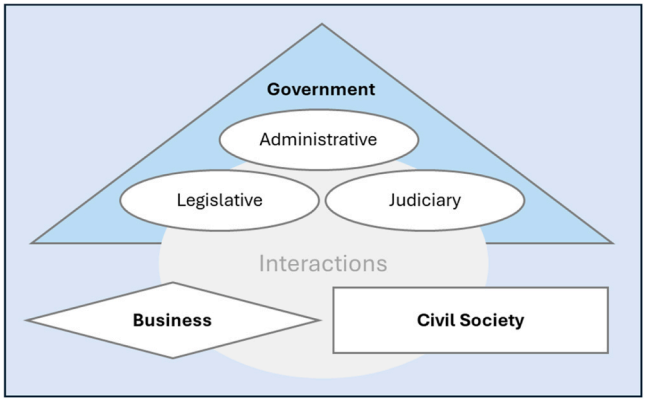


Fig. 3. The actors of governance (adapted from Kong and Yoon (2018)).

may not be formally registered and secure (Chigbu, et al., 2021). This necessary condition is however "insufficient in ensuring land restoration" and meeting LDN targets (Chigbu, et al., 2022), as is the case in the Republic of Mauritius, wherein land tenure security is present in the anthropocentric sense.

In Mauritius, land rights and titles are well-established and secure, as the country disposes of a sophisticated land tenure system that has evolved since colonial times (see historical background in Supplementary Materials). Today, over 80 % of the island is privately owned freehold land, the remainder being state land, with registration and tenure managed by a modern "Land Administration, Valuation, and Information Management System" (MHL, 2014). This comprises a digital cadastral database since 2011, a dedicated Cadastre Unit working in concert with land registration authorities (MHLUP, 2023), and strong contractual law (Yao, et al., 2005; Byamugisha, 2016; Olkeba, et al., 2024). Moreover, protection from deprivation of property is enshrined in the constitution of the country (Republic of Mauritius, 1968). Yet, land tenure rights do not appear to protect ecosystems, let alone promote their restoration. In 1997, less than 2 % native terrestrial habitat remained on the main island of Mauritius (Page and D'Argent, 1997). In 2013, ecosystem natural capital accounting (ENCA) illustrated the ecological degradation in the island between 2000 and 2010: the stock of biocarbon decreased by 8.7 %, and the Net Landscape Ecosystem Potential (nLEP) index, integrating various indicators, decreased in all districts (IOC, 2014; Weber, 2014). More recently, the Critical Ecosystem Partnership Fund (CEPF)'s updated ecosystem profile described the Republic of Mauritius as having "two of the most ecologically devastated islands in the world", with less than 1.3 percent of indigenous forest remaining on Mauritius island (CEPF, 2022). This is despite forests cover (a sub-set of tree cover in Fig. 1) being over 25 % of the island (Nigel, et al., 2015; Karra, et al., 2021; [dataset] ESRI, 2023). Forests however consist of mixed indigenous-exotic vegetation, most of which are degraded to various degrees by invasive alien species, introduced since colonisation (Florens, et al., 2016). Finally, major challenges persisted in the achievement of Sustainable Development Goal 15 (life on land) in 2023, according to Sachs, et al. (2023). Mauritius therefore opens up an opportunity to interrogate the deeper governance issues leading to ecosystems and land degradation, beyond strictly tenure security-related issues. Consequently, this study seeks to answer the following two research questions: (1) *what are the main governance challenges faced by Mauritius in the land use – environment nexus?* and (2) *what are the underlying sustainability problem conceptions guiding this governance, and to what extent?*

2. Methodology

The methodological approach, consisting of three main steps, is captured in the flow chart shown in Fig. 2. The first methodological step was to define the main components of governance (Section 2.1), which would guide the selection of key informants and the design of questions for interviews. The second step consisted of carrying out the interviews,

Table 1
Interview questionnaire.

1	**Legal and regulatory frameworks for land use planning**
1.a.	At your level, what laws and regulations prescribe land use planning and land use change rules?
1.b.	How do these laws and regulations take the impacts of land use changes on ecosystems and ecosystems services into account?
1.c.	How coherent and effective are the legislations in protecting or improving the state of the environment?
2	**Land use planning policies & strategies**
2.a.	What are the existing land use planning policies and strategies that are used today?
2.b.	What are the new or planned policies and strategies and how do they differ from existing ones?
2.c.	How do these policies and strategies prescribe consideration of ecosystems and ecosystem services in land use changes?
2.d.	What is the level of coherence between policies and strategies that have a bearing on land use changes, but which are developed by different ministries or parastatal bodies?
2.e.	Do the policies and strategies have a monitoring and evaluation framework with specific, measurable, achievable, relevant, and time-bound (SMART) indicators?
3	**Institutional arrangements for coordinating stakeholders for decision making, implementation and monitoring and evaluation**
3.a.	What are the public institutions responsible for formulating and implementing land use planning policies and strategies? What institutions carry out monitoring and evaluation? How effective are the existing coordination mechanisms?
3.b.	Are there formal mechanisms to identify or include extra-governmental stakeholders (the public, civil society organisations, and the private sector) in land-use planning decision making and administrative processes (i.e., formulation of policies, strategies and policy instruments, their implementation, and monitoring and evaluation)?
3.c.	By which channels can the public, by its own initiative, interact with institutions to define and enforce land use planning policies and strategies?

registering the results of interviews, and reviewing documentation for corroborating the responses of key informants and provide additional data (Section 2.2). The results of interviews were coded and analysed through two sub-steps as described in Section 2.3.

2.1. Framing of governance and interview design

2.1.1. Actors, components, and attributes of governance

The governance literature is extensive, complex, and continually evolving (Hogl, et al., 2012; Zumbansen, 2012; Kong and Yoon, 2018; Bennett and Satterfield, 2018; Azadi 2023). Broadly, governance encompasses the processes of governing, including social organization, rulemaking, decision-making, coordination, and interventions to address challenges (Bevir, 2012). Steurer (2013) identifies three main actors in governance: government, civil society, and business (Fig. 3), each with its area of authority, which overlap to create co-regulation or co-management (Steurer, 2013), and are influenced by international governance (Fukuyama, 2016). Indeed, for our topic of interest, international environmental processes (see Section 1) require national responses led by governments in collaboration with civil society and business. Therefore, public sector governance merits closer consideration.

Applied to the national level, governance is defined by Fukuyama (2013) as rulemaking, enforcement, and service delivery, whilst Rose--Ackerman (2017) emphasizes managerial competence and cooperative decision-making. For Grindle (2017), it "encompasses notions of how political and administrative decisions get made, how governmental systems work, and why both formal and informal institutions matter in how things get done and how states relate to societies". A more practical examination demands attention to public policy; formulation, implementation, and enforcement by the three primary branches of a typical representative democracy: the legislative, administrative, and judicial branches (Sabatier, 2007; Kong and Yoon, 2018). To ensure relevance in the continuously evolving societal context, integrated policymaking and implementation ought to be a dynamic and iterative process, most commonly referred to as the stages heuristic, or policy cycle (Bridgman and Davis, 2003; UNEP, 2009; Janssen and Helbig, 2015). While there are several theoretical frameworks that complement the stages heuristic (Sabatier, 2007), the policy process implies for our purposes that governments should aim to improve service delivery, requiring a focus on good governance. Good governance attributes are numerous (Grindle, 2017; Bennett and Satterfield, 2018), yet scholars have converged on the key characteristics of effectiveness, accountability, transparency, the demonstrated rule of law, and legitimacy (Hogl, et al., (2012); Zumbansen, (2012); Grindle, (2017); Rose-Ackerman, (2017); Azadi (2023)). In addition, effectiveness depends on the technical competence of institutions, their autonomy, and the degree of overlapping and sometimes contradictory mandates between them (Fukuyama, 2013). This, therefore, places emphasis on coherence and coordination. While legislation is a policy instrument, it sets the direction of broader policy interventions (namely through strategies and action plans). We, therefore, identify the main components of governance as: 1) legislation, 2) policy, and 3) institutional (organisational) arrangements. Elements such effectiveness, coherence, and coordination, among others, can be subsumed to these three main components of governance.

2.1.2. Questionnaire design

Guided by the above and the targets of the KMGBF which emphasize effective, equitable, participatory, and integrated processes (CBD, 2022), a questionnaire was designed for semi-structured interviews with key informants (Bernard, 2000a). Our investigation thus aimed at gaining understanding of environmental and land use legislation and policies, how these consider natural ecosystems, their coherence, and the institutions (organisations) they involve. The role of institutions, their coordination, inclusiveness, and overall effectiveness were then explored (Table 1). However, investigating their technical or

Table 2
Key informant categories and profiles.

Reference	Informant Profile
Civil Society Organisations	
CA1	Independent environment and climate activist
CA2	Member of environmental advocacy organisation
CA3	Member of environmental protection NGO
CA4	Member of environmental advocacy organisation
CA5	NGO member involved with legal affairs
Consultants and Researchers	
CR1	Environmental consultant, conversant with land use change processes
CR2	Sustainability consultant, conversant with land use change and policy processes
CR3	Natural ecosystems academic, conversant with policy processes
CR4	Environment specialist, conversant with land use change and policy processes
CR5	Architect, conversant with land use and environmental regulations
Public sector, current or former members	
PB1	Former government staff familiar with coastal and marine ecosystems
PB2	Government staff, conversant with land use planning processes
PB3	Government staff, conversant with environmental governance
PB4	Government staff, conversant with agriculture and forest governance
Private sector representatives	
PR1	Mixed-use estate administrator
PR2	Landowner and developer representative
PR3	Private sector association representative
PR4	Industrial private sector association representative
PR5	Landowner and developer representative
PR6	Landowner and developer representative

administrative capacity was beyond the scope of this paper. Two interviews were carried out to pretest the questionnaire in order to ensure that questions were clear, neutral (to eliminate potential perceptions of leading questions) and understandable – i.e. avoiding overly technical jargon. Finally, questions were formulated so that informants could supplement the topics addressed, and as the three components of governance are inherently interconnected (e.g., legislation delineates the roles of institutions), it was anticipated that answers to certain questions would provide information relevant to others.

2.1.3. Selection of key informants

To collect balanced, real-world perspectives (Young, et al., 2017), twenty key informants were selected based on referrals for their knowledge, experience, and positions within relevant organisations from each category of governance actors, namely government (four), civil society (five), business (four from landowner firms and two from associations), and a fourth category was added which comprised consultants and researchers (five), as they operate outside of- but may serve each or all- other actors (Table 2). Informants were anonymized for security reasons and are cited in the results section (Section 3) as "PB" for public sector members, "PR" for private sector members, "CA" for CSOs and activists, and "CR" for consultants and researchers.

2.2. Data collection

Interviews were conducted by phone or in person between October 2022 and March 2023, in whichever language informants felt most comfortable (either in English, French, or Mauritian Creole), and transcripts were translated to English where necessary. Concurrent to interviews and to verify and/or substantiate the data provided by key informants, a review of relevant documentation was conducted which comprised academic literature, government-published literature such as legislation, policy documents, and court proceedings, as well as reports from international agencies and policy analysts, and other grey literature such as newspaper articles, aiming to procure real-world insights. These documents are referenced throughout the paper. Throughout our inquiry, the historical background of Mauritius proved important for understanding the context against which the governance systems would be critically appraised. In this regard, relevant macro-level events pertaining to land use and the environment are presented and discussed, within key socio-economic development episodes. This is included in Supplementary Materials for conciseness.

2.3. Processing and analysis

The gathered data were coded and organized by dominant themes emerging from the interviews - i.e., themes raised by multiple informants (Bernard, 2000b; Walker and Lyrick, 2006). Where a specific point was raised by multiple informants, it was synthesized, and the informants were cited together. Where an informant made a point related to a dominant theme but with a specific nuance or addition, they were distinctly cited for it. Those themes were then grouped as sub-sections of the relevant components of governance: legislation, policy and institutional (organizational) aspects (see Fig. 2). Interview transcripts arranged in this manner are provided in Supplementary Materials.

Finally, the investigation sought to observe whether one or more core variables (Walker and Lyrick, 2006) emerged from the data in relation to the four problem conceptions proposed by Cashore and Bernstein (2022). This follows from Visseren-Hamakers, et al. (2022), who argue that "if governments and scholars seek to address the environment then they must begin, and end, with attention to the problem at hand", particularly "fit for purpose problem *conception* and policy analysis". They point to four types of sustainability problem conceptions or schools, articulated by Cashore and Bernstein (2022) out of a rich analysis of the sustainability governance literature. For completeness, the four types of sustainability problem conceptions are:

- In the Type 1 *reinforcing commons* school, policies and institutions focus on avoiding "tragedies of the commons", whereby overuse of common resources by some individuals may take place in the absence of collective control. This school champions economic utility to address a clearly specified collective action problem.
- In the Type 2 *reinforcing economic optimisation* school, the preferred interventions are those that also contribute to economic utility or welfare, and are thus biased towards economic growth.
- The Type 3 *reinforcing compromise* school is founded on participatory processes, seeking balance and compromise across different values and disciplines, and typically produces multigoal policies, e.g., the SDGs. "Its adherents tend to be united around the promotion of human dignity rather than economic utility".
- The Type 4 *reinforcing prioritization* school seeks to analyse, rank, and grant lexical status to incommensurable problems, such as slavery, climate change and species extinction, to prevent solutions to lower-ranking problems from undermining higher-ranked ones.

Type 1 and 2 put emphasis on economic utility whereas Type 1 and 4 place careful attention to problem structure (Cashore and Bernstein, 2022). According to Visseren-Hamakers, et al. (2022), only the Type 4 conception would be "fit for purpose" to effectively address ecosystem decline globally, although other approaches are not obsolete, as knowledge and tools developed by the other schools can contribute to resolving Type 4 problems. Our interpretation of results in relation to those problem conceptions is discussed in Section 4.

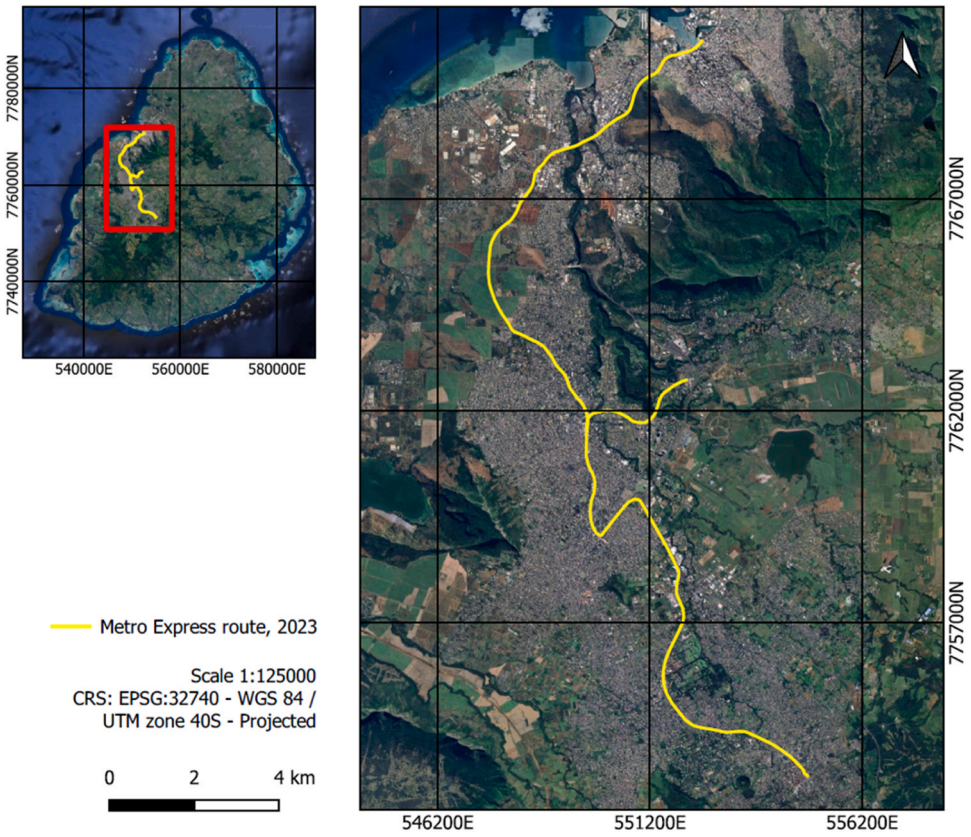


Fig. 4. Route of the Metro Express light rail, EIA exempt. (Source: Authors' elaboration).

2.4. Study limitations

In this study we only considered terrestrial ecosystems, land use, and land use change dynamics when addressing environmental degradation, without delving into sectoral specificities inherent to agriculture, tourism, or the coastal zone, for example, as this would lead to overly detailed information falling outside the scope of our inquiry. Similarly, we chose not to investigate the impacts of solid, liquid, and air pollution on ecosystems. Complementary future research may also analyze the legislative changes undermining environmental protection from a political economy or political ecology perspective and consider the social justice and equity aspects of land governance including tenure (Azadi 2023), as the sense of alienation or "foreignization of space" may undermine social stability (Gooding, 2015; Wortman, et al., 2016). Finally, significant linkages exist between the present topic and climate change adaptation and disaster risk reduction, which can be the subject of further research.

3. Results

3.1. Legal context

3.1.1. Land use legislation

In Mauritius, the central legislation on land use is the Planning and Development Act (PDA) of 2004. It requires the preparation of the National Development Strategy (NDS) on a 20-year cycle as the overarching planning instrument (Republic of Mauritius, 2004). The planning authority at the national level is the Ministry of Housing and Land Use Planning (MHLUP), which prepares and updates the NDS, as well as its declinations into Planning Policy Guidance (PPG) documents (MHL, 2004). The PPGs provide guidance for land use, spatial planning, and urban design for residential (including coastal), commercial, industrial, and resort hotel developments (PPG1), design guidance for Le Morne Cultural Landscape (PPG2), for places of worship (PPG3), for development along the Motorway (PPG5), etc. (MHL, 2008). The PPGs in turn guide district-level Outline Planning Schemes (OPSs) to be enforced by local authorities. These are Municipal City Councils, Municipal Town Councils, Village Councils and District Councils, governed by the Local Government Act (Republic of Mauritius, 2011) and the Town and Country Planning Act (Republic of Mauritius, 1954). For land use changes, the MHLUP and local authorities also act as "permit authorities" as per section 26.(1) of the PDA: "Every application for a development[1] permit shall be made to a permit authority by the owner of the land on which the development is to take place". Some developments, precisely described by the First Schedule of the PDA, are exempt from obtaining a development permit. The developments which require a permit are separated in two, whereby applications for "state-significant developments" are processed at the level of the MHLUP. Applications for developments other than state-significant are processed by local authorities. Consistent with their planning functions, permit authorities must have regard to the NDS, approved development plans, and other planning instruments, as well as material considerations including effects on the economy, employment, social and cultural development, and the natural environment of the area (Republic of Mauritius, 2004). Where agricultural land is to be converted to other uses, the Ministry of Agro Industry and Food Security is responsible for issuing conversion permits under the Sugar Industry Efficiency Act (SEIA) (Republic of

[1] This Act defines "development" as (a) "the carrying out of any building, engineering, mining, or other works or operations in, on, under and over land, or the marking of any material change to the use of land or to any building or morcellement" and (b) includes: (i) use of land; (ii) morcellement; (iii) the erection of a building; (iv) the carrying out of a work; (v) the demolition of a building or work; (vi) any other act, matter or thing that is controlled by a planning instrument.

Mauritius, 2001). With regards to environmental impacts, the PDA stipulates that any development application, among other requirements, must "be accompanied by such relevant application for EIA (Environmental Impact Assessment) license […] as may be required under the Environment Protection Act" (EPA) (Republic of Mauritius, 2002; Republic of Mauritius, 2004). A project's EIA is the responsibility of the project developer and is evaluated by an EIA committee within the Ministry of Environment, Solid Waste Management, and Climate Change (MESWMCC).

3.1.2. Informants' views on the EPA and EIAs

All informants knew of the EIA mechanism under the EPA as a central component of land use change processes. For informants CA2 and CR2, EIAs consider individual project impacts in isolation, i.e., not cumulated with those of nearby projects or features of the neighbouring environment, which for PR1 is not compatible the national land use planning intent of the NDS. CA3 added that EIAs are generally activity-based (hotel, stone-crushing plant, etc.) rather than ecosystem-based, therefore, not adequate to prevent negative ecosystem-scale impacts. It is noteworthy that the words "ecosystem" or "biodiversity" do not appear in the EPA. Furthermore, CA4 and PB2 pointed to ways in which promoters have circumvented EIA requirements, whereby coastal real estate developments are EIA exempt if they are within 1 km of the High-Water Mark and include less than 50 units (hotel units, apartments, villas), as per the Fifth Schedule, Part B, of the EPA (Republic of Mauritius, 2002). Promoters, therefore, tend to split large projects into smaller ones that remain under this threshold.

Informants CA2, CA4, CR4, and PR5 referred to a contrasting mechanism which they state previously existed under the EPA, named the "Strategic EIA" (SEIA), also commonly referred to as Strategic Environment Assessment (SEA). In the EPA of 2002, "strategic EIA" is defined, meaning an EIA of a plan or programme referred to in Part C of the First Schedule, including National Physical Development Plans, such as new towns or satellite towns, and housing programmes. Thus, unlike individual project-focused EIAs, the SEIA would have assessed development impacts on broader scales or even at the island scale. This was reportedly applied in the preparation of the NDS of 2003 (Government of Mauritius 2004), and in preparation of the sugar industry's Multi-Annual Adaptation Strategy (MAAS – see Supplementary Materials) (AGRECO, 2007; Polido, et al., 2014; Deepchand and Seebaluck, 2019). However, little evidence of other SEIA applications could be found in the literature. Later, in the Environment Protection (Amendment of Schedule) Regulations of 2006, Part C of the First Schedule was removed from the EPA (Republic of Mauritius, 2006), and in the Environment Protection (Amendment) Act 2008, the definition of "strategic EIA" was deleted altogether (Republic of Mauritius, 2008). According to CA2, CA3, CR3, and PR4, this mechanism was taken out of the EPA to remove potential barriers in the process of obtaining development permits. CA2 and CR2 believed there was a general perception that SEIAs would slow down projects. PR5 deplored the current absence of a SEIA mechanism, since it would enable the upstream identification of environmental issues in development plans; issues that are now only identified downstream through individual project EIAs (CA2, PR5). CR2 added that its implementation could have been seen as a stamp of quality. PR1, although not referring to the SEIA explicitly, believed EIAs should be carried out regionally rather than per project. To the authors' knowledge, however, a draft Environment Protection (Amendment) Bill was circulated to stakeholders including the private sector for comments in February 2022, which reintroduces a Strategic Environment Assessment (SEA) mechanism, with one of its objectives being the consideration of cumulative impacts for plans and programmes (Republic of Mauritius, 2022a). At the time of writing this paper, the Bill had not yet been presented to Parliament.

It is noteworthy that exemptions of EIA licenses are provided for in the EPA since its first 1991 iteration, whereby "The Minister may declare an undertaking by a public department, which in his opinion is urgently needed in the national interest or for the economic development of Mauritius, to be an exempt undertaking" (Republic of Mauritius, 1991). This was carried forward in subsequent versions of the EPA with minor amendments. The national light rail project (Fig. 4) is perhaps the most significant example of application of this provision (LeMauricien.com, 2017), where Part B of the Fifth Schedule of the EPA (list of undertakings requiring an environmental impact assessment) was amended by regulation to explicitly exempt the project (Republic of Mauritius, 2017a).

In the above-described context, the EIA process is seen as the last remaining arena in which non-state actors, often acting as environmental watchdogs, can tangibly challenge land use changes (see Section 3.1.4). For PB3, the EIA is a veritable clashing zone between economic development and environmental conservation, where economic growth is bound to prevail "because Mauritius is a developing country". CR4 questioned how nearly all EIA applications succeed in obtaining a license, as this would mean that projects must either have negligible impacts, or that the impacts would all be mitigated. CR4 argued that these scenarios are unrealistic, and that if truly aimed at protecting the natural environment, one would expect 20–25 % of EIA license applications to fail, as "the net is not a net if all the fish can go through". In this regard, CA3, CA4, and CR4 believed that pressure from the Economic Development Board (EDB) is reducing the level of stringency of EIAs, precisely to fast-track projects that bring significant Foreign Direct Investment (FDI) to the country (see Section 3.1.4). PB2, CA2 and CR2 similarly observed a general approach of tradeoffs between economic growth and environmental protection, whereby concessions are made leading to a systematic erosion of ecosystems. PB2 illustrated this dynamic with a hypothetical example: supposing a promoter faced ten constraining conditions for obtaining an EIA license, and demonstrated efforts deemed significant to fulfil eight of those, then the authority may "close its eyes" on the remaining two and issue the license.

The informants raised further issues related to the legal framework. CA5 noted that EIAs must include alternative proposals to the development's primary or preferred configuration, which is not done by most promoters. Moreover, EIA licenses can be issued with "future conditions" to be fulfilled, - i.e., compliance with conditions to be observed during project implementation. These are not always checked despite the presence of an EIA Monitoring Committee, as reported by CA3, CR3, CR4, PB2, PR2, and PR4 (see Section 3.3.1). CA1 and CR4 also highlighted that the preparation of an EIA is the responsibility of the developer, and thus, assessments submitted to the MESWMCC are biased in favor of the projects. Some informants (CA1, CA3, CA4, CR4, and PB2) reported the issue of perceived corruption issues, where certain EIA consultants with political ties are able to influence the permit process. PB2 believes the legislation is adequate and that technicians observe the rules, but that decision makers may disregard ecological impacts in favour of economic benefits.

3.1.3. Environmentally sensitive areas

Most informants were aware of an Environmentally Sensitive Areas (ESA) study and mapping conducted in 2008–2009 by the MESWMCC (Republic of Mauritius, 2021), describing areas to be protected as mentioned in the NDS (CA2, CR1); and extracts of which can be found in the National Biodiversity Strategy and Action Plan (NBSAP) (Republic of Mauritius, 2017b). CR1 explained that the mapping did not include thorough ground-truthing, leading to errors such as golf course ponds being classified as wetlands. As a result, various stakeholders including planning authorities argued that the maps must be updated and validated before being published and adopted for official use. For several informants (PB3, CA1, CA2, CA3, CA4, CR3, and CR4), despite the ESA Policy and Bill having been drafted (Republic of Mauritius, 2021), the argument of imprecisions in mapping the ESAs has been used ever since for not promulgating an ESA legislation. Their perception is that the errors in mapping the ESAs are only decoys, the most probable reason being that the legal recognition and protection of ESAs would threaten to stop projects on lands already committed to development, raising

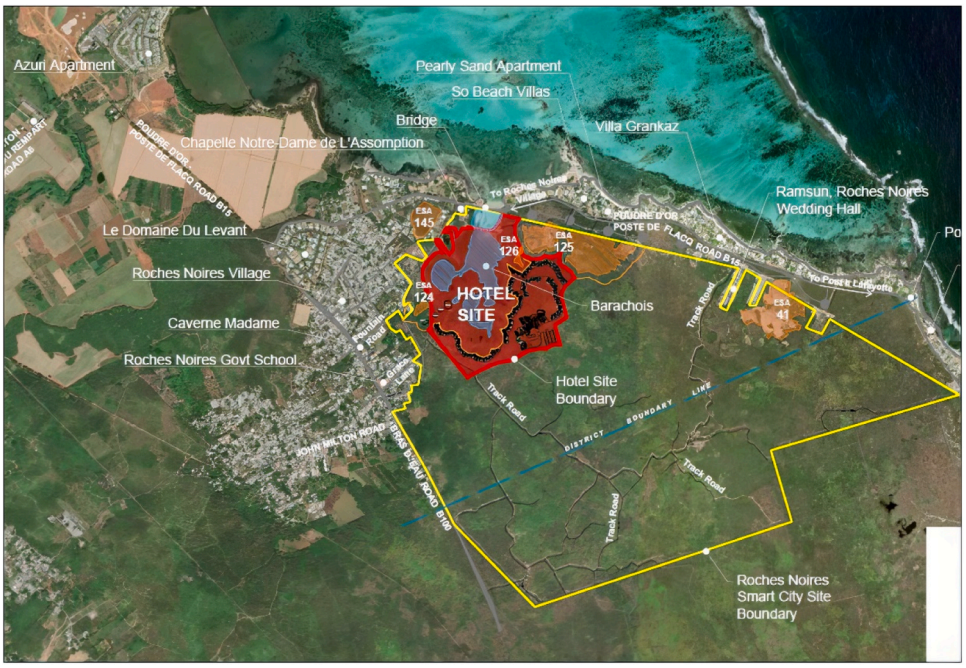


Fig. 5. Site plan of the Roches Noires Smart City (ARUP, 2022).

problematic issues such as compensations to landowners and land developers, or preventing future revenue-generating land use changes and investment flows. Several informants shared that multiple ESAs have been encroached on since 2009; which is evidenced by the significant increase in the number of legal cases against property developers and/or permit authorities (ELUAT, 2023), by a growing awareness of the issue, extensively covered in local newspapers (LeMauricien.com, 2020), and reported by Mauritius' Sixth National report to the Convention on Biological Diversity (NR6) (Republic of Mauritius, 2021). The NR6 states: "During the past decade, rapid and irreversible land use changes owing to high socioeconomic and development pressure have resulted in fragmentation of the wetland, habitat loss and most importantly backfilling".

The latest and most cited example of perceived encroachment on ESAs, and likely the largest, is the proposed 358-hectare *Roches Noires Smart City* project on the Northeast coast of the island (Fig. 5), which is to include a resort hotel "set around the existing Barachois and three ecological sensitive areas (ESA)" (ARUP, 2022). There, wetland ESAs are interlinked with a vast network of lava tubes, causing the area to be regarded as a site of significant geological and paleontological interest (LeMauricien.com, 2022). Whist the promoter's EIA report (for its resort hotel component of the smart city) notes that "a 30 m buffer zone from the mangrove vegetation and ESAs" (labelled "ESA" on Fig. 5) will be respected, and despite geotechnical, ecological, drainage, traffic impact and social impact assessments, the proposal elicited strong opposition from the public and scientists regarding ecological disruptions, though many local residents are favorable to new livelihood opportunities (LeMauricien.com, 2022; Defimedia.info, 2023). In a contrasting case to the observation of individual EIAs as discussed above, however, this project's EIA license application was reported to have been "set aside" by the MESWMCC in 2022, who requested an EIA application for the entire smart city plan including its resort hotel component (Week-End, 2023).

In another part of the island, PR2 explained that the company they represent still awaits an official ESA legal framework to finalize or adjust their development plans, which could be affected or jeopardized by ESA legislation. CA1, CA2, CA3, and other sources (Republic of Mauritius, 2018; Republic of Mauritius, 2021) informed that a Wetlands Bill is in preparation, but its restrained scope excludes ESAs such as mountain slopes, which as covered in Section 3.2 have become the next frontier for real estate development. Despite the above history, the draft Environment Protection (Amendment) Bill introduces provision for the establishment of a new mechanism to sustainably manage ESAs. Under it, a new ESA clearance would be required prior to applying for any other development permit, license, or clearance, including the EIA license. This process would be administered by an ESA Coordinating Committee within the MESWMCC, which would refer to (presumably existing) ESA maps (Republic of Mauritius, 2022a).

3.1.4. *Public comments and legal recourse*

The EIA and Building and Land Use Permit (BLUP - issued by local authorities once an EIA license is obtained, where applicable) processes were known by most informants as the only formal channels through which citizens can submit their views on land use changes. Indeed, EIA license applications are open for public comments for a period of no less than 10 days and no more than 21 days from the publication of notice of public inspection by the MESWMCC, as per Section 20 (3)(d) of the EPA (Republic of Mauritius, 2002). Several informants (CA3, CA4, CA5, CR3) believed the time afforded is too short to properly understand and respond to impact assessments, some of which can take years to prepare, as noted by CR3. In fact, the public comments period was reduced to a maximum of 21 days from 28 days by the Environment Protection (Amendment) Act of 2008 (Republic of Mauritius, 2008), thereby further constraining the ability of the public to comment on an EIA. This legislation also amended the modality of notice for public inspection: pre-2008, it was to be published in "2 issues of the Gazette and in 2 issues of 2 daily newspapers, there being in each case an interval of at least 7 days between the first and second publications" (Republic of Mauritius, 2002). Post-2008, the notice of public inspection is to be published "in the Gazette and in 2 consecutive issues of 2 daily newspapers" (Republic of Mauritius, 2008). This appears to reduce the window of opportunity through which the public can take cognizance for the notice of EIA review. Moreover, the EPA of 2002 introduced a fast-tracking measure for EIA license applications via the Board of Investment (BOI) and now Economic Development Board (EDB), whereby per Section 20 (4) "The Director may in respect of an EIA, *other than one submitted through the Economic Development Board*, extend the time limit specified in subsection (2) to afford reasonable opportunity for any

person to submit public comments on the EIA" (Republic of Mauritius, 2002) (emphasis ours). In the EPA of 1991, this section read: "The Director may on application extend the time limit to afford reasonable opportunity for any person to submit public comments on the EIA".

Under section 54 of the EPA, an "Environment and Land Use Appeal Tribunal" (ELUAT) exists to hear and determine appeals against decisions of the Minister of Environment and the Director of the Department of Environment (who oversees the Environmental Assessment Division) under specified sections, including the issuance of an EIA license (Republic of Mauritius, 2012). The three-step process of appeals is summarised as follows: (i) a person wishing to appeal a decision must lodge a notice of appeal including a statement of case (and a witness statement where necessary); (ii) respondents submit comments to the tribunal on the notice of appeal; and (iii) the appellant may then reply to the respondents' comments. A period of 21 days is allocated to the parties between each step. Within 90 days of the start of proceedings, the Tribunal shall make a determination. As per Section 6 of the ELUAT Act, "any party who is dissatisfied with the final decision of the Tribunal, relating to an appeal under Section 4, as being erroneous in point in law may appeal to the Supreme Court". A notice of such appeal must be given to the secretary of the ELUAT within 21 days of the Tribunal's decision (Republic of Mauritius, 2012).

As for the time given for public comments following publication of an EIA license application, the period of 21 days for submitting a statement of case for appeal before the ELUAT was deemed by CA4, CA5, and CR4 to be too short. Prior to 2016, 42 days were afforded to an appellant to deposit the notice and grounds of appeal (Republic of Mauritius, 2016a). CA4, CA5, and CR4 not only underscored the need to assemble evidence as grounds of appeal, potentially requiring environmental studies that would normally take months to complete, but also addressed the issue of locus standi – i.e., the eligibility for a party to stand and make a case in a court of law. Generally, only people who are personally aggrieved or who can demonstrate that their fundamental rights have been prejudiced from environmental damage can have locus standi. For CA5, this definition is very restrictive, adding that since 2020, one must also have submitted public comments (following the first submission of an EIA license application) to be able to appeal on the issuance of an EIA license (Section 54 (c) of the EPA) (Republic of Mauritius, 2020). An appellant, therefore, faces several burdens consisting of: submitting public comments on an EIA, submitting a statement of case for appeal (both within separate 21-day windows), and demonstrating locus standi, all with the necessary technical and legal expertise. Moreover, in the recent circulated draft amendments of 2022 to the Environment Protection Act, pertaining to the Environmental Impact Assessment (EIA) license process, the following changes were proposed: 1) under section 20 (2), that notice of public inspection of EIA license applications be published in one daily newspaper (instead of two), 2) under section 28 (5), that notice of approval of an EIA be published in one daily newspaper (instead of two) (Republic of Mauritius, 2022a). This, whether deliberate or not, suggests systematic action by the legislator to restrict the public's ability to oppose land use changes on environmental grounds; a continuation of the gradual erosion of environmental protection law in Mauritius since 2002.

For PR5, there is yet another obstacle to surmount. Given that the window for public comments on an EIA application is open when projects are already conceived in high detail - i.e., when promoters have already incurred significant costs (for various studies, plans, and designs) - promoters are very defensive ("even if not defendable") to any proposed suggestions for changes. Some reportedly would go as far as to threaten appellants with demands of compensation for damages, should appellants lose their case while delaying projects (CR4). This is a significant barrier since the role of watchdog is played predominantly by CSOs that are poorly resourced.

Against these conditions for legal recourse, a recent judgement of the Supreme Court of Mauritius in Eco-Sud v the MESWMCC has brought a significant precedent in favor of individuals or CSOs in adopting a more non-restrictive interpretation of the locus standi test, in appropriate cases, while clearly setting out conditions for this interpretation before the ELUAT (SCM, 2023). Indeed, the ELUAT had dismissed an appeal from the NGO Eco-Sud against the granting of an EIA license, on the grounds that it did not have locus standi. Drawing from English and Australian case law, the Supreme Court judged that Eco-Sud had "representative standing", through its genuine and recognized interest and expertise, on both the subject and site under challenge (SCM, 2023). The Supreme Court, however, maintained that this was not a matter of public interest litigation, which does not exist in Mauritius (Deenapanray and Mulloo, 2022; SCM, 2023). Subsequently, the MESWMCC has appealed to the Privy Council against this judgement (JCPC, 2024). The case was heard on March 5th, 2024, and the decision was impending at the time of writing of this paper.

3.2. National policy

3.2.1. Land use, biodiversity, and environmental policy

Beyond the issues raised above, informants addressed a perceived lack of application of national or subnational planning instruments, with varied perspectives. While PB2 asserted that OPSs (see Section 3.1.1) are reviewed every five years in response to population dynamics and development trends, along with national census data compiled every 10 years, PR1's view was that authorities are mostly reactive, with a strong focus on road construction projects aimed at traffic decongestion whereas some localities lack basic services such as access to water. For CR2, many of the texts such as PPGs are philosophical or aspirational, lack detail, and are, therefore, not applied as officers avoid taking responsibility for interpretations; a behavior also noted by PR6. For CA4, the NDS is simply not applied, citing several hotels allowed to be built on the South Coast Heritage Zone that should have been preserved (Government of Mauritius, 2003). Moreover, large plantation landowners have taken advantage of EDB schemes (see Supplementary Materials) to establish their own land use plans for various real estate projects (one can now count fifteen projects on the island issued with Smart City Certificates (EDB, 2021)), and only start interacting with

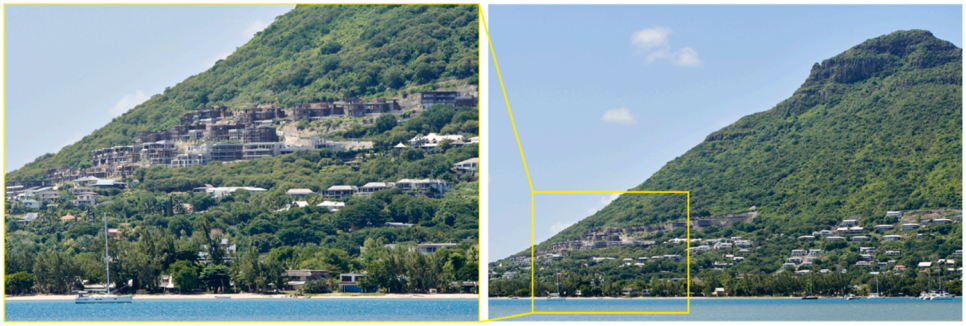


Fig. 6. Photographs of the Legend Hill project site (Source: Author).

authorities when seeking permits (PR4). In response, the NDS application by planning authorities appeared somewhat "loose" to PR6, with projects being allowed outside the perimeters imposed by the OPSs. For CR4, this dynamic has led to an unprecedented level of de-planification, whereby "anything is allowed, anywhere", affecting wetlands (see Section 3.1.3) and mountain slopes, prized by high-end residential developers in search of ocean views (MHL, 2004). According to the PPG, "development will not normally be permitted on slopes steeper than 1:5 (20 %)" (MHL, 2004), yet concessions are made, as exemplified by a project named Legend Hill cited by several informants (Fig. 6). Although this undertaking obtained all necessary permits, it elicited strong reactions from the public (including street protest) and village councils on various aspects including the loss of natural landscape, slope steepness and drainage issues, including during construction (Defimedia.info, 2021; LeMauricien.com, 2021; L'Express.mu, 2021).

Such developments are indeed creating new problems, with PB2 and PR3 pointing out that drainage is becoming a significant issue as higher built-up areas may cause increased rainwater runoff to flood lower areas. PR3 shared that land drainage maps exist but are not made public, as confirmed by the Minister of National Infrastructure and Community Development in Parliament in 2022 (LeMauricien, 2022; Republic of Mauritius, 2022b).

CR4 explained that District Councils have discretionary power on the application of PPGs, because these are only guidelines, and not regulations. CR2 pointed out that some officers do not consider even the NDS as having force of law, despite the PDA clearly stating that it is the prevailing planning instrument to the extent of any inconsistency with PPGs and OPSs, as per Part III, Section 12 (2) of the PDA (Republic of Mauritius, 2004). The current NDS, published in 2003, is currently being updated into a "National Land Development Strategy" (NLDS), with an advanced draft shared to various stakeholders for comments in 2021 (see Section 3.3.2) (Government of Mauritius 2021). For CR2, this iteration is more modern, but does not improve on the lack of detail of the current NDS, and thus remains aspirational. CA4 asserted that the draft NLDS does not integrate the outcomes of the "assises de l'environnement" (a national consultative process undertaken for developing the Environment Masterplan 2020 – 2030), captured in the Environment Master Plan (see below), albeit that the NLDS is still in the process of finalization.

In 2023, the MESWMCC published the Environment Master Plan 2020–2030 (MESWMCC, 2023). Generally, it advocates for longer policy timelines and broader spatial consideration of the environment, highlighting major gaps and needs, and listing proposed policy orientations and strategies across several thematic areas including "urbanism and environmental policy" and "biodiversity and natural resources", which are relevant to the present inquiry. Under the latter, the first policy orientation is as follows: "to ensure that all current and future developments maintain the integrity of existing biodiversity or improve its preservation and any legitimate loss of ecosystems services be compensated accordingly, using strategic environment assessment and natural capital accounting" (section 3.5.3 in Environment Master Plan). Yet, the Master Plan acknowledges that the MESWMCC "has little influence on other dimensions of sustainable development, e.g., social and economic". Whist time will tell whether the Master Plan will be implemented, it does highlight several issues which support our findings, as referenced further in this paper.

CA3, CA4 and CR3 observed that other relevant strategies are in many cases not implemented. The National Biodiversity Strategy and Action Plan (NBSAP) is a case in point. In 2017, Mauritius adopted a NBSAP under the UN Convention on Biological Diversity (CBD), covering the 2017–2025 period (Republic of Mauritius, 2017b), as well as a Protected Area Network Expansion Strategy (PANES) for the 2017–2026 period, aimed at increasing the country's protected terrestrial surface area from 4 % to 16 % (Republic of Mauritius, 2017c). The NR6 to the CBD states that "the implementation of the NBSAP has not been carried out effectively as per proposed recommendation in the said document", and "there is no implementation committee in place for the Republic of Mauritius" (Republic of Mauritius, 2021). This is despite the cross-cutting nature of targets which should influence national and local planning processes, national accounting, and reporting systems for the better management of ecosystems and biodiversity. Regarding the PANES, the NR6 reports that "there has been a monitoring strategy put in place for implementation of PANES for terrestrial biodiversity. However, the implementation has not been effective due to challenges and obstacles faced." For CR3, this may be because the National Parks and Conservation Service (Republic of Mauritius, 2015) and the Forestry Service are under the Ministry of Agro-Industry and Food Security (MAIFS), which serves predominantly the interests of planters rather than protecting and enhancing biodiversity – see also section 3.5.1.m of the Environment Master Plan (MESWMCC, 2023). The draft NLDS does however consider the PANES in envisioning the reinforcement of green corridors across the island of Mauritius (Government of Mauritius, 2021). In addition, a draft Forests and Reserves Bill makes provisions for the proclamation of National Forests and additional Nature Reserves (Republic of Mauritius, 2021).

3.2.2. *Targets, monitoring, evaluation, and review*

With respect to land use and the environment, most informants commented on a lack of systematic monitoring and evaluation of actions against policy goals. For instance, the NBSAP, based on the international Aichi Targets of the CBD, outlines twenty national targets and an action plan but doesn't systematically provide key performance indicators for measuring implementation of each target. According to the NR6 (Republic of Mauritius, 2021), monitoring information was only partially adequate for fifteen targets, with no monitoring systems in place for the remaining five. Progress towards national targets was thus assessed using available information and expert opinion, revealing insufficient progress for all targets except one, for which no significant change was noted; namely, protected areas, the object of the PANES. For CR2, monitoring reports typically focus on describing actions taken rather than using cumulative numerical indicators, a pattern observed in the NR6 as well. Another example pertains to the national SDGs Database, maintained by Statistics Mauritius, which lacks data for several indicators for the 2010–2021 period, including indicator 15.1.2 (proportion of important terrestrial and freshwater biodiversity sites covered by protected areas), indicator 15.3.1 (proportion of degraded land over total land area), and indicator 15.9.1 (integration of biodiversity into national accounting and reporting systems) within SDG 15 (Life on Land) (SM, 2023). CR3 contended that although monitoring and evaluation should occur, reports are not published when results are troubling.

CR2 notes that there are no legally binding goals or restrictive limits that are Specific, Measurable, Achievable, Relevant, and Time-Bound (SMART) to prevent the degradation of land or biodiversity in Mauritius. Some target setting exercises have been carried out, but appear to be driven by multilateral processes such as the CBD giving rise to the NBSAP, or the UN Convention to Combat Desertification (UNCCD) driving a Land Degradation Neutrality (LDN) Target Setting Programme from 2016 to 2018 (Republic of Mauritius, 2018). In the latter, multiple stakeholders from government, civil society and the private sector developed LDN targets for the islands of Mauritius and Rodrigues. The Government Programme 2020–2024, on the other hand, includes broad, unquantified objectives such as: "three new endemic forests will be created and existing ones restored. These forests will be accessible for hiking and nature walk" (Government of Mauritius 2020). Similarly, the draft NLDS proposes policy measures such as "incrementally increasing the amount of land under afforestation, creating biodiversity zones and geoparks managed through public-private and local community partnerships" (Government of Mauritius, 2021). There is thus little evidence of direct LDN targets uptake into government policy. In 2022, the government and United Nations Development Programme (UNDP) country office in Mauritius launched a project titled "Mainstreaming Sustainable

Land Management and Biodiversity in the Republic of Mauritius", aimed towards LDN. This project plans to revisit the existing LDN targets because of inherent deficiencies and lack of completeness. The project is to be nationally implemented by the MAIFS' Forestry Service (UNDP, 2022), which causes PB3 to question why a land management topic is not led by the MHLUP that is mandated for land use planning. In contrast, the country has clear targets for renewable energy (RE), to reach 35 % and 40 % of RE in the electricity mix by 2025 and 2030 respectively, closely monitors housing demand, and is explicitly aiming at reaching the World Bank's high income country category (Government of Mauritius, 2021; WB, 2023).

Finally, the updating of legislations, policies and strategies appears to be affected by significant delays. Besides the cases of the ESA and wetlands legislations addressed in Section 3.1.3 above, a Forests and Reserves Bill was produced as the outcome of a reform project conducted from 2016 to 2019. According to the NR6 (Republic of Mauritius, 2021), "The final draft Forest and Reserves Bill has already been finalised and submitted to the Parent Ministry for endorsement prior to seeking necessary Cabinet/State Law Office approval and enactment through the Parliament". The Bill was expected to be enacted in 2021, but to the authors' knowledge, it has not been presented to Parliament to date. Moreover, the Strategic Plan (2016–2020) for the Food Crop, Livestock and Forestry Sectors (MAIFS, 2016), which provides strategic orientations for biodiversity conservation and protection, does not yet have a successor. Similarly, the new NLDS announced for 2021 (Government of Mauritius, 2020) is yet to be finalized.

3.3. Institutional aspects

3.3.1. Coordination and capacity

Several informants (mainly from the private sector) spoke of coordination challenges apparent among public authorities, regarding land use change processes. In the case of EIA licenses, the evaluation of applications involves at least nine different institutions as part of the EIA committee. These are, as per the Sixth Schedule of the EPA: Permanent Secretaries (or their representatives) of the Ministries responsible for the subjects of: Agriculture, Fisheries and Marine Resources, Health, Housing and Lands, Industry, Local Government, Public Infrastructure, Water Resources, and Waste Water. Each institution, according to its mandate and capacity, must provide comments, clearance, or conditionality for the issuance of a license by the committee. CR1, CR5, and PR6 believed this leads to coordination problems and delays, where it is unclear who will give their opinion first. PR4 and PR5 observed a silo effect, whereby each ministry or authority keeps to its own mandate. For instance, PR5 reported that when approaching authorities for inputs on projects, it was apparent that they did not communicate with each other. Similarly, PR2 reported being "sent around" to different offices and left waiting on multiple occasions, observing a lack of clarity, transparency, and awareness from public officers. PR4 indicated that for projects requiring land use conversion (from agricultural land to other uses), the timeline from the first permit application to final project clearance (including EIA evaluation) can extend up to 33 months, which is material to developers and their business models. According to PR6, the MAIFS consults the same authorities represented on the EIA committee to obtain a conversion license, through a process that is upstream and separate from the EIA mechanism.

These observations could be interpreted as frustration towards lengthy administrative processes, since, as observed by CR4 earlier, nearly all EIA applications eventually succeed in obtaining a license. For CR5, procedures are "long-winded, but they work", and EDB involvement appears to facilitate coordination. The public and private sectors also operate in different conditions; PB3 noted that ministries are generally under pressure to deliver on projects for reporting to the ministry of finance in view of the annual budget preparations, and hence tend to prioritize short term activities over long-term policy measures.

A perceived lack of capacity or resources in public offices was also raised by informants (CA2, CR2, CR4, PB3, PB4, PR1, PR6). For their projects, PR1 and PR6 observed a lack of technical knowledge or expertise to assess the merits of- or to simply enable informed discussions on- proposed methods or technologies which deviated from local guidelines. On the coastal zone, PB4 noted a tendency to favour hard engineering over nature-based solutions (NbS) for the prevention of erosion, demonstrating a lack of knowledge and/or willingness to adopt NbS: in 2022, 3.3 km of coastline have been rehabilitated, works were ongoing for 2 km of coastline in 2023, and the 2023–24 government budget provided for the rehabilitation of another 20 km of shoreline over the next 5 years (Government of Mauritius 2023).

A lack of resources and associated enforcement capacity has even led to the perception of double standard by PR2 and PR6. In their view, large landowners follow strict and lengthy procedures as described above, whereas uncontrolled building (including building on river and mountain reserves, defective drainage, pollution, etc.) are common around the island, as also noted by CA3, CA4, CR3, CR4, CR5, PB2, PR2, and PR3. Despite appearances, however, this contrast may not necessarily demonstrate an actual double standard, as authorities are well aware of illegal constructions (Defimedia, 2018), but that it is the individual and scattered nature of these illegal constructions which renders them difficult to locate and address. This is also partly due to a lack of inspectors for enforcing environmental protection legislation (PB2; Defimedia, 2018). Regarding EIA licensed projects, CR4 was adamant that they are simply too numerous for the ministry's EIA monitoring staff to survey and monitor adequately (see also section 3.5.1.l of the Environment Master Plan (MESWMCC, 2023)).

3.3.2. Stakeholder engagement and participation

Outside of the EIA process, CR2 and CR5 observed that public participation in the public policy planning process is made either through "direct expression" in the media or through open protest and other means. PR2 notes that the radio is a well-used channel for citizens to express their concerns, though often when they already are affected by legislative changes or new projects. CA1 points out that for the authorities, civil society is considered to be CSOs only, and sees the public as having no weight in decision making. The public generally has little access to information about- and knowledge of- complex topics, such as administrative processes and environmental, climate change or socio-economic impacts, especially when these are manifested in the future – a gap that some individuals and organizations are striving to fill, again with limited resources of time, funds and expertise on complex issues related to land use changes (PR2, CA1, CA4, CR5).

In preparing or revising legislations and national strategies, the government generally holds consultations with selected stakeholders. Informants expressed nuanced views on these consultations. CR1, CR3, PR2, PR3, and PR4 shared a general dissatisfaction with the consultation processes, which are often organised on very short notice, with sizeable documentations to be reviewed beforehand, and with poor communication once consultations have taken place. To CA2, CA3, CA4, CR3, CR4, and PR3, consultations often appear to be a tick-boxing exercise, with a sense that decisions have already been made (CA3, CR4), that their inputs are either not taken into account (CR3, PR3) or that they are simply not invited despite their competencies (CA2, CA4). There are, however, exceptions as evidenced by CA2 stressing that the concept of Ecosystem Services has been integrated in the Environment Master Plan through contributions by CSOs. On the formulation of the draft NLDS, consultations were very confidential and solicited a small group of hand-picked stakeholders who were essentially large landowners according to CR2 and PR2, and with CA3 and CA4 deploring the lack of CSOs participation in consultations. CA3 stressed that the participation of their CSO was assumed to represent civil society's views at large. The lack of due consideration to CSO participation was further qualified by CA4 who highlighted that a window of opportunity would only open in 20 years' time (representing the frequency at which the physical development strategy of Mauritius is expected to be updated). Despite

these views, however, we note that a formal communication channel was in fact open for a period of about three weeks to receive the views and comments of the public (GIS, 2021). Then again, one can argue that this time duration was too short for all practical purposes, as is the case discussed above for providing public views on EIAs.

For PR3, the level of engagement and coordination between authorities and other stakeholders largely depended on the officer in charge, as some consultations are well planned and executed. For example, PB3 commended the efforts of the MESWMCC to seek the participation of all stakeholders in defining the Environment Master Plan 2020–2030, through a national consultative process which involved "more than 400 participants from some 200 institutions" in 2019 and "approximately 130 in 2020", from across governmental bodies, parastatal bodies, the private sector, academia, research institutions, experts and practitioners, NGOs, socio-cultural organisations, and CSOs, including gender groups and youth (MESWMCC, 2023). Yet, PB3 voiced that such wide-ranging consultations were difficult to manage to the complete satisfaction of all stakeholders. For instance, the MESWMCC pushed for the contribution of other ministries, but these in many cases requested additional meetings for clarifications, which demanded more time and resources.

At the project level, the EPA requires that EIAs include community consultations in order to, first, explain the ambit of the land use development, and second, to ensure that their concerns and reasonable expectations are taken into consideration (Republic of Mauritius, 2002). According to CR1, these are often bypassed as they mostly yield opposition rather than constructive debates and collaborative solution-finding, leading developers to resort to compensations under the Corporate Social Responsibility (CSR) initiatives that are mandated by law. For PB2, stakeholder meetings generally take an approach of convincing rather consulting; they do not contribute to guiding a project's strategic direction, an observation also made by CR2 and CR4. Similarly, PR6 related that despite the legal requirements, it is easy for promoters to "tick-the-box" on community consultations, especially against a backdrop of increasing barriers for civil society or community groups to challenge land development projects in courts as discussed in Section 3.1.4.

Regarding public participation in policy implementation, monitoring and evaluation, most informants expressed this was not common practice in Mauritius. One reason for this could be the generally weak monitoring and evaluation frameworks that accompany policies, strategies and action plans as mentioned above. Other than for formal complaints, to PR3 and CR5, only individuals who personally know public officers appear to contribute consistently to policy implementation.

4. Discussion: the problem conceptions at play

The governance of the land use and environment nexus in Mauritius expresses different sustainability problem conceptions to varying degrees. Firstly, Mauritius possesses several instruments which govern some of its lands as commons. As per the Mauritian Civil Code (translated from French), "the tracks, roads and streets at the charge of the nation, the navigable or floatable rivers, the shores, lanes and relays of the sea, the ports, the harbors, and generally all the portions of the national territory which are not susceptible to private property, are considered as dependencies of the public domain" (Republic of Mauritius, 1974). The Forest and Reserves Act establishes natural forests, mountain reserves, river reserves, and other nature reserves, though not all of which are public, but generally accessible to citizens as common goods (Republic of Mauritius, 1984). Moreover, Part I, Section 2 of the EPA denotes a shared responsibility for the environment: "It is declared that every person in Mauritius shall use his best endeavors to preserve and enhance the quality of life by caring responsibly for the natural environment of Mauritius" (Republic of Mauritius, 2002). As we have seen in Section 3.1, however, the public who should be able to protect these commons find their field and means of intervention increasingly constrained by successive legislative amendments. Yet, and pending the final ruling of the Privy Council, the recent judgement of the Mauritius Supreme Court in Eco-Sud v the Minister of Environment, Solid Waste Management and Climate Change, has potentially brought a significant precedent in favor of individuals or CSOs in providing more clarity on the conditions for locus standi before the ELUAT (SCM, 2023). Against a backdrop of the historical erosion of the regulatory framework for environmental protection that has been demonstrated in the preceding section, this recent ruling of the Supreme Court will comfort the public and concerned citizens that there is at least a shift in the thinking of the judiciary towards pro-environmental justice in order to protect

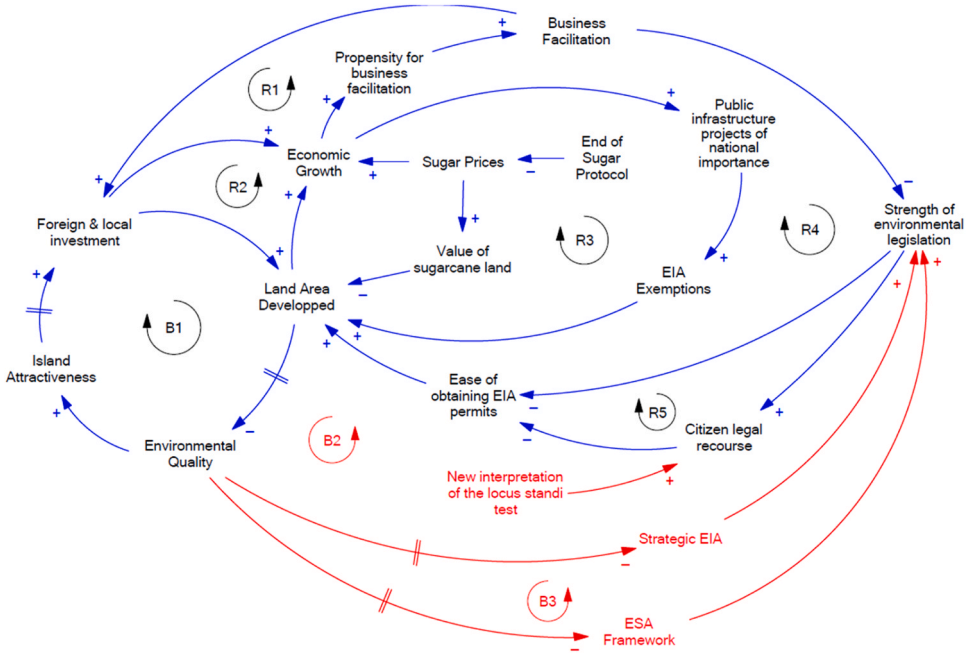


Fig. 7. Main causal relationships promoting and hampering land degradation. (Source: Authors' elaboration).

the natural commons.

Secondly, although the NDS recognizes that the country's natural qualities play a significant role in the wellbeing of its citizens (Government of Mauritius, 2003), this appreciation is largely qualitative, and our results do not suggest the presence of an *economic optimization* problem conception in Mauritius. According to PB4, lack of consideration for ecosystems prevails because their contribution to the national economy is not known. This is acknowledged in the Environment Master Plan (MESWMCC, 2023), which reads: "natural capital is not recognised as an economic and social asset" (section 3.5.1.t of the Masterplan), and "economic valuation of biodiversity is not integrated in the decision-making process" (section 3.5.1.s of the Masterplan). To date, such evaluations have been few and far apart, and were undertaken for specific purposes. For the tourism sector in the context of climate change, it was estimated in 2016 that a projected increase in the mean annual temperature, coupled with beach erosion, could lead to a reduction in tourist arrivals accounting for a revenue loss of up to USD 50 million by 2050. Indeed, erosion has shrunk the width of beaches around certain coastal areas by up to 20 m over the last few decades (Republic of Mauritius, 2016b). In a preparatory study for the NBSAP, a valuation of ecosystem services was carried out for the Mare Longue and Mare aux Vacoas (two of the island's freshwater reservoirs) catchments under different management scenarios. In the basic management scenario, these water catchment ecosystems would provide a total of 2.8 billion Mauritian Rupees (approximately USD 63 million) in economic benefit over a 25-year period using a discount rate of 3 % (Republic of Mauritius, 2017b). To the authors' knowledge, no other monetary evaluations have been undertaken since. Yet, even for these sporadic studies, it remains unknown how their results have been capitalized in an integrated policy planning process for building resilience in the tourism and water sectors. The 2013 results of ecosystem natural capital accounting (ENCA) for the island of Mauritius introduced the concept of ecological debt by quantifying losses of natural capital in bio-physical terms (IOC, 2014), but did not produce monetary evaluations that would have enabled a commensurate comparison of benefits derived from nature and those derived from economic activities, which might have informed economic optimization (Mandle, et al., 2021).

In contrast, our results instead point to a dominant paradigm of *financial maximization*, through accelerated development promotion in the context of a weakening sugar industry (see Supplementary Materials), and the removal or bypass of environmental safeguards over time. Fig. 7 integrates our findings into causal relationships in order to better explain the land use change dynamics. It shows a series of reinforcing dynamics favoring land use changes for infrastructure and real estate development that are counteracted by very few balancing mechanisms. The overwhelming number of reinforcing dynamics explains the overall trend in the degradation of the natural environment and ecosystems.

Reinforcing loops are summarised as follows:

1. The pursuit of economic growth is driving business facilitation to attract investment.
2. Investment in land development contributes to economic growth and the reinforcing loop R1.
3. Economic growth enables public infrastructure projects of national importance which may be EIA exempt, leading to more land development.
4. Business facilitation incurs a weakening of environmental legislation, by increasing the ease of obtaining EIA permits and removing barriers to land development.
5. Constrained citizen legal recourse contributes to the ease of obtaining EIA permits and reinforcing loop R4.

Currently, only one balancing loop may be conceived: land development may over time (i.e., with delay) negatively affect the quality of the island's environment, its attractiveness to investors, and thus FDI and other revenues (B1). Additional balancing loops (in red) may appear upon adoption of the Strategic EIA within the EPA (B2) and the proclamation of an ESA legislation (B3), with an anticipated effect of curtailing the granting of EIA licenses, or at least raising the bar of stringency and scrutiny. Finally, a new interpretation of the locus standi test may improve the conditions of citizen's legal recourse for the protection of nature.

Thirdly, the country to some extent adopts a *compromise* problem conception, as it strives to facilitate economic activities while attempting to manage environmental impacts through the EIA process, albeit limited to the project level. Unfortunately, this approach coupled with a loose application of national policy on land use changes has resulted in a systematic erosion of ecosystems including ESAs. In cases of EIA exemption, there is no compromise. Encouragingly, the recently published Environment Master Plan makes relevant policy recommendations in this context, though their implementation may be limited by the MESWMCC's policy mandate. The new draft of the Environment Protection (Amendment) Bill might reintroduce the Strategic Environment Assessment (SEA) and introduce the ESA clearance permit, thus enabling a more robust compromise approach in the future.

Finally, *prioritization* does not seem to be a prevalent concern in Mauritius within the land use – environment nexus. On the contrary, progress in both fields is evidently opportunistic; the state and economic actors seek to attract investors that will unlock various land use change projects, and the Environment Master Plan lists an array of interventions in the short, medium, and long term without specifying priority areas nor explicitly adopting a strategic approach whereby initial steps would enable subsequent ones using a precautionary approach. Considering this study's results, Mauritius arguably lacks the capacity, resources, and political will at present to prioritize Land Degradation Neutrality or the reversal of nature loss, despite externally led initiatives in this direction. Remarkably, there does not exist a land use land cover map that is regularly updated (BEA, 2022), which could be overlaid with additional spatial data such as ESAs, biomass, or soil quality to facilitate decision-making. A geospatial approach to territorial planning could also include an assessment of how proposed land use changes in the updated NLDS would interact with current and future climate change and climate variabilities. Notwithstanding that concurrent climate events may compound each other; these events can be further amplified by non-climate hazards such as inappropriate land use planning (Boodoo and Deenapanray, 2021). Furthermore, organizational structures could hinder effective prioritization unless the responsibility is assigned to an institution with a prominent role within the government hierarchy. The recently established *Maurice Stratégie* ("Strategy Mauritius"), an organization responsible for cross-sectoral policy research under the Ministry of Finance, Economic Planning, and Development, may be well-suited for this role (mauricestrategie.org, 2023).

5. Conclusion

This study indicates that the sustainability problem conception of Mauritius relative to land use and the environment consists of weak commons and compromise approaches. Economic optimization and prioritization approaches were not observed, as the governance apparatus appears to systematically facilitate the removal of environmental safeguards in favor of revenue-generating land uses. These findings expose the shortcomings of various actors, public and private, in preserving and restoring ecosystems as per SDG 15 (UNDESA, 2023), the UN Convention on Biological Diversity (CBD, 2022), and the UN Convention to Combat Desertification (UNCCD, 2024).

In this context, the authors recommend the timely introduction of the Environmentally Sensitive Areas legal framework, that of the Strategic EIA under the Environment Protection Act, as well as the strengthening of citizen participation and recourse mechanisms. A strong legal and regulatory framework is a necessary policy instrument for regulating land use changes that are a dominant driver of nature loss. Necessarily, the enforcement of legislation is key, which, in turn, requires that non-

state watch dogs have access to the legal system to protect nature. This is critical since the Constitution of the Republic of Mauritius confers no rights to the environment. In addition, government should institutionalize targets that are consistent with the above-cited UN Conventions in order to promote nature-positive land uses, and to integrate and mobilize adequate resources for implementation and enforcement. Citizen participation should be encouraged at multiple stages in the integrated policy planning process, which has been shown to be weak in Mauritius. The above Conventions, as well as the United Nations Convention on Climate Change, are incentivizing Parties to take a long-term view (e.g. 2050 and beyond) on the planning process for achieving sustainability. Such long-term planning, in addition to requiring new approaches to scenario modeling, should be built on the formulation of a coherent long-term development vision for the country. Hence, the broad public should contribute to the process of developing this long-term vision, wherein the prevailing development paradigm should be questioned, and new alternatives proposed.

At this development paradigm level, given the observed dominance of financial maximization, it is proposed that spatialized natural capital accounting and monetary valuation of ecosystem services may provide commensurate data on the benefits derived from ecosystems and those derived from economic activities. These would offer useful insights to legislators and policymakers to support economic optimization while understanding the contribution of common pool resources to ecosystem services (Tucker, et al., 2023), and in turn inform science-based compromise (Damania, et al., 2023) and prioritization as advocated by Visseren-Hamakers et al. (2022), leading to nature-positive land use policy at multiple geographical and time scales. This approach will serve multiple objectives, namely: (i) to provide an evidence-based approach for informing discussions for a long-term national development vision; (ii) supporting land developers with a tool to carry out scenario analysis (including benefit-cost analysis) of alternative land use changes that take into account the valuation of ecosystem services; and (iii) to squarely contribute towards the objective of developing a new macro-economic model of development that takes into account the contribution of natural capital in national wealth creation as proposed in the Environment Master Plan 2020–2030. At the operational level, year-on-year natural capital accounting and monetary valuation of ecosystem services can provide multiple spatialized land use change indicators (e.g. those used for setting LDN targets) that can be used for policy formulation, implementation, and monitoring and evaluation.

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Declaration of Competing Interest

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Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.landusepol.2024.107332.

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