RSB Water Impact Indicator Methodology: Water gains through the removal of invasive alien plant biomass and implementation of follow-up activities to prevent re-infestation

Methodology and water gains calculator tool

Roundtable on Sustainable Biomaterials

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1. Introduction

Background

It is widely known that water scarcity and drought are environmental issues on the rise globally.

The Roundtable on Sustainable Biomaterials (RSB) is a global membership organisation that drives the just and sustainable transition to a bio-based and circular economy. Our sustainability framework, underpinned by 12 key principles and their underlying criteria, is the world's most trusted and peer-reviewed foundation for supporting innovative solutions to the climate crisis. Application of our sustainability framework demonstrates a commitment to realising the United Nations (UN) Sustainable Development Goals. RSB's 12 Principles & Criteria (P&C[1]) describe the best social, legal, environmental and management practices for sustainable production in a bio-based and circular economy.

In response to global concerns over quality water quality and availability, RSB has defined Principle 9 within its P&Cs, directly addressing this matter. RSB Principle 9 "Water" requires RSB Participating Operators (POs) to maintain or enhance the quality and quantity of surface and groundwater resources, and respect prior formal or customary water rights.

While traditional certification focuses largely on risk management, an increasing number of buyers and corporations are setting quantifiable sustainability impact targets, seeking reliable claims beyond carbon mitigation within their supply chains. Demonstrating this shift, the Science-Based Targets Network has recently highlighted companies publicly adopting targets for freshwater and land, indicating a growing interest in measurable impacts beyond carbon mitigation.

Building on our established sustainability framework and rigorous multi-stakeholder consultation and validation process, RSB is well-positioned to support the creation of verifiable, positive impact claims to complement RSB certification. In 2023, RSB launched the RSB Impact Programme with the support of Boeing Global Engagement to bridge real positive sustainability impacts with market demand and facilitate the bio-based and circular economy transition. This programme meets the rising demand from various partners for 'in-sector' sustainability claims encompassing areas like soil health, water stewardship, and biodiversity. Key objectives include:

- Develop impactful claims: Use science-based methodologies to capture the impact of sustainable practices in metrics and translate them into powerful claims for companies and brands.

[1] Roundtable on Sustainable Biomaterials: RSB Principles & Criteria (RSB-STD-01-001) (https://rsb.org/wp-content/uploads/2024/05/rsb-principles-criteria-std-01-001-v4-1.pdf)

- Justify premiums for sustainability: Provide evidence of the value of sustainable feedstock and products in quantifiable metrics, encouraging private sector players to invest in sustainability.
- Create best-practice examples: Develop examples of motivated private sector involvement driving positive impacts throughout the bioeconomy.
- Impact Book & Claim: Enable brands to access impact claims related to their supply chain via the RSB Book & Claim System to support in-sector system transformations.

This document outlines the methodology for RSB's Water Impact Indicator, focusing on water gains achieved through the removal of invasive biomass and follow-up activities to prevent re-infestation.

The approach: water gains through the removal of invasive alien species vegetation

Scientific research has demonstrated the link between water availability and the presence of invasive vegetation. This topic is particularly salient in South Africa, where this methodology has been piloted, and based on which data the water saving calculator has been developed.

In South Africa, the importance of water runoff reduction because of the presence of alien invasive vegetation is such a relevant consideration that these parameters have already been built into the numerical water runoff models for the country. The user of the model only needs to decide on the density, species and cover of the vegetation. In its most rudimentary form, this represents a water-use impact indicator of alien vegetation infestation on runoff. These models are, however, not easily accessible and user-friendly and cannot be used as a tool for general application.

Given the lack of easily accessible tools available for general application, RSB identified the need for the development and implementation of a water impact indicator to quantify the amount of water that can be made available to aquatic ecosystems and potentially to other users after invasive alien plants' vegetation control interventions. The purpose of this indicator is to quantify the volume of water that becomes available after invasive alien vegetation clearing operations have taken place.

The water impact indicator presented in this document may also be used to incentivise and assess alien clearing operations and follow-up activities in removing alien vegetation biomass from the landscape and water catchment area.

The development of the methodology and calculator tool presented in this report has been conducted following the below project phases:

1. Phase 1: Literature review (February 2024)
2. Phase 2: Water impact indicator initial draft proposal developed by third-party consultancies and presented to RSB Secretariat (June 2024)

3. Phase 3: Implementation of a pilot to test the draft methodology and development of a corresponding report presenting the pilot results (August 2024)
4. Phase 4: Stakeholder consultations during online workshops in March and August 2024, complemented by subject matter experts tool review in September 2024

The above-listed project phases have enabled to study, research and test the feasibility and use of water impact indicators related to clearing of IAPs.

Each of the first three project phases resulted in a report detailing the process followed, the expert input received and any other stakeholder engagements or collaborations held under the framework of the RSB Water Impacts Collaboration South Africa in 2023 and 2024.

The basis of the methodology used in the water impact calculator has been established by Dr. David Le Maitre and various co-authors over several years dating back to as early as 2004. Dr. David Le Maitre worked most recently as Extraordinary Professor in the Department of Conservation Ecology & Entomology at the Stellenbosch University after decades in leading research organisations, such as the Council for Scientific and Industrial Research (CSIR)[2]. He played a leading role in the team that developed models to estimate the reductions of surface water runoff as a result of the invasion of catchments by alien trees. He went on to become one of the key scientists that provided support to the Working for Water Programme in South Africa[3] over the next 25 years. Much of his research findings and thinking has been updated in the article "Estimates of impacts of invasive alien plants on water flows in South Africa." by Le Maitre et al. 2016[4].

The purpose of the development of this methodology and tool was to research and assess the current knowledge, indicators and tools available (and easily accessible for end users) and to build off the existing knowledge and resources to develop a concept tool that could serve the needs of RSB, RSB POs and interested stakeholders.

The RSB Water Impact Methodology and tool for water gains due to IAP clearings have been developed by RSB in collaboration with the third-party consultancies Blue North and Blue Science. The methodology and indicators here presented have been developed through a process of stakeholder engagement, where NGOs such as WWF[5] and The Nature Conservancy (TNC)[6] and national subject matter experts were key stakeholders and contributors to the process.

[2] Council for Scientific and Industrial Research (https://www.csir.res.in/)
[3] Working for Water Programme South Africa (https://www.dffe.gov.za/working-water-wfw-programme)
[4] Le Maitre et al. (2016) Estimates of impacts of invasive alien plants on water flows in South Africa. (https://www.ajol.info/index.php/wsa/article/view/147006)
[5] World Wilde Fund for Nature (https://www.worldwildlife.org/)
[6] The Nature Conservancy (https://www.nature.org/en-us/)

2. Objective and scope

The objective of the development of the RSB Water Impact Indicator Methodology for invasive alien biomass is to provide a normative basis for demonstrating additional positive impacts in water ecosystems – following a science-based and credible approach - through the implementation of appropriate management practices by RSB POs in the RSB system.

This methodology and the related calculator tool constitute an additionality to the RSB certification system and will be the basis for POs to make additional sustainability claims beyond standard compliance with RSB traceability requirements.

The proposed impact indicator methodology and calculator tool may be utilised by any RSB PO, with a global scope of application.

3. Methodology

The water gains calculator (which is an Excel-based tool, provided as an Annex) was built to enable data capture and calculation of the amount of water that is made available in the catchment due to the removal of invasive alien plants.

The sections below cover the input data required in the model, available data sources, riparian factors, reduction factors and the state of the vegetation in terms of maturity. The calculation methodology is also explained.

2.1 Input data required

The below information corresponds with the data that is required to be inputted into the water gains calculator tool, in order for the water savings to be calculated:

- Catchment details (quaternary number, river/water resource, province, longitude and latitude in decimal degrees and size in hectares)
- Land management unit details (project name, land management unit name, property cadastral reference code, landowner contact details, land manager contact details, total hectares of the management unit and percentage of the total management unit covered by invasive alien plant species)
- Land management sub-units or 'block' details (reference name/number, block size, number of invasive alien plant species, start and end date of each clearing instance)

- Riparian biome type: dryland, non-riparian, fynbos biome, savanna or grassland biomes. (Le Maitre et al. (2016) and Dye and Jarmain (2004)[7])
- Scientific species' names (e.g. *Acacia mearnsii*)
- Plant stage (Mature optimal, mature sub-optimal, young, seedling, coppice) Source: WWF Water Tracker Tool.
- Proportional canopy cover of selected species (%). The estimation method must be clearly described.
- Total hectares in the management unit cleared from invasive species (Note: In the final version of the Excel-based calculator tool a functionality will be added showing all cleared hectares for each management block, as well as a combined total of hectares cleared).
- Mean Annual Runoff (MAR, in mm per year): captured manually or obtained from Cape Farm Mapper[8].[9]

2.1.1 Tool logic and set-up

The input data for the calculator tool required to be provided by the operator is organised in a structured, clear and logical way as to minimise the repetition of data input. The results of the application of the calculator tool are presented in a visual manner (in the form of graphs) to ease and facilitate the interpretation by the operator. Guidance is built into the tool to ensure user-friendliness and high input data quality.

The calculator tool (which is Excel-based) will be used for conducting the water gains calculation for each clearing project entailing the removal of invasive alien species' biomass. The data entry in the calculator can be done for several clearing blocks per project. Each block is assigned entry data for:

- Initial clearing of invasive vegetation species' biomass;
- First follow-up clearing of biomass;
- Second follow-up clearing of biomass;
- Third follow-up clearing of biomass; and
- Fourth and final follow-up clearing of biomass in the block.

This data collection approach for the calculation of water gains enables the tracking of a block over a period of five years. For the purpose of this methodology, it is assumed that the full water gains impact on the water sources within the block/management unit would be achieved by the initial comprehensive clearing of biomass targeted species

[7] Dye, P. & Jarmain C. (2004): Water use by black wattle (*Acacia mearnsii*): implications for the link between removal of invading trees and catchment streamflow response. (https://www.researchgate.net/publication/30509529_Water_use_by_black_wattle_Acacia_mearnsii_Implications_for_the_link_between_removal_of_invading_trees_and_catchment_streamflow_response)

[8] Cape Farm Mapper (https://gis.elsenburg.com/apps/cfm/)

[9] WR2012 database (https://waterresourceswr2012.co.za/)

and other invasive species. This water gain will be retained over the five-year period, if alien vegetation follow-up work is conducted, and the site is kept clear of alien vegetation re-infestation. Although the water gains will continue after a 5-year period (if the site is kept clear), and the risk of re-infestation will remain, it is proposed that the water gain cannot be claimed longer than this period.

The importance of tracking initial biomass clearings and further biomass removal as part of follow-up activities is critical to the accuracy in the implementation of this methodology and model. If timely follow-up clearing of invasive vegetation is not done, there is a risk that the effect on the water gain could be lost.

The quality of the initial clearing and follow-up activities is critical, as to actively prevent the reinfestation of the cleared area. Most invasive alien plants in South Africa can return aggressively when clearing is not done adequately and may lead to high costs especially if the first clearing was not thorough enough (pers. comm. D. Grobler 2024).

2.2 Formula for the calculation of water gains

Water gains from clearing (m^3/ha/year) = Mean Annual Runoff (mm) x reduction factor x proportion canopy cover x riparian factor x 10

Note: The gains per hectare and the total gains displayed in the tables below are the total sum of the gains per hectare and total water gains calculated for each individual IAP species cleared in a respective block. The gains per hectare and total gains calculated for clearing an individual IAP species in a block is dependent on the canopy density, the hectares cleared and reduction factor related to that specific IAP species, and thus gains will be different for different species cleared. The below results are totals based on clearing of multiple species and therefore, dividing the total water gains by the total hectares cleared in the below table will not match with the gains per hectare per year figure (and the same with dividing the total water gains by the gains per hectare - the hectares below won't match as they are the summed hectares for multiple IAPs cleared).

2.2.1 Main reference data used in the excel tool

The fundamental reference data sets and research outputs that inform the calculation of water runoff and runoff reduction due to catchment utilisation and land use activities (including alien vegetation infestations) under the framework of this methodology are the following:

- WR2005 (Water Resources 2005, a Water Research Commission (WRC)-based data set of the hydrology and runoff in South Africa);
- WR2012 (An update of the WR2005 data);

- The estimation of streamflow reductions resulting from commercial afforestation in South Africa based on (Gush et al. (2002)[10]. More recent research updates by Van Niekerk et al. (2023)[11];
- Specific research related to alien vegetation and its effects on runoff; and
- Various publications of Le Maitre and co-workers and Scott[12] and co-workers have laid the foundation for the science behind water and runoff reduction calculation for invasive alien plants vegetation in South Africa.

2.2.2 Additional required input data

A water gains calculator allows the user to determine the water that can be gained by the removal of invasive alien plants vegetation. The following data is used as input data in this tool:

- Runoff
  - Runoff is captured manually by obtaining site-specific rainfall data from:
    - Cape Farm Mapper (https://gis.elsenburg.com/apps/cfm/);
    - The runoff values that are captured must be for the centroid of the block. The centroid of the block means the geometric center of the block, or the point where the block's area is evenly distributed. They represent the coordinates of the "middle" of the block.

  Note: The average quaternary rainfall data should not be used.
  The WR2012 values for Mean Annual Precipitation (MAR in mm per year) and Mean Annual Runoff (MAR in mm per year) is automatically populated in the excel tool from the WR2012 dataset to serve as a reference value only.

- Plant species (invasive alien plant species)
  - The calculator allows for the selection of 176 plant species
  - A species-specific flow reduction factor is provided (Source: WWF water tracker tool)

Table 1: Example of species-specific reduction factors used in the RSB excel tool. Source: WWF water tracker tool.

[10] Gush et al. (2002): Estimation of streamflow reductions resulting from commercial afforestation in South Africa. (https://www.wrc.org.za/wp-content/uploads/mdocs/TT%20173-02%20WEB1.pdf)
[11] Van Niekerk et al. (2023): The application of national scale remotely sensed evapotranspiration (et) estimates to quantify water use and differences between plantations in commercial forestry regions of South Africa. (https://www.wrc.org.za/wp-content/uploads/mdocs/2966%20final.pdf)
[12] Scott DF, Le Maitre DC and DHK Fairbanks (1998): Forestry and streamflow reductions in South Africa: A reference system for assessing extent and distribution. (https://researchspace.csir.co.za/dspace/bitstream/handle/10204/2111/scott_1998.pdf?sequence=3&isAllowed=y)

Species Name	Mature Optimal	Mature Sub-optimal	Young	Seedling	Coppice
Acacia mearnsii	0,9	0,9	0,5	0,1	0,5
Acacia melanoxylon	0,9	0,9	0,5	0,1	0,5
Eucalyptus camaldulensis	0,9	0,72	0,5	0,1	0,5

- State of the invasive alien plant stands (WWF water tracker tool and Le Maitre et. al 2016), for definitions see section 8 'Terms and definitions' in this document:
    - Mature
    - Mature Optimal
    - Mature Sub-optimal
    - Young
    - Seedling
    - Coppice

- Riparian factor (Le Maitre et al. (2016), Dye and Jarmain (2004), Clulow et al. (2011)[13]), for definitions see section 8 'Terms and definitions':
    - Dryland (non-riparian)
    - Fynbos biome
    - Grassland and savanna biomes

2.3 Overview table of data collection

The table below differentiates between publicly available data and data directly provided by operators (woody biomass suppliers).

Table 2: List of data to be collected for the calculation of water gains and verification methods applied.

Data	Data source	Verification method
State of the invasive plant stand	WWF water tracker tool and Le Maitre et al. (2016)	*TBD*

[13] Clulow et al. (2011): The long-term impact of *Acacia mearnsii* trees on evaporation, stream flow, and ground water resources. (https://www.wrc.org.za/wp-content/uploads/mdocs/TT%20505-11.pdf)

Riparian factor	Le Maitre et al. (2016), Dye and Jarmain (2004), Clulow et al. (2011)	None. Published information.
Species reduction factor	WWF water tracker tool	Reference list of standardised reduction factors *TBD*
Runoff	Cape Farm Mapper (https://gis.elsenburg.com/apps/cfm/)	Published official information by governmental departments.
Rainfall	Entry by operator.	Data verified/cross-referenced against publicly available rainfall records (WR2012) for the nearest area.
Catchment details (quaternary number, river/water resource, province, longitude and latitude in decimal degrees and size in hectares).	Entry by operator.	Checked against publicly available resources such as Cape Farm Mapper; WR2012; publicly available cadastral information; aerial images (Google Earth).
Land parcel/site details (project name, land parcel/site name, property cadastral reference code, land owner contact details, land manager contact details, project portion hectares and invasive alien plant hectares)	Entry by operator.	Checked against publicly available resources such as Cape Farm Mapper; WR2012; publicly available cadastral information; aerial images (Google Earth). National Invasive Alien Plant Survey (NIAPS) 2011[14]
Block details (reference name/number, block size, number of alien invasive plant	Entry by operator.	Verification of plausibility, robustness and accuracy of data and evaluation of the adequacy of general administrative and data

[14] National Invasive Alien Plant Survey (NIAPS) (2011): (https://bgis.sanbi.org/SpatialDataset/Detail/416)

species, start and end date of each clearing instance)		management processes. On-site inspections.
Species names (e.g. *Acacia mearnsii*)	Entry by operator.	Verify the knowledge on the topic by the operator on-site. Skills and qualifications of the responsible staff at the operator could also be used for verification of the appropriate level of knowledge on the subject.
Proportional canopy cover of selected species (%). The Estimation method must be clearly described.	Entry by operator.	Verify estimation method.
Total hectares cleared	Entry by operator.	Verified by Google Earth.
Catchment details (quaternary number, river/water resource, province, longitude and latitude in decimal degrees and size in hectares).	Entry by operator.	Checked against publicly available resources such as Cape Farm Mapper; WR2012; publicly available cadastral information; aerial images (Google Earth).

4. Implementation

4.1 Auditable data

By carefully examining this evidence, an auditor can assess the credibility of the claimed water gains and identify potential areas of weakness or bias in the data and analysis.

RSB will develop - in separate complementary documents – a set of auditable indicators and an audit checklist to enable the practical implementation and verification of the RSB Water Impact Indicator Methodology related to the clearing of IAPs.

Data on Alien Invasive Species

- Species identification: Accurate identification and classification of alien invasive species by the operator within the management unit subject to the clearing of

invasive species. The operator would need a record of the species identified, the coverage of each species entered into the Excel-based tool supplemented with satellite imagery and fixed point photography or similar methods. The species identification must be verified by external auditor before commencement of removal operations.

- Density measurements: Reliable data has been used for the measurement of the density of alien species by the operator within the management unit subject to the clearing. The operator has developed a procedure for density measurements, i.e. the proportional canopy cover of selected species (%). The density measurements must be verified by external auditor before commencement of removal operations.

  Note: Advances in remote sensing data may become available in the future, but methodologies are still in the research phase (therefore remote sensing data is not a sufficiently reliable data source, but shall be used in combination with other data sources).

Biomass Removal Data

- Biomass removal area: Accurate mapping prior to any clearing operation by the operator of each block or management unit subject to clearing and documentation of the specific areas within the management unit where alien species were removed. Mapping should take place in GIS software or, at a minimum, in Google Earth to allow for a KML of Shapefile to be shared with the auditor ahead of the audit for verification. Metadata associated with the Shapefile, such as dates of initial clearing and follow-up clearing activities, are essential to allow for verification during audits.
- Biomass removal methods: Detailed information on the methods (manual/mechanical/machine) used for the removal/ clearing of alien species biomass. Management plans developed for the management units subject to invasive species' biomass clearing, including relevant detailed information about the planned clearing activities (timing of clearing, methods to be used in the clearing, planned follow-up clearing for specific blocks, systems and process to collect relevant data, systems and processes to inform relevant parties, etc.). Records of species-specific clearing methodologies will be required during the audit process, including herbicide use and compliant (responsible and safe) practices associated with herbicide use.
- Biomass removal timing: Precise records of the start and end dates of invasive species' biomass clearing activities.
- Verification of biomass removal: Independent verification of the invasive species' biomass clearing efforts (e.g., field surveys, photographs, aerial imagery, satellite images and any other documentation relevant for the audit process).

Monitoring Data

- Data collection methods: Clear description of data collection systems, methods and protocols is provided by the operator, with regards to the invasive species' biomass clearing activities conducted within its management unit. Verification of the robustness of the data, veracity and reliability of data sources, degree of digitization & data availability.
- Data quality control: Evidence of data quality control measures (e.g., sense-check data collected by multiple teams on the ground, validation) is provided by the operator, with regards to the invasive species' biomass clearing activities conducted within its management unit. Such activities shall be part of internal audits and records made available for external audits.
- Data consistency: Consistency of data over time and across different monitoring sites. Unique identifiers of sites and blocks should be used for each Excel spreadsheet to allow for easy retrieval of data.

Table 3: Overview of main process steps

	Site selection	Initial clearing	Follow-up activities
Activities	Assessment of invasive alien species mix, density, age, landscape-riparian, water related data (mean annual rainfall, run-off, NBEL details, location in water map)	Preparation of clearing, Clearing manually/chain saw/clipper, transport of biomass in/outside site, transport of labour, labour safety, stump spraying, follow-up plan, herbicide us and methods of applying herbicides.	Identify and implement follow-up action plan, per site, per unit management plan, identify and describe potential further control methods/ measures
Data generated	Mapping data, table values, biomass volumes, area size, rainfall figures, site classification	Volumes of biomass, labour hours, area size, species specifications (incl natives), resources needed for follow-up actions	Regrowth (IAPs & indigenous) assessment data, drone/satellite/? data, % success rate eradication/follow-up, % rate further measures required
Data source	Public sources, own assessment based on best practice, guidance from work for water programme, unit management plan (UMP)	Records taken onsite, control in HQ, pics from sites, geo-reference, drone data	Records onsite, comparative cross-site analysis
Data robustness (basic classification, tbc)	High: research & gov data Medium: WfW guideline, UMP Low: own assessment		
Monitoring approach	Verification of data source & correct data interpretation, triangulation of related data, compare procedure in UMP and implementation	Countercheck pics, volume balances, basis of water savings calculations, implementation of best practices in eradication as per WfW	Physical inspection, water data verification, research project for ongoing monitoring, check if determined follow-up actions have been fully implemented
Means of verification	Data sources, documented procedures, records, trainings, onsite inspection, interviews, UMP procedures	Records, raw data sheets, pics, interviews, weighbridge records, follow-up action plan	Records, interviews, drone data, pics, records of follow-up action plan implementation

4.2 Unit Management Plan

The key element for the RSB certified PO to demonstrate compliance will be developed documented procedures describing the methodologies, estimations and calculations

applied to support the robustness of calculated water gains after invasive alien clearing activities and implemented follow-up measures is the Unit Management Plan (UMP).

A Unit Management Plan details the operating procedures, including methods used for the removal/clearing of invasive alien species biomass. It contains a structured data collection system built over time to collect verifiable monitoring data and all other data required for auditing. The Unit Management Plan shall include all data sources and block-specific information in an auditable format.

Roles and responsibilities, such as the PO Certification Manager, must be described in the UMP. This includes ensuring frequent training and conducting internal audits, among other activities. These elements can be reflected in the general documentation relevant to the RSB certification process.

4.3 Implementation challenges

Initial challenges identified with the implementation of the RSB Water Impact Methodology and the related calculator tool are listed below:

Initial Clearing and tracking of follow-up quality clearing activities

There is a need for the operator to keep records as mentioned earlier on canopy cover, density, species present, aerial photography, fixed-point photography etc. that could serve as a baseline description of the site prior to clearing.

Clearing activities and methods used should be documented such as method of cutting, herbicide applications, removal of biomass, avoidance of sensitive areas, erosions management, fire management etc. These are partly operational procedures specific to site conditions but also maps and aerial images and fixed-point photography as may be applicable to ensure that the correct initial clearing activities were followed. In the case of follow-up activities, the same would apply. This may lead to additional record keeping and an administrative burden on the operator but would be required to verify activities. The evaluation of the chosen activities would require a trained and knowledgeable auditor.

Spatial system to track site information

RSB would need a spatial system that could identify the boundaries of each management unit and the subunits (blocks) to allow for the allocation of water claims made and also to track progress made year-on-year through the help of satellite imagery. At this stage provision has been made in the Excel tool to allow for the capture of GPS coordinates for each block as well as a capture field for a KML file link.

Data tracking and links

Data from the operators that will be captured in an Excel file should be clearly linked to the spatial system so that RSB can easily identify clearing activities with progress and potential water claims. Chain of Custody of the biomass may also become important.

Naming conventions by different operators

At this stage relatively few operators are envisaged but should the number of operators and management units grow there may be a need for a specific naming convention for management units and sub-units (blocks) to allow for easy data capture and analysis within a database. This would however be for future consideration.

Training of clearing operators and potential support

Operators will need training in operational requirements as well as completion of the Excel-based tool. Guidance material should be developed, but a help desk may be required should the number of operators expand.

Training of external and internal (operators) auditors

Detailed auditor training specifically relating the removal of alien invasive vegetation would be required with a somewhat flexible approach to specific site conditions and constraints.

Continued follow-up and clearing once the operator has left the site – beyond the 5 year timeframe

A question remains on how maintenance can be achieved on a site after the 5-year timeframe as a high risk of re-invasion remains on certain sites depending on the alien species present, history of invasion, clearing methods used and invasions status of surrounding areas. This may bring an implementation challenge linked to a water claim. A site that has been re-invaded due to failed follow-up should not be eligible in future for water claims.

Potential challenges related to water gains claims

Obtaining accurate and reliable evidence to support water gains claims from invasive alien plants removal can be challenging due to several factors:

1. Data Availability and Quality
    - Data accuracy: Ensuring the accuracy of data collected on invasive alien species identification and distribution, density, can be complex due to variations in measurement methods and potential biases.
2. Monitoring and Verification
    - Long-term monitoring: Demonstrating the long-term impacts of alien species removal on water flow requires extended monitoring periods, which can be costly and time-consuming.
    - Resource constraints: Adequate funding and personnel for effective monitoring and data analysis can be limited.

3. Other potential challenges

    - Economic factors: The economic costs of data collection, monitoring, and analysis can be significant, potentially limiting the scope of evidence gathering.

5. Conclusions

RSB has developed a methodology and a tool to calculate water gains through the removal of invasive alien plant biomass and implementation of follow-up activities to prevent re-infestation of previously infested areas to help incentivise RSB certified PO to generate specific water impacts in addition to the sustainability impacts covered by RSB certification.

By doing so RSB provides an innovative opportunity to link market participants by insetting sustainability impacts and responding to both a growing need for reporting on sustainability footprints in global supply chains as well as ongoing demand for support of locally applied measures to counter the negative impacts of invasive alien plants.

The RSB Water Impact Indicator related to the clearing of IAPs has been developed primarily with the local partners of the RSB Water Impacts Collaboration South Africa: Coega Biomass Centre as industry partner, Blue North and Blue Science as technical consultants and WWF South Africa for stakeholder engagement.

Two stakeholder workshops with national and international participants were held to ensure a consultative engagement process discussion methodology, tool and the results of piloting the application of the RSB Water Impact Indicator in two regions in South Africa.

This document is complemented by the RSB Water Gains Calculator (Annex), an Excel-based calculator tool designed to be user-friendly and deliver robust and verifiable results.

As with the introduction of any innovation within a globally recognised leading sustainability certification system, the implementation within the RSB certification system and the full integration into all relevant system elements, including the RSB Book & Claim Impacts registry, will need time will be subject to review. This is a normal process following the RSB processes to ensure continual improvement of its certification system. The aim of releasing this first version of the RSB Water Impact methodology is to have a sufficiently robust impact indicator to develop over time, reflecting the needs of all parties involved in RSB certification. Continuously learning from the water impact indicator's implementation moving forward will help to overcome the initial implementation challenges. We believe that by having this in the RSB we will be providing a science-based way of demonstrating positive impacts on water systems in line with the RSB mission of a biobased economy.

6. References

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7. Abbreviations

CSIR	Council for Scientific and Industrial Research
GIS	Global Information System
IAP	Invasive Alien Plant
KML	Keyhole Markup Language format (XML-based file format for displaying information in a geographic context)
MAP	Mean Annual Precipitation
NIAPS	National Invasive Alien Plant Survey
RSB	Roundtable on Sustainable Biomaterials
P&C	Principles and Criteria
PO	Participating Operator
RSB	Roundtable on Sustainable Biomaterials
SOP	Standard Operating Procedures
TNC	The Nature Conservancy
UMP	Unit Management Plan (PO)
UN	United Nations
WfW	Working for Water Programme South Africa
WR	Water Resources South Africa
WRC	Water Research Commission South Africa
WWF	World Wide Fund for Nature

8. Terms and definitions

Land management unit: A land management unit is a defined area of land that is managed according to a specific set of principles and criteria. In this case it could be principles and criteria developed for invasive alien management.

A land management unit should have:

1. Clear boundaries identified and mapped

2. There should be a management plan linked to the land management unit. The management plant must as a minimum describe the goals, objectives and strategies for managing the land in accordance to set principles and criteria. The FSC is usually used here and the operator at Coega also uses FSC.
3. Consideration for future – consider a Chain of Custody to track products from Land management unit to market.
4. Certain aspects should be detailed in the management plan such as herbicide use, health and safety etc. Please refer to the Working for Water Standard Operating Procedures (SOP) that was included in the calculator. Consider standards and guideline development as a separate workstream.

A land management unit can be subdivided into smaller units depending on the specific site conditions, for example there may be certain ecological areas like rivers, rocky outcrops, wetlands etc that you would like to handle differently. In the case of this methodology we referred to these smaller units as blocks.

Block: land management sub-units that requires specific management or has specific operational circumstances. Often those are active clearing operation areas.

Runoff water: is the portion of precipitation that results in surface water flows over the land surface, rather than being absorbed into the soil or evaporate. This water can come from rain, snowmelt or increased groundwater contribution to the surface water flow.

State of the invasive alien plant stage:

Plant stage	Description
Mature	Has the mature growth form, generally also reproductively mature
Mature optimal	Pines - all summer rainfall areas except highveld and upper Drakensberg escarpment = Mature optimal
	Wattles - all areas = Mature optimal (Highveld considered sub-optimal for A mearnsii)
	All other species default = Mature optimal, this can be refined further for some species if desired
Mature sub-optimal	Pines - all winter rainfall areas = Mature sub-optimal
	Pines - highveld and upper Drakensberg escarpment - Mature sub-optimal

	Eucalypts - highveld = Mature sub-optimal, otherwise Mature optimal
Young	Between a seedling and mature plant, can be reproductively mature in fast maturing species (e.g. wattles)
Seedling	Seedling and sapling up to 4-years old in slow growing plants, 1-year in fast growing plans like wattles
Coppice	Resprouting from the main stem or roots, multi-stemmed, will become a mature plant after some years

Dryland (non-riparian): Riparian areas are the zones along rivers, streams, lakes, or other bodies of water where terrestrial and aquatic ecosystems meet. They are typically characterized by vegetation that is adapted to living in or near water, such as trees, shrubs, and grasses. In the case of this methodology riparian areas will have more water available and non-riparian areas less water available

Fynbos biome: Fynbos is a unique biome native to the Western Cape region of South Africa. It is characterized by its dense, shrubby vegetation, which is adapted to the region's Mediterranean climate with hot, dry summers and cool, wet winters.

Grassland and savanna biomes: Grasslands and savannas are both terrestrial ecosystems dominated by grasses, but they differ in their tree cover and other characteristics. In the context of this methodology typically receive moderate amounts of rainfall, whilst Savannas experience a distinct dry and wet season.

9. Annex 1: RSB water gains calculator for clearing IAPs

The RSB water gains calculator is an Excel-based tool for calculating water gains achieved by clearing invasive alien plants. The current focus is on trees, and subsequent follow-up activities are required to prevent re-infestation.

Once the calculator tool and methodology of this RSB Water Impact Indicator are approved by the RSB Assembly of Delegates, the RSB Water Impact Indicator will be published on the RSB website.