

Five-dimensional Strategic Environmental Assessment (SEA) Action Framework Toward Sustainable River Basin Management Under Climate Change

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Abstract. Although strategic environmental assessments (SEA) for river basin management are being implemented in many countries, there is considerable variation in approaches, institutional arrangements, impact assessment tools, scope, and procedures. Moreover, the extent to which SEA addresses sustainability and is anchored in the United Nations Sustainable Development Goals (SDGs) depends on various factors, particularly the impacts of climate change. This research proposes an SEA action framework for sustainable river basin management under climate change with the integration of the SDGs' five dimensions People, Planet, Prosperity, Peace, and Partnership (5Ps). A selection of SEA tools to assess the impacts of climate change along the 5Ps is presented. A systematic literature review and content analysis are carried out to establish the SEA action framework and identify the SEA tools. A systematic literature review and content analysis was conducted, e.g., of peer-reviewed research publications and publicly available information and guidance documents, to establish the SEA framework for action and identify SEA tools. The proposed framework provides more comprehensive and applicable SEA for sustainable river basin management and for assessing the potential impacts of climate change.

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1. Introduction

Recent decades have witnessed worsening water shortage, inequitable water distribution, and water disasters as a result of climate-induced extreme weather events despite attempts by governments to invest in sustainable water resources management and technology [1, 2]. The European

Union (EU) has been paying attention to mainstreaming climate change into its policies since it launched the European Climate Change Program in 2005, which focuses on impacts and adaptation. Climate change is also part of the Flood Risk Management Directive; it is one of the main issues to be considered when Member States carry out an initial flood risk assessment and prepare the risk management plans. Similarly, climate change must be taken into account in water management planning in relation to droughts and water scarcity [3]. Besides, now included in the United Nations (UN) 17 Sustainable Development Goals (SDGs), are two SDGs aiming at tackling water-related issues (i.e., SDGs 6 and 14) [4]. As a result, climate change and its potential impacts should be taken into consideration in the management of water resources.

Strategic environmental assessment (SEA) is a process for evaluating the environmental implications and the sustainability of a proposed policy, plan or program (PPP); and provides means for exploring cumulative effects and adequately address them at the earliest stage of decision making along economic and social considerations [5-7]. This practice has begun in the United States, particularly in the state of California, and expanded to countries such as Australia, Canada, and New Zealand, as well as in the EU. For the SEA river basin district, the European Commission [8] has stated that the SEA directive should be considered in the implementation of the Water Framework Directive for river basin management plans.

Although more and more countries are implementing river basin management in the form of SEA, the extent to which SEA addresses sustainability and achieves the intended SDGs goals depends on a variety of factors in each area, including the skills available among practitioners, the flexibility afforded by decision makers, a range of assessment tools available at SEA, and the existing guidance documents [9-16]. There are very few guidance documents that thoroughly consider the risks of climate change because management of supply, demand, and interrelationship between emissions in different areas and the effects of

climate change (e.g., extreme floods and droughts) are vary considerably with location. [17-21]. There is no single assessment tool that is ideal for all SEA, so there is a need to develop a specific and comprehensive guide, especially in countries that do not yet have a SEA guide for a specific sector such as river basin management [22].

The traditional concept of sustainable development originated around three decades ago is still a goal setting for a country development [23]. The same sustainability concept has also been implemented in the SEA, even though the SEA concepts and applications have evolved rapidly over the past decade [24]. Most SEA guidance conceptually addresses the climate change but does not provide a comprehensible concept that allows extensive analyses on the sustainable aspect of the SEA process [22, 25, 26]. A recently proposed 5 dimensions of the SDGs, the United Nations Agenda: People, Planet, Prosperity, Peace, and Partnership (5Ps), provides a comprehensible concept that allows extensive analyses on the sustainable aspect of the SEA process.

The aims of the five dimensions (5Ps) are as follows: Planet (Natural Resources): To protect natural resources and climate for the current and future generations; People (Livelihood): To improve livelihood and end poverty and to ensure equal access to healthcare and education; Peace (Social and Institutions): To foster peaceful, just and inclusive societies, with priority given to humanitarian issues arising from water scarcity, inequitable water distribution, and water use; Prosperity (Economy and Technology): To ensure that all people can lead prosperous and fulfilling lives in harmony with nature; and Partnership (Participation): To prioritize the needs of the poorest and most vulnerable with the participation of all stakeholders and all people [4].

Specifically, this research proposes an SEA action framework for sustainable river basin management under climate change along the five dimensions of the UN SDGs: People, Planet, Prosperity, Peace, and Partnership (5Ps). A selection of corresponding SEA tools to assess the potential impacts of climate change on river basins is provided together with the proposed framework. This makes it more comprehensive and applicable for assessing the potential impacts of climate change on river basins. Especially in those countries that do not yet have a specific guide for river basins.

2. Research Methodology

This research conducts a systematic literature review and content analysis to establish an SEA action framework for sustainable river basin management under climate change. Abbreviations that are used throughout the manuscript were listed in Table 1. The articles that meet all inclusion criteria as follows Table 2 will be included in the review process. The SEA actions for sustainable river basin management and the available SEA tools were abstracted.

The reviewed literature includes peer-reviewed research publications (69) and publicly available information

and guidance documents (24), totaling 93 publications and documents. The publications and guidance documents are in the field of the impacts of climate change on river basins (18), sustainable river basin management (22), SEA process (27), and SEA tools (26).

The peer-reviewed publications are retrieved from citation databases of the Web of Science, Elsevier's Scopus, and Google Scholar [25]. No date restrictions are imposed on the search such that the search results are comprehensive and illustrate the current and the increasing relevance of the topics. The publicly available information includes climate change reports, legislation, SEA guidance documents, and guidance documents on sustainable river basin management. The reports and guidance documents are published by local and international institutions, such as the United Nations (UN), United Nations Development Program (UNDP), European Union (EU), Organization for Economic Cooperation and Development (OECD), the World Bank Organization, the Intergovernmental Panel on Climate Change (IPCC), the U.S. National Environment Management Authority (NEMA), the U.S. Environmental Protection Agency (EPA).

Abbreviations	Description
5Ps	People, Planet, Prosperity, Peace, and Partnership
EPA	U.S. Environmental Protection Agency
EU	European Union
IPCC	The Intergovernmental Panel on Climate Change
NEMA	U.S. National Environment Management Authority
OECD	Organization for Economic Cooperation and Development
PPP	Policy, Plan or Program
SDGs	Sustainable Development Goals
SEA	Strategic Environmental Assessments
UN	United Nations
UNDP	United Nations Development Program

Table 1 List of abbreviations used in the manuscript.

The relevant keywords	Inclusion criteria
Climate change impacts on river basins	Describes the impacts of climate change on risks to human society and natural ecosystems in river basins that are expected to be increasingly disruptive in the coming decades. e.g., change of seasons and extreme events (floods and drought).
Sustainable river basin management	Describes components, plans, or activities contribution to sustainable river basin management.
Strategic Environmental Assessment	The current concept and process of SEA from various national guidance documents and SEA Processes that support climate change.
Tools of SEA	Tools or methods that used in current SEA process from various national guidance documents and capable of addressing climate change.

Table 2 Inclusion criteria for material eligibility

Fig. 1 shows the research scope and the proposed 5P-based SEA framework for sustainable river basin management. The proposed SEA action framework is developed by integrating the five dimensions of the UN

SDGs (People, Planet, Prosperity, Peace, and Partnership) into the four phases of the SEA process; implementing the SEA; informing and influencing decisions; and monitoring and evaluation [27], to formulate the 5P-based SEA action framework for sustainable river basin management.

The impacts of climate change and their corresponding SEA tools to assess and predict the impacts of climate change on river basins are gathered, classified, and presented with the proposed framework by searching peer-reviewed publications and general guidance documents for the common tools that were mentioned frequently that are capable of assessing climate change impacts on river basins [1, 18, 24, 28-32].

The SEA tools for assessing and predicting the impacts of climate change on river basins are summarized and categorized into two groups: qualitative and quantitative SEA tools. The SEA tools will be selected according to the 5Ps of *identify and predict potential impacts* task as part of the second SEA phase (i.e., implementing the SEA). illustrates the scope of this research and the proposed 5P-based SEA framework.

3. Results and Discussion

The review of 93 peer-reviewed research publications and publicly available reports and guidance documents reveals three essential findings. First, the major impacts of climate change on river basins include unprecedented floods and severe droughts [18, 21, 33-36], consistent with the IPCC reports. An increasing number of studies have attached greater importance to climate change-induced extreme weather events and the SEA process [19, 37, 38]. Furthermore, governments have increasingly integrated SEA into the policy, plan or program preparation process from the early stages [10, 39].

Second, most of the general SEA guides for some countries that do not have river basin SEA guidance are too general to apply. It is complicated to identify the SEA tasks or activities associated with the various phases of the SEA process [22, 40, 41]. Besides, there exists no discussion in the current guidance documents as to the applicability of the SEA tools to assessing the potential impacts of climate change [42-44].

Third, similar to the general SEA guidance documents, those pertaining to river basin management (i.e., specific guidance documents) are too generic to be of use. In addition, a lack of uniformity exists between the national-level, regional-level, and area-specific SEA guidance documents. For that reason, the SEA activities and tool selection are largely predicated on the subjective views and experiences of practitioners at different levels [45].

Table 3 presents the 5P-based SEA framework for action for sustainable river basin management. It serves as a guide for the formulation of sustainable river basin policy. It should be noted that the 5P approach may also be applicable to other resource-related PPPs for areas experiencing conflict or resource stress and scarcity. It lists the 5P-based activities associated with the four SEA phases for sustainable river basin management.

In the first phase (i.e., establishing the context for the SEA), SEA practitioners examine relevant data on sustainable river basin management along the 5P dimensions (People, Planet, Prosperity, Peace, and Partnership); and identify all stakeholders. The practitioners then collaborate with the stakeholders to establish the SEA goals, with greater importance attached to natural resources at risk and the most vulnerable groups of people. If possible, there should be participation at the initial phase, requiring consultation and updating by the parties. This would lead to more open and transparent decision-making, greater representativeness, and early identification of conflicts to reduce the risk of litigation by affected stakeholders. This in turn would help avoid delays in implementation [27, 46].

The second phase (implementing the SEA) involves gathering historical data on floods, droughts, extreme weather events as well as water demand. The observed (historical) data are used to determine the levels of water stress and to project the potential impacts of climate change on river basins. The mitigation strategies are subsequently formulated (i.e., measure identification). Early warning systems and water-sensitive urban planning or redesign through more effective policies, multilevel flood and drought models, and data-driven water quantity and quality models are new technologies that increase the effectiveness of mitigation strategies [47]. In addition, coordination and collaboration with local governments is essential for an effective response to climate change adaptation development [48].

The third phase (informing and influencing decision) entails making recommendations to the decision makers under three scenarios: (i) with the existing water infrastructure, (ii) with improved water infrastructure, and (iii) with new water infrastructure in addition to the existing one. The recommendations should be formulated along the 5P dimensions.

In the fourth phase, monitoring and evaluation mechanisms are put in place to minimize the environmental impacts from the implementation of the policy, plan, or program; and to ensure the SEA goals are materialized. The mechanisms enable the timely identification of negative impacts and implementation of corrective action.

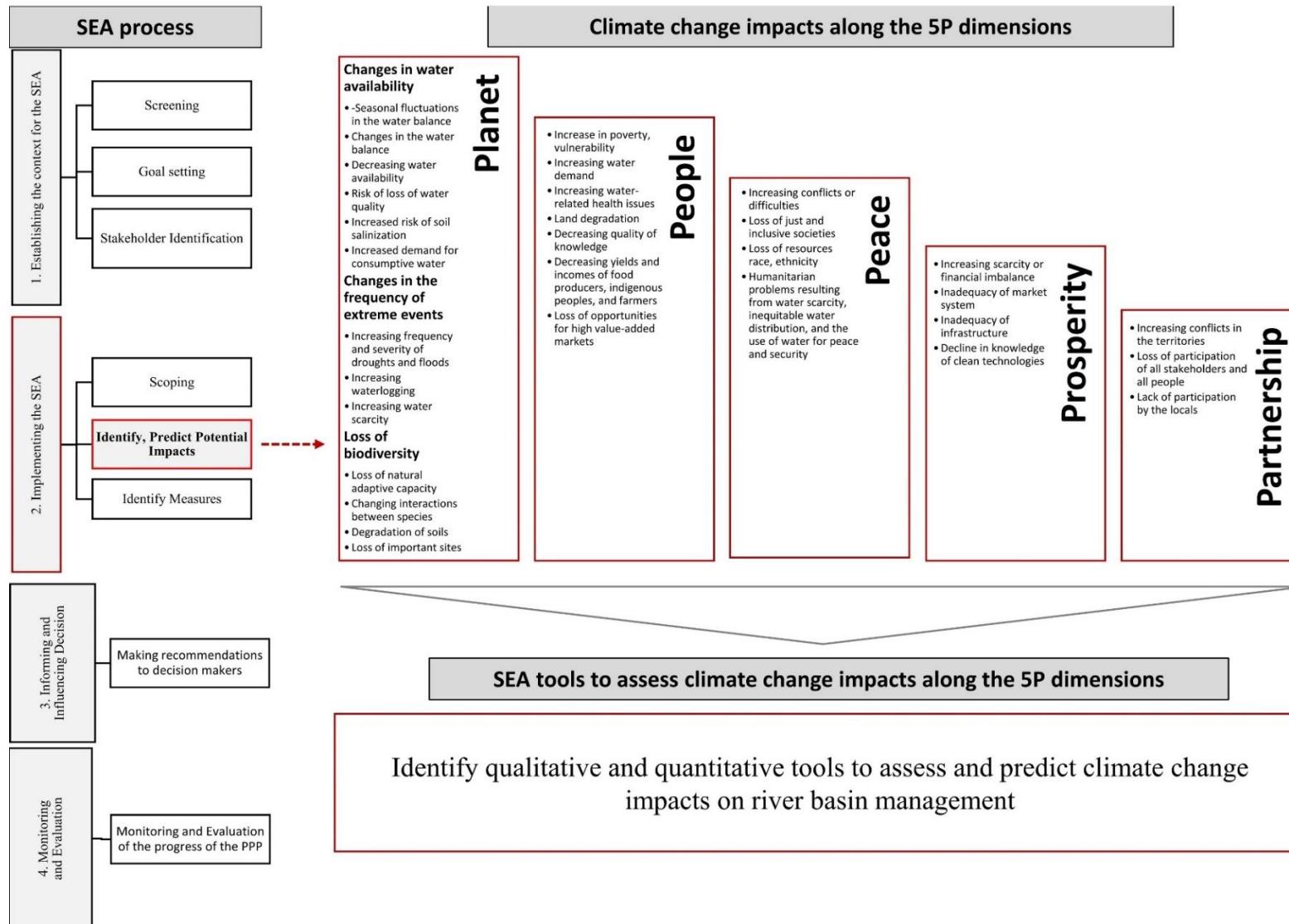


Fig. 1 The research scope and the proposed 5P-based SEA framework for sustainable river basin management.

SEA Process	Sustainable river basin management activities					References
	Planet (Natural resources)	People (Livelihood)	Peace (Social and institutions)	Prosperity (Economy and technology)	Partnership (Participation)	
	Screening	* Screen for natural resources to protect for present and future generations.	* Gather data on livelihoods and accessibility to healthcare and education.	* Determine conflicts in societies and humanitarian issues arising from water scarcity or floods, inequitable water distribution, and water use.	* Find out whether people lead prosperous and fulfilling lives where economic and technological progress occurs in harmony with nature.	* Gather data on the poorest and most vulnerable with the participation of all stakeholders and all people.
	Goal setting	* Ensure availability and sustainable management of water for all; and take action to mitigate climate change and its impacts.	* Protect the poorest and most vulnerable from inequitable water distribution, water-related natural disasters, and climate-induced extreme weather events.	* Foster peaceful and inclusive societies for sustainable development; to provide access to justice; and to build effective, accountable, and inclusive institutions at all levels.	* Promote sustainable economic growth and access to affordable, reliable, sustainable water use.	* Encourage active participation and build a good rapport.
	Stakeholder Identification	* Identify vulnerable natural resources.	* Identify people affected by inequitable water distribution, water-related natural disasters, and climate-induced extreme weather events.	* Communicate to stakeholders the goals of SEA in the context of the proposed policies, plans or programs (PPP). * Take account of the water resources development priorities.	* Identify direct economic loss attributable to water-related disasters in relation to global gross domestic product (GDP).	* Identify and engage stakeholders who are the most exposed to inequitable water distribution, water-related natural disasters, and climate-induced extreme weather events. * Brainstorm and inform SEA proposal to solicit comments and concern affected stakeholders and relevant parties.

SEA Process	Sustainable river basin management activities					References	
	Planet (Natural resources)	People (Livelihood)	Peace (Social and institutions)	Prosperity (Economy and technology)	Partnership (Participation)		
Phase 2: Implementing the SEA	Scoping	<ul style="list-style-type: none"> * Identify baseline data: hydrological data of river basins, physiography, climate, geology, and forests. * Identify key problems or sensitive areas, critical habitats, and valuable ecosystem components. * Identify the proportion of water bodies with good water quality. * Identify the proportion of forest land to total land area. * Identify the proportion of areas important for terrestrial and freshwater biodiversity. * Identify the proportion of degraded areas to total land area. * Identify the proportion of protected areas important for biodiversity. * Identify the proportion of wildlife that is poached or illegally traded. 	<ul style="list-style-type: none"> * Identify demographics such as fertility, mortality, household size, population density, education, and health. * Identify the number of deaths, missing persons, and those directly affected by water-related disasters. * Identify the proportion of population living below poverty line and/or without access to consumptive water. * Identify the proportion of population with secure property rights. * Identify livelihoods of river basin communities and source of income. 	<p><u>Society</u></p> <ul style="list-style-type: none"> * Identify cultural, religious structures and ethnic groups. * Identify land use and common property. <p><u>Institution</u></p> <ul style="list-style-type: none"> * Ensure that the objectives of the PPP are consistent with the country- and/or region-level river basin management policy. * Establish a specific and realistic timeframe. * Establish a management team/steering committee and appoint an SEA coordinator/manager. * Identify the extent of integrated water resources management. * Identify related government agencies, laws, and human rights. 	<p><u>Economy</u></p> <ul style="list-style-type: none"> * Determine the annual growth rate of GDP per capita. * Determine the percentage of individuals aged 15-24 who receive no formal education. * Determine the percentage of total government spending on water services. * Determine international financial assistance to support clean energy research and development (R&D) and renewable energy. * Determine R&D expenditures as a percentage of GDP. <p><u>Technology</u></p> <ul style="list-style-type: none"> * Identify current infrastructure. * Compile tools, strategies, and legislation for river basin management. 	<ul style="list-style-type: none"> * Inform about the SEA process to bring key stakeholders together to agree on problem, objectives, alternatives, and quality control measures. * Share information of transboundary basin with operational agreement on water cooperation. 	[71-73]
	Identify, Predict Potential Impacts	<ul style="list-style-type: none"> * Identify trends in natural resources degradation based on temperature-precipitation variability, transition times, runoff, sea level rise and storm surges, and flooding. * Assess frequency of droughts, soil fertility, and deforestation. * Identify trends in water use efficiency over time. * Identify trends in natural resources at risk. * Identify trends in levels of water stress: freshwater withdrawals relative to available resources. 	<ul style="list-style-type: none"> * Identify livelihood trends (time series data on employment/employment structure/poverty dynamics/entry and exit by occupation). * Identify activities likely to have impacts on river basins, e.g., water use, deforestation, land degradation, land speculation, and overfishing. * Predict likely impacts and the response of various stakeholders. 	<p><u>Society</u></p> <ul style="list-style-type: none"> * Identify trends in race and ethnicity distribution. * Identify trends in elite formation and competing for land claims. <p><u>Institution</u></p> <ul style="list-style-type: none"> * Identify the percentage of local governments that adopt and implement area-specific disaster risk reduction strategies consistent with national disaster risk reduction strategies. 	<ul style="list-style-type: none"> * Assess capacity of water supply. * Assess vulnerability of water supply * Determine the proportion of water resource use from a variety of sources. * Identify the proportion of irrigated land to productive and sustainable agriculture. * Identify trends in water use and resource use: deforestation, land degradation, land speculation, and overfishing. 	<ul style="list-style-type: none"> * Educate the stakeholders and public about the impacts of water-related disasters on physical and mental health. * Emphasize stakeholder and all relevant party participation, including blunt impact assessment and soliciting feedback from stakeholders and the public. 	[1, 18, 20, 21, 25, 28-32, 36, 53, 60, 69, 74-96]

SEA Process	Sustainable river basin management activities					References	
	Planet (Natural resources)	People (Livelihood)	Peace (Social and institutions)	Prosperity (Economy and technology)	Partnership (Participation)		
	Identify Measures	<ul style="list-style-type: none"> * Identify measures to protect at-risk natural resources. 	<ul style="list-style-type: none"> * Identify individual-level water-related risks and adaptive measures. * Assess and adopt individual-level adaptive measures to water-related risks. * Provide adaptive training to vulnerable people, including people with disabilities, indigenous peoples, and children in vulnerable situations. * Ensure that positive outcomes are maximized instead of focusing on minimizing harm from negative impacts. 	<p><u>Society</u></p> <ul style="list-style-type: none"> * Identify community-level water-related risks and adaptive measures. * Provide full and productive employment and decent work for all. <p><u>Institution</u></p> <ul style="list-style-type: none"> * Provide recommendations for avoiding and/or solving conflicts arising from water issues among stakeholders. 	<ul style="list-style-type: none"> * Increase financial support for healthcare and medical research, especially for diseases caused by water pollution and soil contamination. * Increase the efficiency of water use. * Strengthen economic and social cohesion for future generations. * Adopt new technologies to improve efficiency and productivity. * Promote sustainable economic growth. * Ensure access to affordable, reliable and sustainable water for all. * Build infrastructure; promote inclusive and sustainable irrigation; and encourage innovation. 	<ul style="list-style-type: none"> * Make aware of the water-related risks, in particular the most vulnerable. * Build a good rapport between communities and local government. * Attach greater emphasis to the importance of water reuse and how to achieve net-zero water use at international conferences on water management. 	[97-101]
Phase 3: Informing and Influencing Decision	Making recommendations to decision makers	<ul style="list-style-type: none"> * Recommend legislation and adequate funding for the prevention or control of invasive species. 	<ul style="list-style-type: none"> * Present potential impacts to all stakeholders. * Recommend alternatives for consideration; methods for analysing key issues; and sources of relevant data. * Recommend livelihood support through barter, unpaid labour, work sharing, caretaking, project compensation, cash transfers, pensions, and gifts. 	<ul style="list-style-type: none"> * Present potential impacts in a straightforward manner. 	<ul style="list-style-type: none"> * Recommend evaluation process and provide financial compensation. * Mobilize financial resources. 	<ul style="list-style-type: none"> * Resolve conflicts between stakeholders and recommend dispute settlement. 	[34, 49, 77, 102-110]

SEA Process	Sustainable river basin management activities					References	
	Planet (Natural resources)	People (Livelihood)	Peace (Social and institutions)	Prosperity (Economy and technology)	Partnership (Participation)		
Phase 4: Monitoring and Evaluation	Monitoring and Evaluation of the progress of the PPP	<ul style="list-style-type: none"> * Review progress on PPP and sustainable river basin management. * Review the number of contributions, long-term strategies, adaptation plans, and communications on adaptation as reported. 					[37, 38, 50, 52, 54-57, 59, 60, 65, 67, 84]

Table 3 The 5P-based SEA action framework for sustainable river basin management.

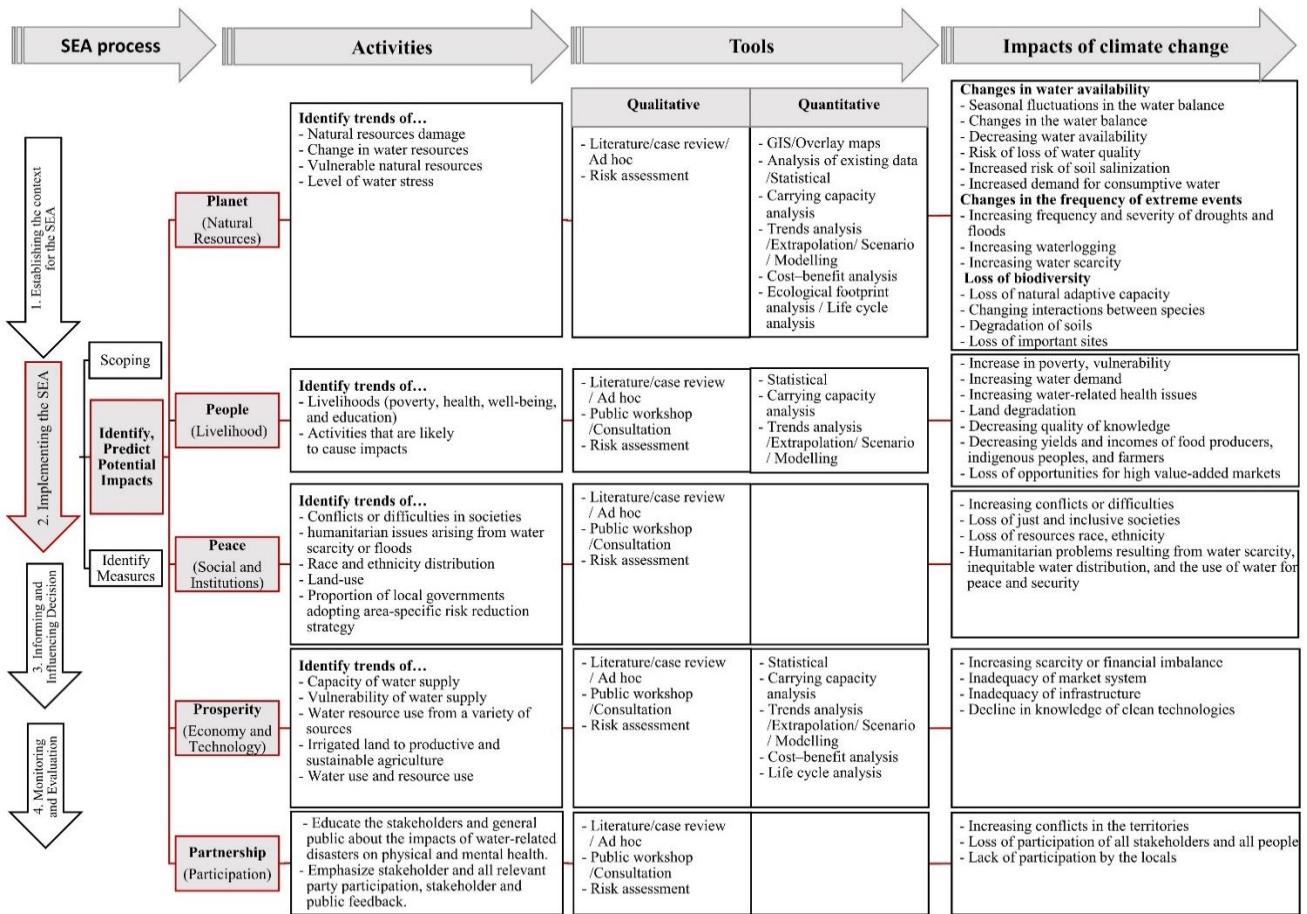


Fig. 2. The SEA tools to assess potential climate change impacts on river basins along the 5P dimension.

Fig.2 presents the SEA tools to assess the potential impacts of climate change on river basins along the 5P dimensions (People, Planet, Prosperity, Peace, and Partnership). As illustrated in, the SEA tools belong to the *identify and predict potential impacts* task under the second SEA phase (i.e., implementing the SEA).

The tools are gathered from the SEA guidance documents and categorized into two groups: qualitative and quantitative tools [12, 26-28, 42-44, 87, 111-113]. The qualitative SEA tools are necessary to observe specific situations [54, 114-116]. These tools are based on the experience, judgment, and wisdom of the members of the SEA team. Examples of the qualitative SEA tools are literature case study, ad hoc analysis, and risk assessment. In practice, the SEA practitioners should first adopt the qualitative tools to assess the potential impacts along the 5P dimensions. Given the significance of natural resources for human life, previous research on climate change impacts on river basins places considerable emphasis on the planet dimension (natural resources) [117]. A literature review and ad hoc analysis are a qualitative review of scientific sources on a particular topic. Both qualitative tools provide an overview of current knowledge and case studies in the field and identify relevant theories, methods, and gaps in existing assessment [118]. The risk assessment tool is used to rank

the risks to determine which should be addressed first and for which the largest countermeasure budget should be allocated. It consists of both qualitative and quantitative data, as the tool relies on interview responses (qualitative data) such as the Delphi method, brainstorming, storyboarding, focus groups, surveys, questionnaires, checklists, and interviews [118-120]. and statistical analysis (quantitative data) specific to a particular community to assess and predict the potential risks.

The quantitative SEA tools used to assess the climate change impacts on river basins [116, 121] include geographic information system (GIS), overlay maps, statistical analysis, carrying capacity analysis, hydrologic factor prediction, trends analysis, extrapolation, scenario, modelling, cost benefit analysis, ecological footprint analysis and life cycle analysis. The process may begin with using GIS and overlay maps to delineate the area to and then performs statistical and carrying capacity analyses using the existing data to determine the water resources carrying capacity (WRCC) [122, 123] of a river basin under the predicted climate change impacts. [124-127]. Practitioners must use quantitative SEA hydrologic factor prediction tools with a water resource account to analyses the climate change impacts on river basins, for example to predict fluctuation of the surface runoff as a result of climate change that could lead to severe flood and drought [128-131]. Then using the

trend analysis, extrapolation, mathematical modelling (stochastic or deterministic) to predict climate change impacts on the river basin [132]. The prediction or forecasting can be carried out with the applications of machine learning and remote sensing through technologies of choice available in various industries [128, 133-137].

Quantitative tools for predicting climate change impacts should use statistical data analysis with scenario modelling [114]. An example of scenario modelling that provides reliable and comprehensive predictions is the scenario modelling developed by the IPCC [138] that considers changes in the hydrological cycle and presents representative concentration pathways (RCPs) of the climate change scenario to enable predictions [139]. Cost-benefit analyses, ecological footprint analyses, and life-cycle analyses can help decide on the best technical solutions or alternatives in water resource use with economic and technological aspects of water resource management [140, 141].

Of relevance is public consultation which is the qualitative tool conventionally employed to encourage participation of stakeholders and gatekeepers [64, 142]. By definition, the gatekeepers refer to individuals and/or groups who control access to the people or resources needed in the development of a social and behavior change communication strategy. In a public consultation workshop, stakeholders and gatekeepers are invited to a brainstorm session to solicit their views on the proposed PPP and to build a consensus. It should also include soliciting feedback, input, and participation from stakeholders and the public, with the most important participation being "active listening to stakeholders." It allows parties with different mandates on natural resources and other issues to make lasting commitments and reach agreements with a long-term perspective [46, 143].

4. Conclusion

This research proposes an SEA action framework for sustainable river basin management under climate change along the five dimensions of the UN SDGs: Planet, People, Peace, Prosperity, and Partnership (5Ps). In addition, the SEA tools along the 5P dimensions are presented to assess the potential impacts of climate change on river basins, complementing the common tools used in the SEA process. In this study, a systematic literature review and content analysis are undertaken to establish the SEA action framework and identify the SEA tools. The reviewed literature includes peer-reviewed research publications and publicly available information and guidance documents. The proposed 5P-based SEA action framework consists of four phases: establishing the context for the SEA; implementing the SEA; informing and influencing decisions; and monitoring and evaluation. The SEA tools to assess the impacts of climate change on river basins are categorized into two groups: qualitative and quantitative SEA tools. The SEA tools belong to the *identify and predict potential impacts* task of the second SEA phase. Essentially, the proposed 5P-based SEA action framework for sustainable

river basin management under climate change encompasses the three pillars of sustainability: environmental, social, and economic. Essentially, the proposed 5P-based SEA action framework for sustainable river basin management under climate change is based on the 5P dimensions of UN, which comprise the three pillars of sustainability: environmental, social, and economic. Therefore, unlike the existing SEA frameworks that are based only on the three pillars of sustainability, it is more comprehensive and emphasize suited to assess the potential impacts of climate change on river basins.

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