

SURUMER - Sustainable Rubber Cultivation in the Mekong Region

Implementing Aichi Biodiversity Targets



Within the last decade, world production of natural rubber has increased by one-third. Currently China uses more than 1/3 of the world rubber production, to be produced in the southern tropical regions of China (especially Yunnan) and its neighboring countries of the Mekong region.

The overall objective of the joint project SURUMER is to develop an integrative, applicable, and stakeholder-validated concept for sustainable rubber cultivation in Yunnan. The outcomes of the project will not only refer to the regional situation of the study region. Rather, they provide a wider application for potential rubber cultivation areas across the Mekong region. The concept is based on multi-, inter- and transdisciplinary approaches to identify trade-offs and synergies between ecosystem functions and services on the one hand and socio-economic goals and constraints on the other.

Acronym	Full Name
BMBF	German Ministry of Education and Research
GMS	Greater Mekong Subregion
INVEST	Integrated Valuation of Ecosystem Services and Trade-offs
NRWNNR	Naban River Watershed National Nature Reserve
SURUMER	Sustainable Rubber Cultivation in the Mekong Region

C



Biodiversity in the Naban River Watershed National Nature Reserve

Our study area, the NRWNNR, is subdivided in zones featuring several degrees of protection status for land use conversion. Restrictions are highest in the core zone, while limited agricultural and collection activities are allowed in the buffer zone. The experimental zone features the lowest number of protection measures, which is also represented in the results of our wildlife and habitat surveys for the NRWNNR.

Compared to the buffer zone, only half the number of ungulate species have been found in the experimental zone. Similar results have been found for selected insect species (longhorn beetles, bark beetles, wild bees and hoverflies). The lowest species and individual numbers were recorded near the edge of rubber plantations, while the natural forest played an important role in the maintenance of a majority of these insect groups.

Our 'Balanced trade-offs' scenario approaches these problems by increasing the area of near-natural forest, as well as including alternative land management solutions, such as reduced herbicide application, to enhance the habitat quality within and around rubber plantations.



A stingless bee (Trigona sp.)

13 Assessing species richness in the NRWNNR and developing biodiversity conservation measures

12 Development of a methodology to incorporate multiple levels of species diversity into ecosystem service models with reference to red list and endemic species

A



Losses of natural habitat and ecosystem functions and services due to rubber monoculture expansion

SURUMER's concept is based on multi-, inter- and transdisciplinary approaches to identify trade-offs and synergies between ecosystem functions and services on the one hand and socio-economic goals and constraints on the other. This information will be integrated into an overarching assessment based on the sustainability of the current rubber production systems and their impact on ecosystem services and functions in order to highlight pathways and approaches to develop, communicate and demonstrate more sustainable and more biodiversity friendly rubber management alternatives.

The project goal is the development of an integrative, applicable, and stakeholder-validated concept for sustainable rubber cultivation in Xishuangbanna Dai Autonomous Prefecture, Yunnan, China. This highly diverse eco-region represents most of the potential rubber cultivation areas across the Greater Mekong Subregion (GMS), where presently more than half of the global natural rubber is produced. Rubber cultivation in this region increased dramatically in the last few decades, with consequences such as the reduction of natural forests and biodiversity on various scales, impacts on important ecosystem services and functions, as well as changes and risks in the socio-economic situation of farmers.



Hillside clearings to prepare for rubber plantations lead to extensive losses of natural habitat

5 Assessing the effect of rubber plantations on biodiversity and ecosystem services

4 Stakeholders have been presented with our results during multiple transdisciplinary stakeholder workshops

D

Water	Carbon	Biodiversity	Social welfare
Quality	Biomass	Habitat quality	Income
Quantity	Latex	Pollination	Workload
Evaporation	Sequestration rates	Animal husbandry	Payments for ESS
Transpiration	Sedimentation	Non-Timber Forest Products	Conservation Value
Erosion	Export	Human-Wildlife conflicts	Tourism

Analysing ecosystem services and trade-offs

To assess and quantify the effects of the 'Balanced trade-offs' scenario, especially in comparison to alternative scenarios (such as 'Business as usual'), an ecosystem service assessment was conducted using InVEST (Integrated Valuation of Ecosystem Services and Trade-offs), an open-source modeling software package (<http://www.naturalcapitalproject.org/invest/#what-is-invest>). InVEST allowed us to compare trade-offs between several ecosystem services among several land use scenarios in a spatially explicit way in order to determine the most beneficial future scenario.

We included ecosystem services such as carbon sequestration, water yield, erosion prevention, latex yield from rubber cultivation and habitat quality (including a variety of vertebrate, invertebrate and plant species) and analysed them in respect to their provision on a landscape scale.

For the NRWNNR we found an increase in almost every of the aforementioned ecosystem services when comparing the 'Business-as-usual' scenario to the 'Balanced trade-offs' scenario. The only exception is a reduction of the total amount of yielded latex in the NRWNNR, as we restricted the establishment of new rubber plantations in the 'Balanced-trade offs' scenario, while the 'Business-as-usual' scenario allowed for an expansion of rubber areas.

The areas planned for reforestation measures (as indicated in section B of this poster) not only increased the total habitat quality, but were also responsible for a considerable part of the improvement of several other ecosystem services, especially the amount of sequestered carbon and the reduction of erosion-prone land sections.

14 Improving human-well-being through ecosystem service assessments

15 Potential increase of carbon sequestration in the NRWNNR via reforestation plans in the uplands

B



Developing a 'Balanced trade-offs' land use scenario

Several future land use scenarios have been developed by SURUMER for our study area, the Naban River Watershed National Nature Reserve (NRWNNR). The 'Balanced trade-offs' scenario comprises the different stakeholder interests from production level (farmers) to societal level (e.g. city dwellers dependent on water quality). The first measure is a restoration of rubber sites above 900 meters above sea level into near natural forest, as these rubber areas are less profitable and more prone to be negatively affected by unfavourable environmental conditions. Secondly, the same measure is applied to rubber sites located on slopes of higher than 23 degrees. Both measures will lead to an increase of near natural forest habitat areas while also decreasing farmers economic risks.

Additionally, to ensure the drinking water quality for the rural population, several water protection zones are planned to be established in our study area. These include water conservation priority zones around water sources as well as buffer strips of natural vegetation along streams and rivers, which provide valuable water purification services. In addition to the beneficial water purification and habitat services, our 'Balanced trade-offs' scenario also provides a reduction of areas susceptible to erosion as well as featuring enhanced carbon sequestration services.

5 Developing land use change scenarios which preserve biodiversity and ecosystem services

7 Developing land use management solutions to enhance habitat quality and preserve an undisturbed flow of ecosystem functions

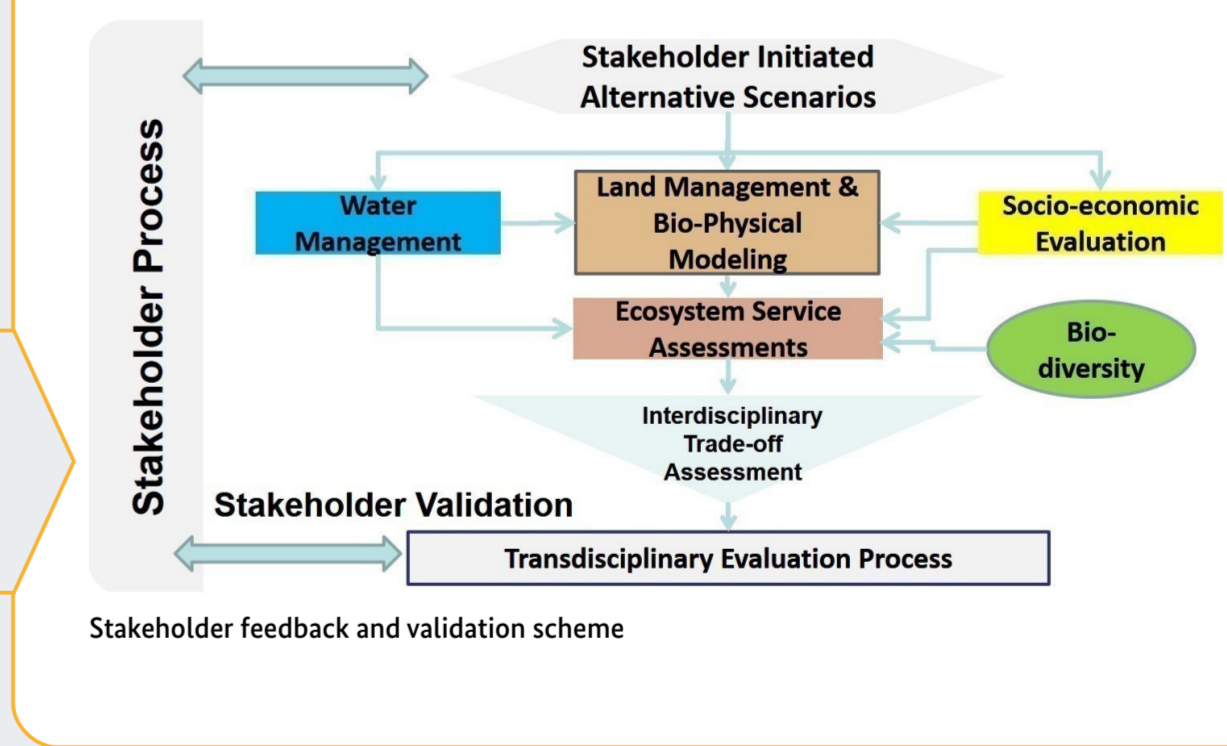
8 Reduction of pollution from chemical weed management by reducing the amount of herbicides to single, well-timed application event

E



Transdisciplinary evaluation process

Integrated ecosystem services assessments are communicated to stakeholders through workshops, posters, presentations and training sessions, depending on the stakeholders topics, needs and preferences. Feedback gained through these activities is transferred back to scenario modeling to better match with stakeholders interests. A final stakeholder workshop took place in Jinghong, China, in October 2016. Several results of the SURUMER project on rubber management practices as well as their associated impacts on ecosystem services and biodiversity have been presented there. The stakeholders participated with a high level of cooperation and interest. Feedback and suggestions gained in the workshop are currently being incorporated in the final ecosystem service modeling process.



18 Transdisciplinary evaluation processes through stakeholder workshops involving participants from administration, research and industry on a prefecture and commune level

19 Final development of stakeholder-validated ecosystem service assessments

AICHI BIODIVERSITY TARGETS STRATEGIC GOALS

A Address the underlying causes of biodiversity loss by mainstreaming biodiversity across government and society

- Target 1: By 2020, at the latest, people are aware of the values of biodiversity and the steps they can take to conserve and use it sustainably.
- Target 2: By 2020, at the latest, biodiversity values have been integrated into national and local development and poverty reduction strategies and planning processes and are being incorporated into national accounting, as appropriate, and reporting systems.
- Target 3: By 2020, at the latest, incentives, including subsidies, harmful to biodiversity are eliminated, phased out or reformed in order to minimize or avoid negative impacts, and positive incentives for the conservation and sustainable use of biodiversity are developed and applied, consistent and in harmony with the Convention and other relevant international obligations, taking into account national socio-economic conditions.
- Target 4: By 2020, at the latest, Governments, business and stakeholders at all levels have taken steps to achieve or have implemented plans for sustainable production and consumption and have kept the impacts of use of natural resources well within safe ecological limits.

B Reduce the direct pressures on biodiversity and promote sustainable use

- Target 5: By 2020, the rate of loss of all natural habitats, including forests, is at least halved and where feasible brought close to zero, and degradation and fragmentation is significantly reduced.
- Target 6: By 2020 all fish and invertebrate stocks and aquatic plants are managed and harvested sustainably, legally and applying ecosystem based approaches, so that overfishing is avoided, recovery plans and measures are in place for all depleted species, fisheries have no significant adverse impacts on threatened species and vulnerable ecosystems and the impacts of fisheries on stocks, species and ecosystems are within safe ecological limits.
- Target 7: By 2020 areas under agriculture, aquaculture and forestry are managed sustainably, ensuring conservation of biodiversity.
- Target 8: By 2020, pollution, including from excess nutrients, has been brought to levels that are not detrimental to ecosystem function and biodiversity.
- Target 9: By 2020, invasive alien species and pathways are identified and prioritized, priority species are controlled or eradicated, and measures are in place to manage pathways to prevent their introduction and establishment.
- Target 10: By 2015, the multiple anthropogenic pressures on coral reefs, and other vulnerable ecosystems impacted by climate change or ocean acidification are minimized, so as to maintain their integrity and functioning.

C To improve the status of biodiversity by safeguarding ecosystems, species and genetic diversity

- Target 11: By 2020, at least 17 per cent of terrestrial and inland water, and 10 per cent of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscapes and seascapes.
- Target 12: By 2020 the extinction of known threatened species has been prevented and their conservation status, particularly of those most in decline, has been improved and sustained.
- Target 13: By 2020, the genetic diversity of cultivated plants and farmed and domesticated animals and of wild relatives, including other socio-economically as well as culturally valuable species, is maintained, and strategies have been developed and implemented for minimizing genetic erosion and safeguarding their genetic diversity.

D Enhance the benefits to all from biodiversity and ecosystem services

- Target 14: By 2020, ecosystems that provide essential services, including services related to water, and contribute to health, livelihoods and well-being, are restored and safeguarded, taking into account the needs of women, indigenous and local communities, and the poor and vulnerable.
- Target 15: By 2020, ecosystem resilience and the contribution of biodiversity to carbon stocks has been enhanced, through conservation and restoration, including restoration of at least 15 per cent of degraded ecosystems, thereby contributing to climate change mitigation and adaptation and to combating desertification.
- Target 16: By 2015, the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization is in force and operational, consistent with national legislation.

E Enhance implementation through participatory planning, knowledge management and capacity building

- Target 17: By 2015 each Party has developed, adopted as a policy instrument, and has commenced implementing an effective, participatory and updated national biodiversity strategy and action plan.
- Target 18: By 2020, the traditional knowledge, innovations and practices of indigenous and local communities relevant for the conservation and sustainable use of biodiversity, and their customary use of biological resources, are respected, subject to national legislation and relevant international obligations, and fully integrated and reflected in the implementation of the Convention with the full and effective participation of indigenous and local communities, at all relevant levels.
- Target 19: By 2020, knowledge, the science base and technologies relating to biodiversity, its values, functioning, status and trends, and the consequences of its loss, are improved, widely shared and transferred, and applied.
- Target 20: By 2020, at the latest, the mobilization of financial resources for effectively implementing the Strategic Plan for Biodiversity 2011-2020 from all sources, and in accordance with the consolidated and agreed process in the Strategy for Resource Mobilization, should increase substantially from the current levels. This target will be subject to changes contingent to resource needs assessments to be developed and reported by Parties.



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