SUPPLEMENTARY MATERIAL TO: Mbopha et al. S Afr J Sci. 2021;117(9/10), Art. #8666.

HOW TO CITE:
Mbopha MS, Marais C, Kleynhans TE, Esler KJ. Unlocking and securing ecological infrastructure investments: The needs and willingness to invest and institutional support mechanisms used [supplementary material]. S Afr J Sci. 2021;117(9/10), Art. #8666. https://doi.org/10.17159/sajs.2021/8666/suppl

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Appendix 1: The systematic review protocol to define the objectives of the review, review questions, criteria for inclusion and exclusion of sources and keywords.

Research question

How to unlock and secure ecological infrastructure (EI) investments through policy framework and partnerships with private landowners?

Eligibility criteria

Peer-reviewed journal articles and grey literature reports written on partnership investments made to support EI maintenance and restoration. Sources covering these key aspects: (1) developmental need for EI investments, (2) desire from private landowners to cooperate, or (3) policy support to encourage EI protection cooperation.

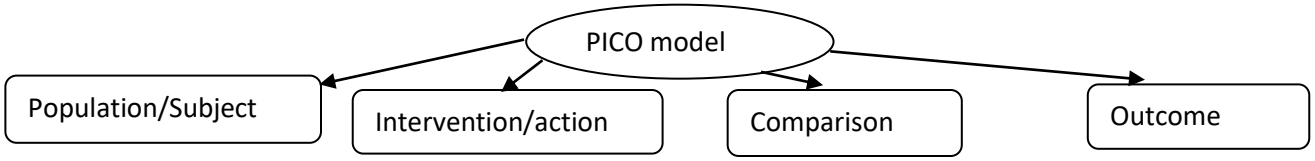
Search strategy

Key concepts:

1. Ecological infrastructure
2. Investments
3. Policy framework

PICO model

Of the search strategy models/tools available (e.g. SPICE, ECLIPSE, SPIDER), a PICO (Population/problem, Interventions, Comparison, Outcomes) model was chosen to break down the search words and enable the researcher to define the qualitative research question and lay the pathway for a systematic search strategy.[1]



Sources

Science Direct, Scopus, Web of Science and Google search engine.

Searching other resources: Snowballing was conducted to add more studies, relevant reviews, reports, and other grey literature for relevant references.

Validity

Include the sources that document collaborative partnerships towards EI maintenance and restoration. Exclude non-English papers. No restriction on publication year due to the newness of the EI concept.

Data extraction and management

A customised PRISMA workflow was used to screen studies. This process was used to review the titles, abstracts, and keywords. Irrelevant studies were excluded after reading the titles and abstracts and on indication that they did not meet the inclusion criteria described above. Relevant articles proceeded to the full review.

Data analysis

A mix coding approach was conducted deductively and inductively; the former to code (1) developmental needs of EI investments, (2) desires to invest and (3) policy support mechanisms. The latter to extract ideas found in order to generate the emerging theory from the literature. Atlas.ti was used for qualitative analysis.

Appendix 2: Details of sources analysed to answer research questions posed in the review. This database was used in the qualitative systematic literature review in order to synthesise the ecological infrastructure investment needs, willingness to invest and institutional support mechanisms at a global scale.

Author(s)	Year	Location	PICO	Study type	Ecological infrastructure investment needs or drivers	Ecological infrastructure investment desire, willingness, contribution and capacity (public and private landowners)	Policy dimension and other supporting institutional mechanisms
Davis and Gartside[2]	2001	Australia	Intervention	Survey	Curb the overexploitation and destruction of important marine assets in industries such as fishing and tourism.	Not defined	Economic instruments for managing marine natural resources and financial incentives for conserving the environment. These differ from the traditional approaches which only emphasise application of compliance regulations and command and control measures to resolve natural resources problems.
Verbič and Slabe-Erker[3]	2008	Slovenia	Willingness	Analysis	Not defined	Determinants of willingness-to-pay include the respondent's income, the frequency of visiting the environmental goods, attitude to environmental goods.	Not defined
Yang et al.[4]	2010	Australia	Outcome	Survey	Not defined	The innovative use of market-based approaches to government investment in conservation has made substantial advances towards improved cost-effectiveness	Government investment programmes; agricultural stewardship schemes and payments for ecosystem services aim to motivate conservation actions on private land to generate substantial public benefits, often occurring off-farm or downstream.
Primdahl et al.[5]	2010	UK	Policy	Reviews	Paying directly for a clean and diverse environment.	Not defined	Agri-environment schemes (AES) are designed to address protection, maintenance, and enhancement of natural resources (water and soil), biodiversity (species and habitats) and landscape values.
Moon and Cocklin[6]	2011	Australia	Comparison	Perspective	Not defined	Landholders' decisions to participate depended on the level of formal biodiversity protection, potential changes to their property rights, personal benefits of participation, conservation, production, financial and experimental imperatives.	Market-based economic instruments should be used when there is a commitment to conservation by the landholders and programme administrators and sufficient funding. Voluntary and economic policy instruments can be used to stimulate participation and to reduce the creation of perverse ecological outcomes.

Author(s)	Year	Location	PICO	Study type	Ecological infrastructure investment needs or drivers	Ecological infrastructure investment desire, willingness, contribution and capacity (public and private landowners)	Policy dimension and other supporting institutional mechanisms
Schroeder et al.[7]	2013	England	Outcome	Perspective	Lessen biodiversity deterioration, soil erosion, greenhouse gases and project water quality due to agri-intensification.	Willingness was influenced by demographic, business and environmental features (age, education, size and type of a business/farm ownership).	The government financially supported environmental conservation through AES – a results and efficiency-driven approach.
Duke et al.[8]	2013	US	Intervention	Review	To enhance social benefits to deliver enough ecosystem services	Not defined	Conservation policy was used to incentivise landowners to protect endangered species habitat, control erosion, improve water quality, enhance riparian buffers, and expand wetlands.
Franks and Emery[9]	2013	England	Intervention	Perspective	Not defined	Environmental Stewardship Scheme (ESS)	ESS was used to improve collaboration between local authorities, communities, statutory agencies, the voluntary and private sectors, farmers, land managers, and individual citizens to create Ecological Restoration Zones.
Zammit[10]	2013	Australia	Intervention and subject	Empirical	To restore and maintain endangered ecological communities	Incentives for private landowners to engage in active biodiversity conservation measures through cost-effective investments of public funds and build capacity to be effective conservation managers.	The Forest Conservation Fund and the Environmental Stewardship Programme were funded by the government to target endangered ecological communities and secure contracts, landowners, to improve habitat condition.
Pettersson and Keskitalo[11]	2013	EU/UK	Intervention	Policy analysis and review	Protection of biodiversity in general due to climate change, and a desire to halt biodiversity losses.	Not defined	Rules, regulations, substantive provisions that restrict access to, or prohibit the use of designated habitats and control activities.
Lapeyre et al.[12]	2015	France	Policy	Analysis	Protect and deliver ecosystem services.	Farmers were encouraged to protect and generate ecosystem services through market-based conservation instruments (MBCIs).	Compensatory mitigation, biodiversity offsets, mitigation banking, habitat banking, species banking, wetlands mitigation, are MBCIs for ecosystem services and compensation for damages from development.
Froger et al.[13]	2015	France	Comparison	Analysis and comparison	To restore and protect wetlands, species, habitats, ecosystem services or functions.	Not defined	Biodiversity banks have been developed to provide biodiversity units or credits to offset environmental damage caused by economic development.

Author(s)	Year	Location	PICO	Study type	Ecological infrastructure investment needs or drivers	Ecological infrastructure investment desire, willingness, contribution and capacity (public and private landowners)	Policy dimension and other supporting institutional mechanisms
Yeboah et al.[14]	2015	USA	Willingness	Empirical	Mitigate non-point source (NPS) pollution in a catchment.	Willingness to participate in agri-environment programmes was positively related to farm size, educational attainment, farmer's interest and/or experience with conservation, environmental attitudes, access to and quality of information, perceived financial and farm-level related benefits.	Payments for environmental services (PES) were introduced by the government to encourage best management practice adoption for catchment protection and to control NPS pollution and agricultural run-off.
Glumac et al.[15]	2015	Netherlands	Intervention	Empirical	Limitations to public funding	Not defined	Public–private partnerships have led to governments inviting the private sector into various long-term arrangements for capital-intensive projects.
Bremer et al.[16]	2016	Latin America	Intervention and outcome	Empirical	To promote long-term catchment conservation with multiple benefits for biodiversity and human well-being.	A legal mechanism catalysed participation.	Public funding secured through legislation provided the most funding; private sector, NGO, and development bank sources also supported
Russi et al.[17]	2016	Germany	Policy	Perspective	Not defined	Farmers were motivated to join the scheme by monetary incentives and ethical reasons.	Result-based agri-environment measures to stimulate and improve the conditionality and efficiency of the use of CAP funding for environmental land management. They differ from action-based measures.
Mcwilliam and Balzarova[18]	2017	New Zealand	Intervention	Empirical	Alleviate farming environmental impacts on terrestrial and freshwater ecosystems.	Farmers developed EI conservation policies with support from government-due to NGOs and public concerns.	The government encouraged the best farming practice through regulatory enforcement.
Galbraith et al.[19]	2017	Costa Rica	Intervention	Perspective	Land-use and cover (LUC) change is a major driver of ecosystem services loss worldwide.	Not defined	Policymakers had designed conservation strategies that incentivised maintenance of LUC, ecosystem services provision and poverty reduction.
De Krom[20]	2017	Belgium	Intervention	Perspective	Sustainably integrate environmental production in agricultural business development.	Farmers participated in AES to enhance the long-term viability of their agricultural businesses through cooperatives and, bridging social ties with other stakeholders.	Farmers were incentivised for conserving and enhancing the environment through Common Agricultural Policy (CAP)
Weikard et al.[21]	2017	Hungary	Intervention and outcome	Perspective Theoretical Analysis	Mitigate flooding risk due to climate change	Farmers' willingness to have their lands included in a conservation programme depended on the compensation they will obtain.	A proposed new compensation scheme consisted of an unconditional annual payment and a reparation payment conditional on flooding.

Author(s)	Year	Location	PICO	Study type	Ecological infrastructure investment needs or drivers	Ecological infrastructure investment desire, willingness, contribution and capacity (public and private landowners)	Policy dimension and other supporting institutional mechanisms
Piffer Salles et al.[22]	2017	Brazil	Policy	Analysis	To generate ecosystem services to meet human needs, reduce carbon emissions and maintain biodiversity.	The willingness was driven by the use of incentive-based economic instruments.	Reduce Emissions from Deforestation and Forest Degradation (REDD+) was used to provide economic incentives for the adoption of forest-based mitigation measures against global climate change.
Harrington and Hsu[23]	2018	US	Intervention	Empirical	Address storm-water management challenges	Government and non-profit organisations collaborated to provide the funding to experiment green infrastructure technologies.	The government led green infrastructure through policy and political support and NGOs provided information
Feng et al.[24]	2018	China	Intervention	Empirical	To protect catchment ecosystem services	Compensation was used to motivate local farmers to contribute to the conservation initiative.	Ecological compensation regulations and laws as well as environmental awareness for EI protection.
Zhang et al.[25]	2018	China	Outcome	Empirical	Mitigate drought caused by climate change scenarios.	Farmers voluntarily developed adaptation strategies to manage threatened water resources.	Public-Private Partnership (PPP) mechanism raised Ecological Infrastructure funding. The government launched policies to protect water resources and investment in water infrastructures.
Sheremet et al.[26]	2018	Finland	Intervention	Empirical	Mitigate risks from invasive forest pests and diseases	The willingness of the general public to fund a PES scheme depended on benefits from a forest	The policy designers encouraged spatial coordination in the uptake of PES-type contracts to deliver control measures on disease, risks and maximise social benefits
Riley et al.[27]	2018	UK	Outcome and intervention	Perspective, theoretical	Not defined	Not defined	To encourage more joined-up thinking by offering payments to farmers to form collective agreements for conservation.
Hardy et al.[28]	2018	Australia	Policy review	Empirical	Protecting biodiversity on private land	Revolving funds were used by conservation organisations to buy, resell and permanently protect private land with important ecological values.	Conservation organisations used 'revolving funds' to acquire private land with high conservation value and then resell it to new owners, adding an in-perpetuity conservation covenant or easement. The agreement permanently restricts activities harmful to biodiversity.
Nielsen et al.[29]	2018	Vietnam	Need and willingness	Empirical	Establishment of plantations, abstinence from logging a plot of mature plantation trees or refrain from cutting indigenous hardwood trees.	Willingness to engage in contracts was motivated by compensation	REDD+ social safeguards promoted the improvement of local communities' livelihoods.

Author(s)	Year	Location	PICO	Study type	Ecological infrastructure investment needs or drivers	Ecological infrastructure investment desire, willingness, contribution and capacity (public and private landowners)	Policy dimension and other supporting institutional mechanisms
Arnott et al.[30]	2019	England	Intervention	Empirical	Promote 'greening', 'sustainability' and 'ecosystem services' approaches to land management.	Environmental, economic and social benefits of result-oriented schemes outcomes drive willingness. Factors such as climate change, the behaviour of neighbouring farmers and the breeding, feeding, and migration patterns of mobile species all have the potential to influence willingness to participate.	Used action-based AES as a delivery mechanism for ecosystem services

Note: The listed studies exclude sources which could not answer the research question. The studies are ordered by publication date.

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