WAIKATO DYNAMIC MODELS PROJECT

Tooku awa koiora me oona pikonga, he kura tangihia o te maataamuri

Vision

Our collective responsibility for restoring and protecting the health and wellbeing of the Waikato and Waipā rivers is enabled through a shared set of co-developed water quantity and quality models.

Benefits of funding the project

Protection of the Awa

Models enable us to predict how different uses of the land and water will impact river and stream health. Modelling can be used to help us to make better decisions around how we use our land and water resources so that water quality is improved for generations to come.

Reduced costs

A collective modelling approach will reduce costs to individual contributing organisations because costs are shared. Partner organisations will obtain access to a range of models and model predictions.

Use of models

The models can be used by partner organisations to help meet organisational needs such as evaluating resource-use, identifying ways to target actions to improve water quality and quantity, and improved planning.

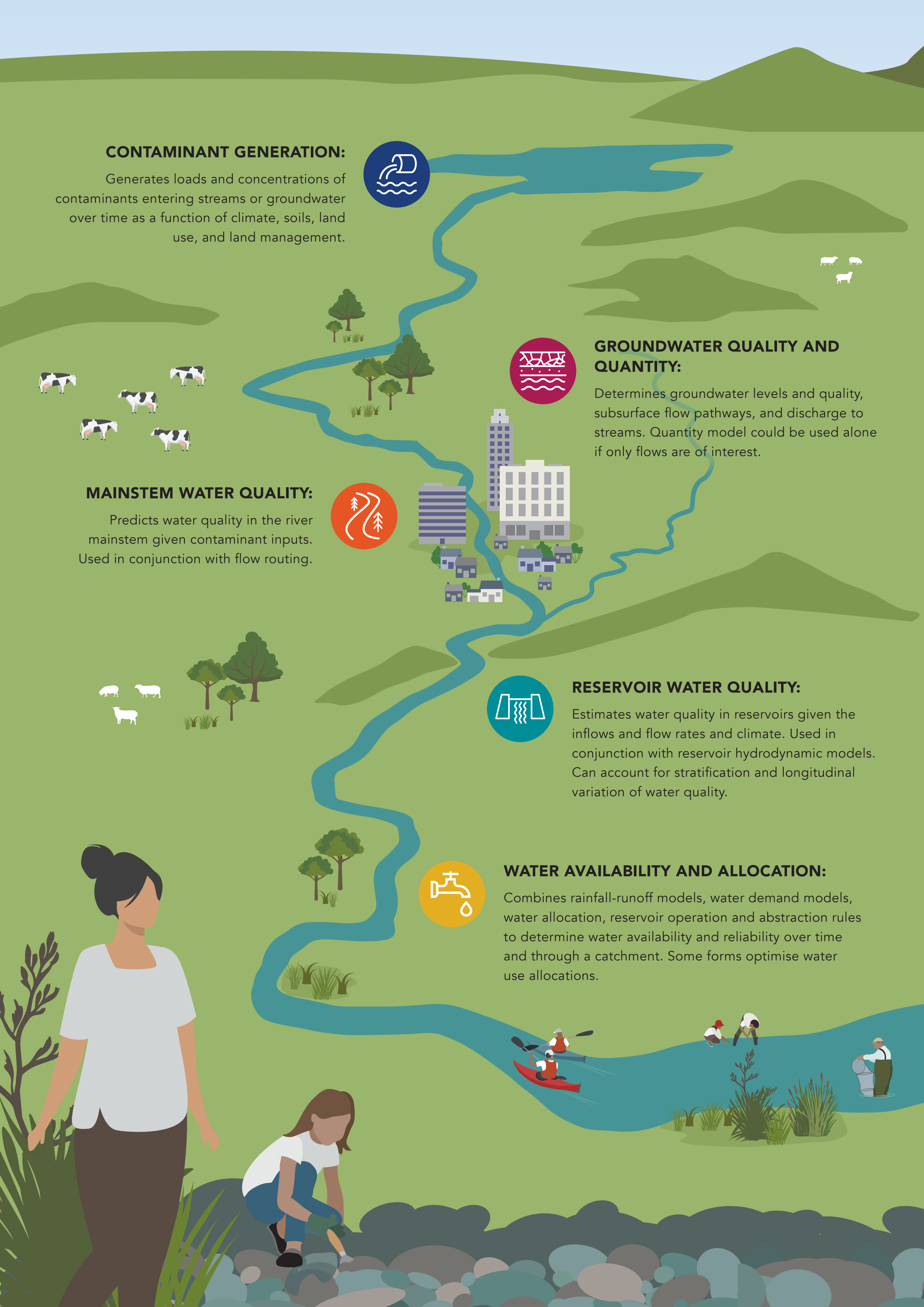
Increased collaboration and confidence

By sharing models and associated datasets there will be less duplication of effort, competition between parties will be reduced, and more will be achieved overall. The use of open-source software where appropriate means that a wider range of parties can engage in model development and applications. Opens-source software lends greater confidence in the model due to transparency.

Improved data

Collation of data required for modelling will have multiple benefits beyond providing inputs to models (for example, facilitating data visualisation and reporting activities external to the modelling process); in return, modelling provides additional justification for targeted data collection and dissemination.

NIWA Taihoro Nukurangi · DairyNZ · The University of Waikato Te Whare Wānanga o Waikato · Waikato Regional Council Te Kaunihera ā Rohe o Waikato · Waikato River Authority · Watercare · Mercury · Waikato Tainui



CONTAMINANT GENERATION:

Generates loads and concentrations of contaminants entering streams or groundwater over time as a function of climate, soils, land use, and land management.

GROUNDWATER QUALITY AND QUANTITY:

Determines groundwater levels and quality, subsurface flow pathways, and discharge to streams. Quantity model could be used alone if only flows are of interest.

MAINSTEM WATER QUALITY:

Predicts water quality in the river mainstem given contaminant inputs. Used in conjunction with flow routing.

RESERVOIR WATER QUALITY:

Estimates water quality in reservoirs given the inflows and flow rates and climate. Used in conjunction with reservoir hydrodynamic models. Can account for stratification and longitudinal variation of water quality.

WATER AVAILABILITY AND ALLOCATION:

Combines rainfall-runoff models, water demand models, water allocation, reservoir operation and abstraction rules to determine water availability and reliability over time and through a catchment. Some forms optimise water use allocations.

Model components, timing and costs

There were 13 model components initially identified throughout the consultation process with potential partners and stakeholders, which have been prioritised through workshops and documented in reports (scoping report, prioritisation background, prioritisation results and work plan). These highest-priority components along with associated uses, preliminary estimated costs and timeframes are outlined below, at a total of $3.8 million:

Model components	Potential uses	Timeframe and costs	Taura attributes addressed
CONTAMINANT GENERATION	· Regional plans · Limit setting · Assessing benefits of rehabilitation · Assessment of large consents	**2 – 5 years** **Cost:** Modelling, including application, training, development $500k. New data acquisition $300k	Kai, Water quality, Experience, Ecological integrity
GROUNDWATER QUALITY AND QUANTITY	· Regional plans · Assessment of large consents · Assessing impacts of nitrogen loss mitigation, including spatial aspects · Improving water resources models, especially low flow prediction	**2 – 5 years** **Cost:** Modelling, including application, training, development $250k	Kai, Water quality, Experience, Ecological integrity, Water security
MAINSTEM WATER QUALITY	· Understanding how inputs of nutrients and microbes, and associated mitigation, affect mainstem river quality · Understanding how flow abstractions affect water quality · Understanding how imported water affects water quality · Understanding the risks of algal blooms · Can reservoir operation be modified to reduce risks of blooms?	**2 – 5 years** **Cost:** Modelling, including application, training, development $350k **Cost:** New data acquisition $300k	Water quality, Experience, Ecological integrity, Water security
RESERVOIR WATER QUALITY:	· River rehabilitation · Limit setting (quality and flow) · Refining reservoir operation regimes · Large consents · Forecasting water quality (with an additional forecasting model)	**2 – 5 years** **Cost:** Modelling, including application, training, development (preliminary estimate) $300k **Cost:** New data acquisition (preliminary estimate) $400k	Water quality, Experience, Ecological integrity, Water security
WATER AVAILABILITY AND ALLOCATION	· Development of water management options, including participatory approaches · Regional plan and rule development · Basis for assessing large-scale consents	**2 – 4 years** **Cost:** Modelling, including application, training, development $350k	Water security, Water quality

Overarching project components

Data platform and hosting – Several of the proposed models will use common data, so it would be best to collate and deliver such data in a structured and organised way. Model results could also be stored in a structured way so that they can be retrieved and displayed by multiple parties. A workstream would be responsible for collating and hosting datasets. A budget of $300k is suggested for this task.

Students and building capacity – The proposed set of models will require people to build and apply models. It is envisaged that capacity will need to be extended to provide the necessary skillset in the long term. Considering that advanced skillsets are required, it is desirable to fund university students to conduct research on model development and application. We will also be looking to enhance Iwi capability and capacity in modelling in the process. A budget of 450k is suggested for two PhD students.

Model hosting – Costs will be associated with data licences, software licences for some proprietary models, and software support. A budget of $100k is suggested for this task, but this will be dependent on the number of models and licences required.

Governance hosting and management – Institutional arrangements will be required to address roles such as co-ordinating and managing workstreams, contracting and managing delivery, providing technical system-level leadership, organising training, managing steering groups and technical workshops, and providing communication about the project such as aims, progress and outcomes. A budget of $225k is suggested.

Next steps

To move forward with this project, we are seeking funding to develop the model components in a prioritised way in collaboration with our key partners.

If you want to discuss becoming a partner in the Waikato Dynamic Models project, please contact Sandy Elliot on Sandy.Elliott@niwa.co.nz.

To see a web-based version of this document and to access the project background reports, please visit:

niwa.co.nz/freshwater/waikato-dynamic-model