Sustainable Development and Safeguards assessment

SDGs and Environmental and Social Risk Assessment for the implementation of AWD practices in Thailand under the framework of the Article 6 of the Paris Agreement

Introduction

Alternate Wetting and Drying (AWD) is a water management practice designed to enhance sustainability in irrigated rice cultivation by reducing methane emissions and improving resource use efficiency. Developed by Varuna and myclimate under the framework of Article 6 of the Paris Agreement and the Switzerland–Thailand bilateral agreement, this programme seeks to balance environmental and social benefits with social responsibility.

The activity does not fall under any of the category of projects that are required to carry out an Environmental (and Social) Impact Assessment[1] according to the Thai law, nevertheless the programme has carried out an Environmental and Social risk assessment in this document (Safeguards Assessment). In line with TGO requirements to ensure sustainable development and identify safeguards[2], the risk assessment has identified safeguards to mitigate risks of negative environmental and social impacts that may arise from project implementation.

The programme adheres to the Quality, Safety, Security, Health and Environment Policy of AI and Robotic Ventures[3], to which Varuna belongs to.

Sustainable Development Goals (SDG)

Besides the obvious contribution of the programme to combating climate change (SDG13), this programme will also positively impact farmers' income (SDG 1), ensure sustainable food production and foster food-security (SDG 12, SDG 2), will create job opportunities during the trainings and monitoring (SDG 4 and SDG 8), will broaden the use of high-tech instruments (SDG 9), will optimize water usage (SDG 6), improve soil conditions (SDG 15) and will also promote gender equality by engaging with female farmers (SDG 5). This MA will monitor the three most relevant SDGs among the abovementioned ones. The following targets and indicators identified with the application of the GS impact tool[4] will be monitored to track the programme's progress and its contribution to driving sustainable development in Thailand.

[1] https://eiathailand.onep.go.th/imgeditor/maptaput/EIA-Eng-2021.pdf
[2] https://tver.tgo.or.th/index.php/en/en-premium/kar-phathna-khorngkar-en/pre-en-project-specification/pre-en-sustainable-development-and-safeguards-assessment
[3] https://arv.co.th/en/who-we-are/sustainability/2
[4] https://globalgoals.goldstandard.org/430-iq-sdg-impact-tool/

SDG	Target	Relevance:	Monitoring parameter:
SDG 2: Zero hunger	2.4 By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality	The adoption of AWD practices requires less water enabling therefore more drought resistant cultivation practices. This strengthens farmers' capacity for adaptation to climate change.	Number of farmers adopted practices promoted by the project
SDG 3: Good health and wellbeing	3.9 By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination	The programme will train farmers in avoiding the practice of open straw burning, which causes considerable air pollution.	Area under reduced/avoided open burning of biomass, crop residue
SDG 6: Clean Water and Sanitation	6.4 By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity	The adoption of AWD practices requires less water enabling the preservation of natural freshwater bodies and addressing water scarcity issues	Land area provided with (i) new, (ii) improved irrigation and drainage services

Safeguards assessment

1. Non-Discrimination, Gender equality, Inclusion and Freedom of Expression

Potential Risks:

The risk of discrimination arises primarily from entrenched social hierarchies and institutional barriers that could exclude certain groups—such as women, ethnic minorities, tenant farmers, or those lacking land documentation—from programme access and benefits. In rural Thailand, customary land tenure and informal arrangements are common, potentially preventing renters or sharecroppers from equal participation.

There is a risk that women and marginalized populations may be sidelined in benefit sharing, training, or decision-making, perpetuating existing inequalities.

Power dynamics in rural communities may discourage open feedback, with stakeholders fearing reprisal if they raise concerns about programme implementation or benefit allocation.

Risk and Safeguard assessment:

To address these risks, the programme's eligibility criteria are intentionally broad, welcoming all rice farmers, irrespective of land ownership or gender. Legal land use is verified through a range of accepted documents, including leases and certificates, reducing the administrative burden on non-owners.

Discrimination on the basis of gender or religion is not common in Thailand and is not expected, nevertheless the programme strives to ensure non-discrimination. The programme actively encourages participation of female farmers and ensures equal access to training, technology, and incentives.

To foster a safe environment, multiple reporting channels—including hotlines, anonymous emails, and physical drop-boxes—are actively promoted. Independent committees comprising community representatives, government officials, and third-party experts ensure grievances are reviewed impartially. Whistleblower protections are codified, guaranteeing confidentiality and safeguarding against retaliation.

Risk Likelihood: Negligible

2. Labour, Child Rights, and Equal Opportunity

Potential Risks:

As the AWD initiative creates opportunities in field monitoring, data entry, and community leadership, there is a potential for unintentional child labour or unfair practices, particularly where informal labour arrangements are the norm. Power imbalances could also lead to discrimination or harassment within new employment avenues.

Risk and Safeguard assessment:

The programme adheres to the Thai labour law and ILO conventions, with explicit clauses against child and forced labour. All staff and participants are educated about anti-harassment and equal opportunity policies upon enrolment. A clear, confidential grievance mechanism is accessible for reporting abuses, and all complaints are independently reviewed to guarantee fair outcomes and corrective action.

Risk Likelihood: Negligible

3. Corruption, Fraud, and Good Governance

Potential Risks:

Risks include misallocation of resources, undue influence in benefit distribution, or manipulation of emissions data, particularly given the financial incentives associated with carbon credits. The complex flow of funds across borders raises concerns about transparency and the potential for illicit activity.

Risk and Safeguard assessment:

Varuna adheres to integrity policies, sexual harassment policies, and anti-corruption policies in line with PTTEP requirements and in line with AI Robotic's Quality, Safety, Security, Health and Environment Policy (link). Varuna conducts business with honesty and integrity. Both aggressive and passive corruption will not be permitted.

Varuna has positioned itself to comply with Anti-Money Laundering legislation and laws. By maintaining an organized and ethical business practice, the company is dedicated to preventing any involvement in acts that facilitate money laundering.

Robust financial controls are in place: all transactions are conducted via regulated bank channels, with clear documentation. Data collection leverages secure digital platforms, with traceable audit trails and government oversight, reducing manual intervention and the scope for tampering. Closed chamber measurements—subject to manipulation—are reserved for plausibility checks, while primary verification relies on satellite and remote data, further limiting opportunities for fraud.

Risk Likelihood: Minor

4. Privacy and Data Security

Potential Risks:

The use of digital platforms and remote sensing requires the collection of personal and geospatial data, raising risks of misuse, unauthorised sharing, or data breaches that could undermine trust and violate privacy rights.

Risk and Safeguard assessment:

The data collected will be strictly used only for the MRV of the programme. Any disclosure will be avoided, with the exception of the Thai and Swiss authorities and the VVB bodies.

In the event of a suspected or confirmed data breach, there will be temporary suspension of affected systems. Ther will be an incident response including notification to all related parties and root cause analysis investigation.

Risk Likelihood: Minor

5. Occupational Health and Safety

Potential Risks:

Introducing new practices or technologies may inadvertently expose farmers to unfamiliar risks, from equipment-related injuries to unfamiliar field conditions.

Risk and Safeguard assessment:

Risk assessments confirm AWD does not introduce hazards beyond those in traditional rice cultivation nor does it require the application of heavy machineries. Farmer training cover nevertheless safe operation of technology and best practices for fieldwork. Feedback loops allow prompt identification and mitigation of unforeseen risks, with adjustments to protocols as needed.

Risk Likelihood: Negligible

6. Cultural Heritage and Practices

Potential Risks:

Any shift in farming practice can affect cultural heritage, particularly if traditional methods are deeply tied to local identity or community rituals.

Risk and Safeguard assessment:

There is no significant cultural practices that is expected to be lost; AWD is an adaptation of existing rice farming rather than a fundamental change.

Risk Likelihood: Negligible

7. Economic and Livelihood Risks

Potential Risks:

Transitioning to AWD may present economic risks: initial yield reductions, increased management complexity, or upfront costs could deter adoption or impact farmer incomes.

Risk and Safeguard assessment:

Yield impacts are closely tracked, with rapid-response extension support if unexpected losses occur. Financial incentives from carbon credits cushion short-term income variability and defray costs for technology or

infrastructure upgrades. Ongoing capacity building and technical support lower adoption barriers, and the use of SMARTfarmer platform encourage knowledge exchange.

Risk Likelihood: Minor; mitigated through design

8. Programme Governance, Participation, and Communication

Potential Risks:

Lapses in communication, lack of transparency, or insufficient engagement can erode trust and hinder widespread adoption.

Risk and Safeguard assessment:

Routine stakeholder engagement is built into the programme's lifecycle, from design through evaluation. Digital and face-to-face communication tools ensure all participants are informed and heard. Feedback and grievance mechanisms are reviewed for effectiveness and accessibility at least annually, with results shared openly.

Risk Likelihood: Negligible

9. Water Quality and Accessibility

Potential risk:

AWD alters irrigation schedules, which could disrupt water allocation for downstream users or impact local water quality due to changes in flooding and drainage patterns.

Risk and Safeguard assessment:

AWD is implemented only in regions with established irrigation infrastructure and in coordination with local water authorities and farmer water-user groups. Impact assessments are conducted before initiation to ensure no adverse effects on community water access. Adaptive management allows for real-time adjustments to scheduling should conflicts or issues arise.

In general, AWD practices improve water accessibility by allowing a reduced use of water resources.

Risk Likelihood: Negligible (Positive)

10. Soil Health and Quality

Potential Risks:

Potential negative impacts on soil organic carbon (SOC) due to increased aeration from intermittent drying.

Risk and Safeguard assessment:

Current science suggests SOC changes are minimal due to offsetting effects. Farmer training emphasizes sustainable residue management improving soil health which is expected to improve due to enhanced root growth and better aeration.

Risk Likelihood: Negligible to Positive

11. Air Quality

Potential Risks:

While AWD has large beneficial effects on air quality due to reducing methane emissions, there are risks associated to the potential increased machinery use and continue field residue burning.

Risk and Safeguard assessment:

Training modules discourage residue burning and promote alternative uses for straw, such as composting or mulching, with compliance monitored via satellite imagery. Machinery use is not expected to be required as the majority of the farmers operate in flat lands. Impact to air quality is monitored and largely compensated by CH_4 emissions reductions

Risk Likelihood: Negligible (Positive)

12. Biodiversity and Ecosystem Services

Potential Risks:

Altering hydrology may affect field flora and fauna, potentially reducing local biodiversity if not managed with ecological sensitivity.

Risk and Safeguard assessment:

AWD supports integrated pest management and reduces periods of stagnant water, which can benefit soil organisms and beneficial insects.

Risk Likelihood: Positive

Conclusions

The programme contributes to 4 SDGs: climate action (SDG 13), zero hunger (SDG 2), good health and wellbeing (SDG 3) and clean water and sanitation (SDG 4).

The Safeguard assessment is summarized in the following table:

Risk Area	**Potential Risks**	**Mitigation Measures (safeguards)**	**Likelihood**
Non-Discrimination, Gender equality, Inclusion & Freedom of Expression	Exclusion of marginalized groups	Broad eligibility; outreach; continuous monitoring	Negligible
Labour, Child Rights & Equal Opportunity	Child labour, unfair practices	Adheres to law; anti-harassment policies; grievance mechanism	Negligible
Corruption & Governance	Resource misallocation, fraud	Financial controls; audits; digital traceability	Minor
Privacy & Data Security	Data misuse or breaches	Restricted use; incident response plan	Minor
Occupational Health & Safety	New operational risks	No complex new technologies required; feedback loops	Negligible
Cultural Heritage & Practices	Impact on traditional practices and local identity	AWD adapts existing rice farming; no significant cultural loss expected	Negligible
Economic & Livelihoods	Yield, income risks	Monitoring; financial incentives; support platforms	Minor

Programme Governance, Participation & Communication	Poor communication, lack of transparency, insufficient engagement	Routine stakeholder engagement; effective communication tools; annual review of feedback mechanisms	Negligible
Water quality & accessibility	Water disruption	Coordination with authorities; adaptive management; AWD practices reduce water usage	Negligible (Positive)
Soil quality	Soil changes	Promotion of sustainable practices	Negligible (Positive)
Air Quality	Increased machine use and Residue burning	Training on avoid use of heavy machineries; Discourage burning; Reduce CH_4 emissions	Negligible (Positive)
Biodiversity	Biodiversity impacts	AWD support ecosystem services	(Positive)

This Environmental and Social Risk Assessment demonstrates that the AWD programme in Thailand developed under the framework of the Article 6 of the Paris Agreement and the bilateral agreement between Switzerland and Thailand, as structured in the Mitigation Activity Design Document, is well-aligned with international best practices and does not generate significant negative impacts. Minor negative impacts are further mitigated by the safeguards in place. The programme includes robust safeguards, transparent monitoring, and strong stakeholder engagement, ensuring that AWD implementation not only reduces greenhouse gas emissions but also delivers social, economic, and environmental co-benefits for Thai rice farmers and their communities.