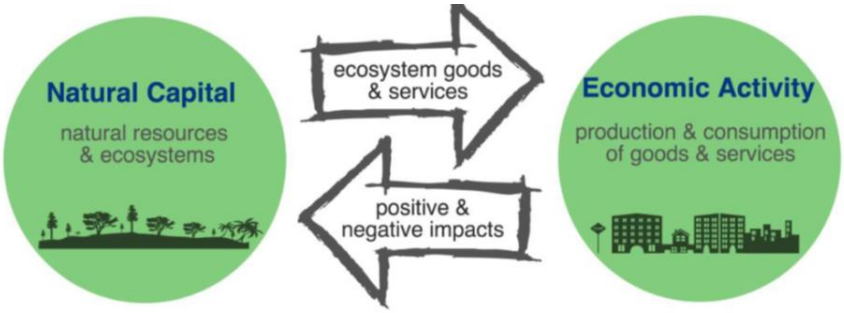
Alluvium, along with Natural Capital Economics and Marden Jacob Associates were engaged to assist the Gold Coast Waterway Authority (GCWA) to understand the contribution to the regional economic activity (locals and tourists) from their waterway assets. This information will be used to assist GCWA with decision making, business cases and investment.

GCWA has significant responsibility for the ongoing management and the subsequent benefits derived from the Goal Coast waterways by residents (primarily recommendation and other social values), businesses (waterways as an asset that underpins business activities) and visitors (waterways are a major drawcard for visitors). GCWA's responsibilities largely relate to the maintenance of the condition of relevant built and natural waterway assets that deliver the benefits to residents, businesses and visitors.

The use of waterways by residents for recreation, tourists for water-based activities and relevant businesses, creates economic activity. This economic activity stimulates the economy (including flow-on impacts and induced economic activity), creates employment, and triggers ongoing investment. Typically the size of regional economies is measured as its Gross Regional Product (GRP) within a national accounts framework. However, tourism and recreation are not formal sectors within a traditional national accounts framework. Research has already been undertaken to develop Tourism Satellite Accounts (TSA) that evaluate the tourism industry activity and performance within a national accounting framework. Through the aggregation of relevant expenditures estimated through this project, we focused on determining the approximate proportion of the $9.5 billion tourism industry in the Gold Coast is attributable to the use of waterways.



Our overall framework we delivered considered the broad suite of goods and services There are four interrelated issues that we reviewed in detail.

1. Waterway *categorisation* (type, extent, condition, trends). This categorisation process identifies and measures the key waterway assets relevant to the study.
2. *Use* of relevant waterways by different user groups. This is effectively a measure of the activities undertaken on waterways (type, participation rates and frequencies). This information provides
3. The economic *contribution* of waterways to the Gold Coast and SEQ economies (i.e. what is the contribution of waterways to the Gross Regional product of the Gold Coast?). This effectively provides an

understanding of the important commercial role of waterways in the regional economy. This information provides insight to policy makers and investors with an interest in sustainable economic development.

4. The economic *value* of relevant waterways including both the market and non-market values attributable to the waterways (what is the total economic value of waterways?). This information provides insight to a broader suite of stakeholders as it goes beyond commercial values and incorporates environmental and social values.

We used an 'ecosystem services' approach, which provided a robust and logical means to identify, quantify and value the broad suite of relevant values. The table below outlines the broad ecosystem services categories, key ecosystem services provided by the waterways and the typical valuation approaches used.

Table 1. Key ecosystem services relevant to the project and potential valuation approaches

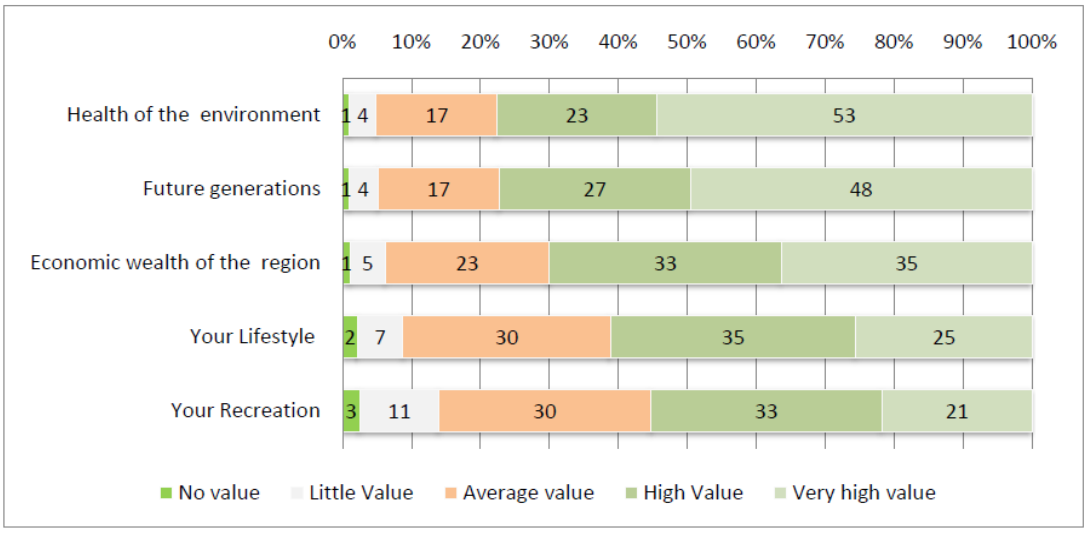
Ecosystem service categories and key services	Valuation approach
Provisioning services	
Commercial fishing	Reported value of production and value added from Department of Primary Industry datasets.
Transport of good and people	Production function approach including benchmarking against alternative modes / built infrastructure options
Regulating services	
Movement of water	Key values relate to drainage and flood mitigation based on costs of floods avoided. This will build on previous flood risk assessments and previous economic risk assessments undertaken by out team.
Pest control	To the extent possible, these values will be estimated using a damages avoided approach.
Water quality	Benefit transfer from previous non-market valuation studies parameterised to Gold Coast circumstances.
Cultural services	
Recreation uses (kayaking, boating, fishing, swimming, surfing)	Travel cost approach, building on existing economic studies (unit values) and information on data for participation rates.
Tourism use	Travel cost approach, building on existing economic studies (unit values) and information on data for participation rates.
Property values	Impact on property process using a desistance decay function and previous hedonic pricing studies.

This framework allowed for the values of the individual ecosystem services to be aggregated into a estimate of the Total Economic Value of the relevant waterways (including the dominant market and non-market values). Furthermore, through the capitalisation of the estimated stream of annual values of ecosystem services, it was possible to calculate a natural capital value for the waterway assets. This enables better comparison of management decisions between built assets (e.g. a bridge) and natural assets (e.g. a watercourse for ferry transportation).

Importantly, our approach also deliberately incorporates inputs from both economics and science, as it is the risks to waterway assets (condition) that lead to changes in the benefits derived. And it is policies and investments undertaken by the GCWA in managing the condition of waterways and their use that will ensure the continuation and enhancement of benefits derived by the local community, visitors and related businesses for the long-term.

We collected a broad range of data to assist us in drawing conclusion, some examples are provided below;

- *How residents value waterways and their perceived contribution to a range of health and wellbeing values*



- *Understanding of economic units and values*

Environmental value	Unit	Low	More likely	High	Comments and key source(s)	Data quality
Beach recreation (annual benefit per household)	$ / household / annum	$420	$480	$520	Based on estimates of value of beach visits for studies from Rolfe and Windle (2013, 2014). Converted to annual $/household/annum using data from HWL social survey of participation and frequency.	
Recreational fishing (value per trip)	Consumer surplus per trip ($/trip/person)	$60	$62	$64	Based on estimates from a major travel cost study Pascoe et al (2014). Note these values represent the marginal values as this better represents values attributable to changes in waterway health induced change.	
Walking	Health benefits ($/km)	$1.39	$1.90	$2.83	Based on estimated health benefits (health costs avoided using the Disability Adjusted Life year Approach) for a major study in SEQ conducted by SKM and PWC (2011). In the absence of any specific data, we have assumed a range of average walking distance of 0.75-2.25km (mid point 1.5km).	
Picnics, BBQs, enjoying nature	Consumer surplus ($/trip/person)	$6.25	$12.50	$58.70	No directly relevant studies have been completed. These medium and high figures are based on travel cost studies for beach visits Raybold et al (2011). The low estimate is based on 50% of the low estimate from the source study to reflect that beach visits may have a higher recreational value than visits to terrestrial waterways for tertiary uses only.	
Freshwater waterway health	Value of a 1% improvement on waterway ecosystem health ($/household/ year)	$3.60	$4.58	$5.36	Based on a major choice modelling study in SEQ, undertaken by MJA (2010).	
Mangroves & seagrass	Value of a 1% improvement on waterway ecosystem health ($/household/ year)	$0.62	$0.73	$0.84	Based on a major choice modelling study in SEQ, undertaken by MJA (2010).	

- *Relationship between proximity to water and land values for Gold Coast property.*