ABCG TANZANIA LAND USE PLANNING WORKSHOP, APRIL 2017 WORKSHOP REPORT

AFRICA BIODIVERSITY COLLABORATIVE GROUP

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INTRODUCTION

Africa is experiencing an unprecedented pace change and history has shown repeatedly that rapid, poorly-planned development can have significant social and environmental consequences. The United Nations 2030 Agenda's Sustainable Development Goals (SDGs) call for development that tackles poverty's root causes while heeding social and natural resources concerns. Achieving progress towards SDGs at a regional scale requires careful land use planning with support of governments, private sector, and civil society. This project is applying a participatory planning framework for a region in southern Tanzania that is both rich in wildlife and agricultural resources.

PROJECT OVERVIEW

Modern land use planning approaches can help strike a balance among competing uses in a manner that minimizes trade-offs and promotes sustainability[1]. Effective participatory planning approaches that consider multiple planning objectives using models can stimulate cross-sector strategic thinking, help participating stakeholders confront the drivers of change, recognize trade-offs, and improve decision making[2]. In this project, the Africa Biodiversity Collaborative Group (ABCG) uses a participatory approach emphasizing the use of scenario models of land use change to help stakeholders understand the land use dynamics in southern Tanzania as basis for formulating sustainable land use strategies. ABCG has found that target landscapes are being reshaped, not by a single driver, but by a suite of drivers including population growth, changing resource utilization patterns, economic development and increasingly climate change. In many landscapes these drivers are accelerating. Conservation planning frameworks need to recognize this reality and incorporate the current and forecasted future cumulative impact of these drivers of change to identify more robust conservation interventions.

Supported by USAID, the African Wildlife Foundation (AWF) and the Wildlife Conservation Society (WCS) are leading an ABCG initiative with contributions from Conservation International, Jane Goodall Institute, and the World Resources Institute to develop a planning framework emphasizing a scenario analysis approach for southern Tanzania. Much of our study area intersects the Southern Agricultural Growth Corridor of Tanzania (SAGCOT) where public and private sector investment aims to triple agricultural output over a 20-year period begging the question: how can that growth be made sustainable considering the region's abundant conservation and natural resource assets?

We will generate spatially-explicit scenarios to inform land-use planning that considers multiple objectives such as protection of wildlife corridors and ecosystem service delivery areas and agricultural expansion. A spatial prioritization analysis will maximise different objectives (e.g., save 80% of current elephant habitat) across different scenarios or alternative futures to identify trade-offs. Scenarios will be based on landscape visions,

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[1] Metternicht, G. 2017. Global Land Outlook Working Paper: Land Use Planning. United Nations Convention to Combat Desertification.
[2] Sandker, M., et al., 2010. The role of participatory modeling in landscape approaches to reconcile conservation and development. *Ecology and Society*, 15(2).

objectives and drivers. By evaluating scenarios against landscape objectives, favourable land-use distributions or configurations can be identified. The Mbeya workshop convened stakeholders that shape land use change--government, commercial sectors, communities and conservationists—and formulated questions and objectives driving the creation of scenarios that will be assessed in a participatory, landscape-level planning process. Stakeholder input is critical to formulate objectives that are meaningful to realities on the ground and, to interpret resulting scenarios to formulate recommendations that minimize conflict between land use objectives while considering climate-smart strategies, conservation values, and human well-being.

The aim of this report is to provide a summary of a two-day stakeholder workshop on land use planning in southern Tanzania. The agenda for this workshop can be found in Appendix 1. At the workshop, 22 workshop participants represented 4 ABCG member organizations, 4 government ministries, and 3 organizations specializing in agriculture, forestry, water resources. The full list of attendees is included in Appendix 2.

WORKSHOP OBJECTIVES

- Present to stakeholders work that has been done by various organisations emphasizing on biodiversity, water services and agricultural land in southwestern Tanzania. Presentations also included an analysis of drivers of land use change, biodiversity studies, SAGCOT, pilot planning exercises.
- Provide an open forum to discuss and prioritise key land use planning objectives and challenges.
- Identify additional information and data that will contribute to the robustness of the proposed land use planning analysis and explore how these data might be included in analysis.
- Participatory mapping exercise to identify features of interest (development areas, existing industry, key biological features, etc.)
- Discuss and seek stakeholder views on key scenarios of future change to incorporate into land use planning.

WELCOME

David Williams of AWF welcomed the attendees and began by offering the context of the workshop emphasizing how the region is subject to an expanding suite of development drivers shaping land use change including human population growth, external investment, and socio-economic and natural infrastructure. SAGCOT's ambitious and worthy development goals present sustainable development challenges and related questions such as: how can growth be accommodated without degrading key conservation habitat and ecosystem service delivery areas? Where should investment be directed to meet the interests of regional development, private sector, and conservation stakeholders with divergent agendas? What land use strategies will improve local livelihoods while maintaining a natural resource base that mitigates water scarcity and climate change impacts and sustains wildlife populations?

With this project, we strive to build on a multi-sectoral, stakeholder-driven methodology developed in prior ABCG work that enables stakeholders to make informed decisions based on what is likely to happen given prevailing trends in the region. At the intersection of some of the highest population growth on the planet, the fastest growing economy in Africa, globally significant biodiversity, and several major development corridors including SAGCOT, Tanzania offers a powerful case for proactive planning. Through this forward thinking process, Tanzania can avoid unintended consequences that have plagued many poorly planned economic expansions across the world.

CURRENT WORK AND STATE OF KNOWLEDGE IN THE REGION

AWF's John Salehe facilitated a series of presentations on the current work and state of knowledge in the region with respect to salient issues. Ravic Nijbroek of International Center for Tropical Agriculture (CIAT) presented on agricultural intensification and suitability in the context of the SAGCOT project. He profiled the SAGCOT corridor's envisioned infrastructure expansion and upgrades in addition to cluster concept and how it aims to contribute to agricultural expansion that will lift 2 million people out of poverty. He noted a significant issue with agricultural expansion is that they often encroach on wetlands due to their water availability and productive soils. For this project, CIAT improved FAO GAEZ crop suitability models by accounting for soil organic carbon levels and modeled grazing grasses for cattle (Mulato Brachiara types). They combined the agricultural suitability models with a model of travel time to markets revealing that some protected areas (e.g. Ruaha NP) are highly suitable for maize production.

CIAT performed a land use/cover change analysis spanning 2000- 2016 land use/land cover product for the entire 234,222 km^2 study area derived from Landsat satellite imagery that highlighted a significant expansion of cropland across the time period which could have implications for ecosystem services delivery and wildlife habitat. The analysis revealed that cropland and settlement and grassland areas increased in the region at the expense of woodland, wetland, and bushland. The expansion of the former is attributed to population growth; experience reveals a tendency of settlements and agriculture to cluster along transport corridors along with unsustainable expansion of cropland. Infrastructure expansion is therefore a key determinant to land cover and resource use levels and patterns. Grassland and bushland reductions constrain pastoralism and increase related resource use conflicts. Climate change impacts are likely to accelerate the biodiversity loss and create water scarcity for agriculture, conservation and energy needs in the region, exacerbating water resource conflicts.

Conservation land uses expanded from 29.1% to 34.9% of the region since 1990 and has helped to control degradation particularly since 2002. Game Control Areas and Wildlife Management Areas support wildlife beyond the strictly protected area borders. WMAs are investments that aim to increase wildlife populations and associated benefits but at the risk of increasing human-wildlife conflicts, an issue that demands particular consideration in planning. The planning commission sees the need to balance biodiversity conservation with development which requires a strategy to: a) protect wildlife outside protected areas without annexing more village agricultural land; b) to boost and diversify tourism activities

in the zone; and c) place more emphasis on water and forest conservation to satisfy agricultural needs and biodiversity conservation.

The Wildlife Conservation Society's Noah Mpunga profiled the status, threats, and trends related to large and threatened mammals in the region. Salient points follow below:
- Lions have been extirpated very recently from most of landscape (e.g. Kitulo NP-skulls found in the 90s, no longer there). Tanzania's lion population is mostly restricted to reserves now with the study area's major strongholds being Ruaha NP (4500) and Selous GR (5500).
- Tanzania is home to 42 species of primates of which 16 are endemic (38%). One endemic, the Kipunji, was first discovered by WCS scientists in 2003 and is known in 2 sites in SW Tanzania within the study area. Total population 1117 individuals
- Abbott's duiker is a montane forest-dependent antelope only found in remnant patches of high biodiversity.
- Elephants are also largely restricted to reserves and WCS is working with Ruaha-Rungwe and Katavi areas to implement conservation measures.

David Williams presented Tanzania's wildlife corridor network. An impressive 35% of the national territory lies within its protected area network keeping many natural areas intact relative to much of the world. The Tanzania Wildlife Act (2009), provided, for the first time, legislation for gazettement of wildlife corridors, a first in Africa. Regulations to guide legal establishment, however, have not been developed and conservationists have since invested significant effort in corridor creation with mixed results. A 2009 nation-wide assessment documented 31 remaining important corridors in Tanzania; 74% were deemed in extreme or critical condition[3]. 13 of these 31 corridors intersect our study area.

Charles Mengo of the Rufuji Basin Water Board introduced the group to the basin and the board's work and challenges. The basin includes 4 major rivers and 3 major wetland systems supporting a wealth of flora and fauna. Major basin land uses include agriculture, mainly in Usangu plain and Kilombero catchment, mining, fisheries, and conservation. The basin produces over 469 MW of hydro-electric power across several major and minor plants. The basin water board generates data to support resource management, approves and issues permits for water discharge and use, plans for water resource management, monitors and enforces permits, and is leading an ongoing feasibility study for irrigation schemes in Kilombero. Management challenges include: excessive water use and illegal water diversion/abstractions, pollution from excessive agro-chemical applications and mining activities, destruction of water sources, and climate variability and change.

Dr Zacharia Malley of the Selian Agriculture Research Institute (SARI) presented his work on the nexus of climate change and natural capital in the region. Natural capital (land, water and atmosphere) underpins human development across food and energy production, livelihoods, biodiversity conservation, and ecological services which are vulnerable to climate change impacts. There is a positive relationship between use of natural capital and

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[3] Jones, T., T. Caro, and R. R. B. Davenport. 2009. Wildlife corridors in Tanzania. Tanzania Wildlife Research Institute, Arusha.

human development or people's happiness. 1988-2008 temperature trends in the Mbeya-Mbarali-Ruaha Ecosystem suggest a gradual rise while precipitation trends from the late 1970s through 2008 suggests a significant drop with temperature changes being more pronounced in the lower, drier section. Per capita yields of maize, sorghum, rice declined significantly due to climate change and diversion of water and increased pressure on resourced from higher human population. Villager's perceptions of changes in natural capital-climate interactions showed an increase resource conflicts and water shortages. In Ruaha NP water shortages (climate-induced + diversion) have led to declines in water availability downstream and a decrease in the numbers of many large mammals. Solutions include investing in integrated agriculture landscape management, participatory village land use planning, sustainable agriculture intensification, climate-smart practices, introducing innovative nature-conserving livelihood activities (beekeeping, water business, etc), and reduced reliance on irrigated agriculture.

Jane Goodall Institute's Shadrack Kamenya profiled the conservation status of the Chimpanzee in the region, and examined its distribution, habitat, and threats. Chimpanzees mostly rely on woodland ecosystems which are declining. JGI analysed threats to chimpanzees in core habitat and corridors and presented these at a workshop in Arusha in 2016. Smalholder agriculture and settlements & infrastructure emerged as top threats with roads, uncontrolled fire, and disease among second tier threats. Climate change impacts include increased disease, loss of food sources such as fruiting trees, and increasing conflict with human resources as chimpanzees move out of woodlands to find food. JGI recognizes chimpanzees as a flagship species for water sources and other woodland dependent species and has instigated land use plans in Kigoma District, Uvinza District, Mpanda and Nsimbo to set aside village forest reserves.

Joseph Mwalugelo of Conservation International presented Vital Signs, a monitoring system designed to provide site level information to guide agricultural development that is sustainable for people and nature. Vital Signs recognizes that agriculture is the most important sector in Africa accounting for 65% of Africa's workforce and 32% of the continent's GDP but is diverse and complex. Vital Signs aims to collect data at various scales that helps address questions like 'What is the value of nature to farmers?'; 'Where should
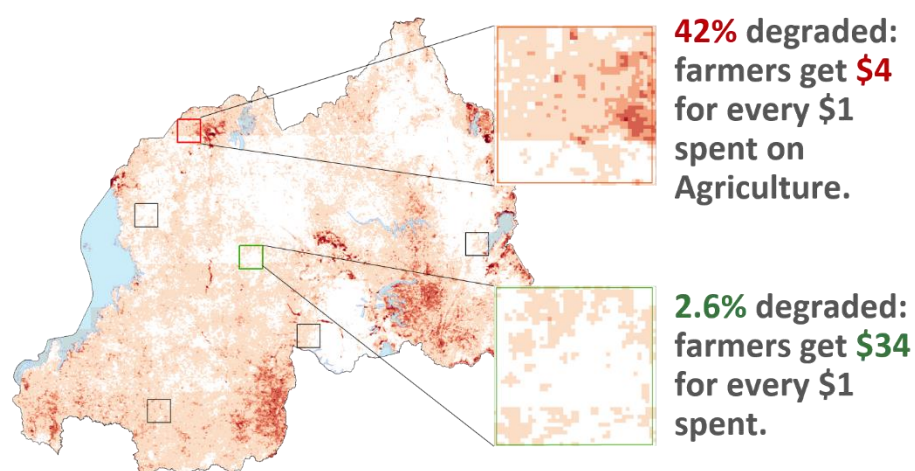

42% degraded: farmers get $4 for every $1 spent on Agriculture.

2.6% degraded: farmers get $34 for every $1 spent.

Figure 1. Low returns on agricultural investment in Rwanda due to degradation (Vital Signs).

agriculture be intensified to maximize yields while sustaining healthy ecosystems?' making it highly aligned with this project. Preliminary findings include:

- Forest can buffer against malnutrition where agricultural output is low. Relating results to the Sustainable Development Goals. E.g., Households near intact forest reported no hunger (meets sustainable development goal of "No hunger");
- Land degradation can lower returns on agricultural investment;
- Improved seeds and extension services are critical for high yields;
- Female farmers carry the largest burden and female-headed households have significantly different resource use patterns and diets.

Drawing from work led by World Resource Institute's Norbert Henninger, David Williams briefly profiled the issue of major drivers of land use change in the region, noting that with lots of its natural resource base intact, Tanzania has an opportunity to learn from the mistakes other nations made in allowing extensive unplanned development leading to expensive unintended consequences or indirect effects (e.g., road leading to deforestation and loss of ecosystem services or channelization of the Mississippi River in USA which authorities are trying to undo). David then provided an overview of direct and indirect drivers of change in southern Tanzania, leading to an example of how they might impact elephant habitat, corridors, and populations.

Gerald Mwakipesile, an economist from the Tanzania National Land Use Planning Commission, presented on land use planning and implementation in the SAGCOT context emphasizing different levels of planning (national, zonal/regional, district, and village). Tanzania created a National Land Use Plan for 2013-2033 that aims to facilitate rational allocation of land resources and decision-making on resources management at national level providing opportunity to prioritize investments for accelerating socio-economic development in areas lagging behind. In the SAGCOT region 21 Districts have Land Use Plans. Village Council is convened to prepare a Village land use plan that demarcates land for community services, residential uses, agriculture uses, livestock grazing, conservation and land for investment. A related challenge is giving land access to external investors without having village land use plans in place.

INTRODUCTION TO ABCG PRIORITISATION WORK AND THE LAND USE PLANNING FRAMEWORK (MARXAN)

Ayesha Tulloch from the Wildlife Conservation Society introduced the group to the land use planning framework common to the ABCG sites noting the central role of the Marxan decision support tool[4]. Her talk provided an overview of how the tool has been used to

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[4] Ball, I.R., H.P. Possingham, and M. Watts. 2009. Marxan and relatives: Software for spatial conservation prioritisation. Chapter 14: Pages 185-195 in Spatial conservation prioritisation: Quantitative methods and computational tools. Eds Moilanen, A., K.A. Wilson, and H.P. Possingham. Oxford University Press, Oxford, UK.

explore trade-offs in other landscapes and cited Marxan's use around the globe to prioritize critical areas for species and ecosystem conservation that minimize the impact of conservation decisions on other stakeholders. Marxan can also be used to assess trade-offs between competing objectives, or to identify where offsets for development impacts (e.g. forestry, farming etc.) would be best cited, through an extension called Marxan with Zones[5]. The talk also covered the fundamentals principles of systematic conservation planning, including stating of quantifiable objectives, complementarily, efficiency and an emphasis on an engaged and participatory planning process.

KEY ISSUES FOR LAND USE PLANNING IN SOUTHERN TANZANIA

Building on the state of knowledge presentations and ensuing discussions, WCS's Ayesha Tulloch then led the group through a session further exploring the key issues land use

planning that will form the basis for planning objectives and questions. Some of the issues that emerged are listed below:

- Unsustainable expansion of cropland and settlement + clustering along transport corridors
- More livestock than pastoral space: encroachment on natural/cropping lands + potential conflict
- Lack of data on land use in Districts without land use plans (LUP) and poor implementation of LUPs by some villages
- Smallholder agriculture the biggest threat to chimpanzees a flagship species that also represent water and other ecosystem services
- Access to intact forests ensures human happiness and meet Sustainable Development Goals of no hunger
- Future climate change (rainfall, water shortages) + increased human population pressure for resources
- Water degradation + access issues
- Large mammals mostly lost from outside reserves
- Huge loss of woodland/shrubland + ecosystem services
- Best places for maize = biggest protected area Ruaha NP
- Push for economic development + high population growth

Common themes across these issues include:
- Water change/access
- Provision of ecosystem services + link to key species/vegetation types
- Need to improve agricultural production: conflict between best places to crop + other uses (e.g. reserves)
- Need for bottom-up planning: village forest reserves / Land Use Plans

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[5] Watts, M.E, I.R. Ball, R.R. Stewart, C.J. Klein, K. Wilson, C. Steinback, R. Lourival, L. Kircher, and H.P. Possingham. 2009. Marxan with Zones: software for optimal conservation based land- and sea-use zoning, *Environmental Modelling & Software*, doi:10.1016/j.envsoft.2009.06.005

PLANNING OBJECTIVES AND QUESTIONS

We divided into three breakout discussion groups to identify 4-5 key questions and objectives for land use planning in the region. Each group reported back on their questions and objectives. We then integrated the above into a single set of 16 potential objectives spanning 6 categories: Livelihoods/economic development, biodiversity, water, governance, capacity, scale of planning. As these objectives drive the formulation of the spatial prioritization in the region, each objective was accompanied by a brief discussion on the required spatial data inputs (Appendix 3). It was noted that finding appropriate spatial data will be a challenge for achieving some objectives.

SCENARIOS: EVALUATING ALTERNATIVE PRIORITIES AND FUTURES

Ayesha gave a brief talk the use of stakeholder-driven Marxan scenarios to help envision and evaluate alternative priorities for different land uses and resources. She presented an example involving the current region that contrasted alternative scenarios driven by varying objectives for ecosystem protection and cropping and pastoralism (Figure 2).

The scenario emphasizing a higher level of ecosystem protection resulted in more protected land and less cropping (Figure 2b). Marxan can also profile alternative futures such as scenarios for reduced crop yields due to changed climate or new infrastructure pathways. She then discussed various future scenarios for Tanzania such as a change in technology catalyzing an agricultural shift from rainfed to irrigated agriculture.

DATA AVAILABILITY AND NEEDS

To match our potential objectives with appropriate data, we split participants again into breakout groups discuss data availability and needs (Figure 3). We asked participants to consider 6 related data themes below in the context of the potential objectives:
- Livelihoods/economic development
- Biodiveristy
- Water
- Governance
- Capacity building
- Scale of planning

For each data theme, we asked them to consider the following sets of questions:

Data to represent now (status quo):
Q1: What/where are the key landscape values/features for the theme now?
Q2: Do we have maps of these?
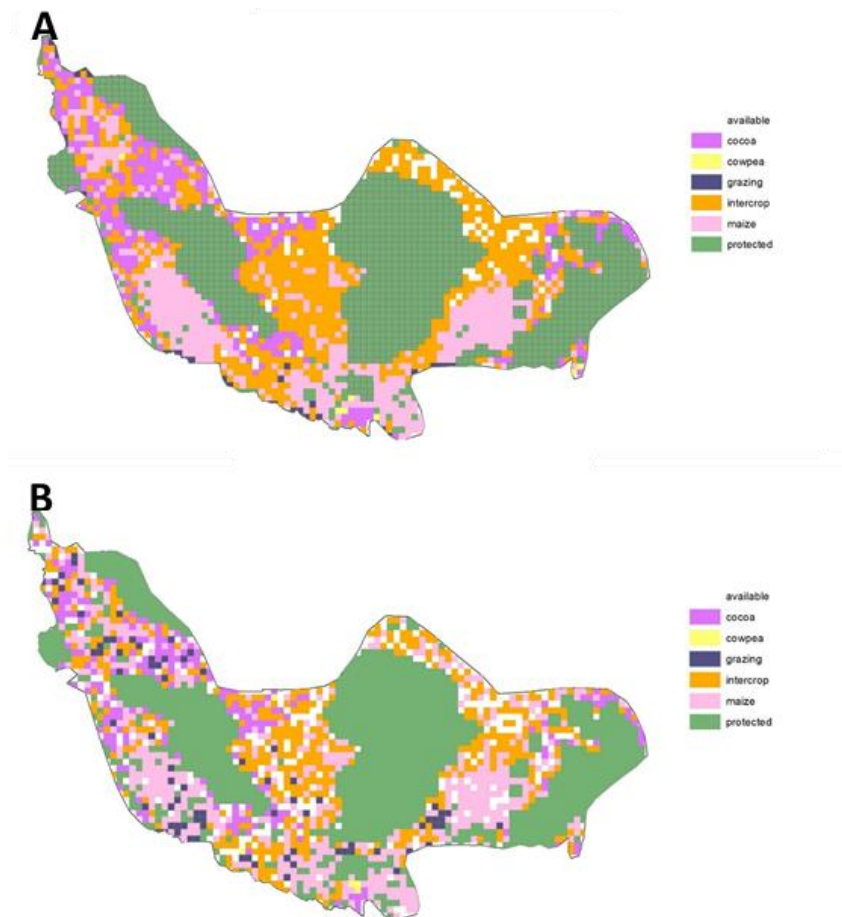Q3: Do we know how to get them?

Figure 2. Results of two planning scenarios where (a) ecosystem protection is weighted equally to cropping and pastoralism or (b) ecosystem protection is weighted *higher* than cropping and pastoralism. Each scenario has a different objective: (a) Protect 30% of all ecosystems + develop 30% of all suitable land for each crop, and (b) Protect 40% of all ecosystems + develop 20% of all suitable land for each crop + pastoralism.

In 20 years:
Q1: What/where will the key landscape values /features be?
Q2: Do we have maps of these?
Q3: Do we know how to get them?

Respondents then reported back to the group. The ensuring discussion enabled the addition of potential data sources for each objective (Appendix 3).

Photo of a breakout group discussing data needs on day two of the workshop. Photo Credit: AWF

POTENTIAL PLANNING SCENARIOS

Based on the objectives, the team formulated 9 rough scenarios representing stakeholder objectives for further exploration in term of feasibility considering data requirements and assimilation into Marxan:

1. Protected area effectiveness: Reduced effectiveness in some/all protected areas due to increased human population pressure and unsustainable hunting
2. Change in technology: Irrigated versus rainfed agriculture. Would that increase productivity?
3. New crop type (not currently targeted for investment)
4. Climate change (e.g. rainfall change or drought) affecting crop yields + ecosystem persistence (or climate change effect on water availability)
5. Policy change: recognize/gazette current agricultural land, so that land is managed effectively (would cropping/grazing conflict?). There is a law for grazing recognition but not for cultivated land
6. Improved knowledge, agri-tech or industries that (a) maximises yields or (b) increases market values of products
7. Will infrastructure (powerlines) increase human pressure?
8. If all villages had land use plans? Would that cater to better outcomes?
9. Increased access to alternative energies

In a facilitated session, participants sorted objectives into those that are immediately able to be addressed (based on data availability: in particular, objectives 1 to 4), and those that require longer term planning and data collection.

WORKSHOP CONCLUSION AND NEXT STEPS

The workshop concluded with a discussion of what would happen next in the analysis. Participants were advised that the next workshop would likely take place in Dar Es Salaam later in 2017, and specific participants should expect to be asked to help source data either within their organizations or from 3rd parties to serve as model inputs. Participants expressed great interest in the steps that would follow after the next workshop and how the plan and outcomes of the workshops would be communicated to other government ministries and to stakeholders in the landscape. Specific action items outlined below:

1) Evaluating potential scenario feasibility and revise them as necessary. In some cases data generation may be required to fill gaps.

2) Follow up with the experts and additional data sources identified in during the workshop to drive the scenarios.

3) Setup a file sharing site for the project to facilitate data sharing and collaboration.

Participants were advised that the next workshop will present objectives, new data collected, and resulting scenarios. We will systematically review the objectives against the scenarios to determine which can be addressed with the current scenarios and which would require another phase of work. Primary outputs will be a) opportunities to use the scenarios to help inform policy development, b) strategies to communicate the above to select audiences to drive that discussion, c) pathways to fill remaining knowledge gaps. Given that the next workshop will emphasize reviewing scenario modeling results and formulating strategies informed by them, decision-makers who influence land management policy decisions are key.

APPENDIX 1. WORKSHOP AGENDA

AFRICA BIODIVERSITY COLLABORATIVE GROUP

ABCG Tanzania Land Use Planning– Workshop

Monday 3 – Tuesday 4 April 2017
Usungilo City Hotel, Mbeya, Tanzania

Facilitators: David Williams (AWF) and Ayesha Tulloch (WCS)
Scribe: (TBA) (to ensure input and decisions are clearly documented)

Meeting Goal:
Provide a high level introduction to the project for key stakeholders in southwestern Tanzania land use planning (Local to global level agencies, industry stakeholders). Project goals and outcomes will be presented with highlights on "informed decision making" tools and pilot planning stages.

Workshop Objectives
- Present to stakeholders work that has been done by various organisations in southwestern Tanzania, including analysis of drivers of land use change, biodiversity studies, SAGCOT, pilot planning exercises.
- Provide an open forum to discuss and prioritise key land use planning objectives and challenges.
- Identify additional information and data that will contribute to the robustness of the analysis and how this can be included in analysis development.
- Participatory mapping exercise to identify features of interest (development areas, existing industry, key biological features, etc.)
- Discuss and seek stakeholder views on key scenarios of future change to incorporate into land use planning.

Day 1

Time	Topic	Lead
09:00-09:30	Introductions and workshop objectives, project origins/ABCG.	David Williams
	Morning session: Presentations and Discussion	
09:30 – 12:30	10 minute talks on current work and state of knowledge in the region - CIAT: introduce SAGCOT, infrastructure development, and agriculture modelling - WCS: Large and threatened mammals - AWF: Major Wildlife Corridors - Rufiji Water Office: Water Resources - SARI: Climate change Discussion	Facilitated by J. Salehe
10:30-10:45	**Tea/Coffee**	
10:45-12:45	- JGI: Chimpanzees - TZ Forest Conservation Group: Vital Signs/Forestry	

	- WRI/AWF: Drivers of change	
	- National Land Use Planning Commission: Government (planning, infrastructure)	
	Discussion	
12:45 – 1:45	**Lunch**	
	Afternoon session: Planning Objectives and Questions	Ayesha Tulloch
1:45 – 2:45	Facilitated discussion on key issues in the region	
2:45 – 3:15	Introduction to prioritisation and ABCG work and land use planning framework (Marxan)	
3:15-3:30	**Tea/Coffee**	
3:30 – 5:00	Breakout discussion groups identifying key questions and objectives for planning in the region Present back to group	
5:00 – 5:30	Facilitated session to prioritise key objectives for the project	

Day 2

Time	Topic	Lead
09:00-09:30	Overview for day two	David Williams
	Morning session: Data Needs and Availability	Ayesha Tulloch

09:30 – 12:00
 	
(tea/coffee ~10:30a)
	Guided by planning objectives, breakout groups discuss data availability and needs for key themes (TBA)
	Discussions can be facilitated with hard copy maps of study region to enable participatory mapping
	  - Biodiversity
	  - Water
	  - Agriculture (cropping and pastoralism)
	  - Tourism
	  - Forestry/plantations
	  - Development (agriculture, mining, major infrastructure)
	  - Other land uses (community/social needs)
	
	Present back to the group	

12:00 – 1:00	**Lunch**	
	Afternoon session: Next steps	Ayesha/David
1:00 – 2:30	Facilitated group discussion on what spatial maps and models need to be developed or collected, roles and responsibilities	
2:30-3:45	**Tea/Coffee**	
2:45 – 3:45	Facilitated group discussion on prioritisation scenarios for planning	
3:45 – 4:45	Wrap up and next steps (including discussion of requirements for report and next workshop)	David Williams

APPENDIX 2. PARTICIPANTS

Name	Organization
Ayesha Tulloch	Wildlife Conservation Society
Charles Mengo	Rufiji Basin Water office
David Williams	African Wildlife Foundation
Dr. Proches Musigula	Sokoine University of Agriculture
Emmanuel Mambela	The Nature Conservancy
Eng. Castro D. Maduwa	Ministry of Energy and Minerals
Eng. Fares E. Mahuha	Ministry of Agriculture Livestock and Fisheries
Gerald Mwakipesile	National Land Use Planning Commission
Godlisten Matilya	African Wildlife Foundation
Helena Mkoba	National Land Use Planning, Southern Zone Office
John Salehe	African Wildlife Foundation
Joseph Mwalugelo	Tanzania Forest Conservation Group
Lucy Magembe	The Nature Conservancy
Nijbroek, Ravic	International Center for Tropical Agriculture-Kenya
Noah Mpunga	Wildlife Conservation Society
Pascal Kinyage	Water Resources Integration Development Initiative
Pastor Magingi	African Wildlife Foundation
Patrick Damas	African Wildlife Foundation
Paul Mjema	Jane Goodall Institute
Petyer Dewaard	Water Resources Integration Development Initiative
Shadrack Kamenya	Jane Goodall Institute
Zacharia J.U. Malley	Uyole Agriculture Research Institute

APPENDIX 3. OBJECTIVES, ASSESSMENT OF DATA NEEDS AND AVAILABILITY

Potential Objectives	Potential Data Needs	Data Available
LIVELIHOODS/ECONOMIC DEVELOPMENT 1. Minimise conflict between farmer needs of **cropping** and **grazing** and **protected areas/corridors** 2. Enhance sustainable agricultural intensification and other livelihood opportunities 3. Develop land use conflict management strategy (balance the needs of different farmers/grazers with one another and with biodiversity needs) 4. Avoid conservation or maximise conservation (at risk of failure) in SAGCOT clusters: where are the opportunities if we ignore SAGCOT economic clusters and try to find best places for biodiversity + agriculture 5. Is there a possible solution to allow livestock migration from N to S Tanzania? NO. This is not an interest from the Land Use Planning perspective as TNZ is instigating a cattle tagging program to track illegal movement of livestock across the landscape.	1. Where is cropped areas now? 2. Where is grazed now? 3. What are the primary crops of future interest? 4. Land ownership 5. Land prices 6. Pasture suitability 7. Protected area boundaries 8. SAGCOT boundaries 9. Livestock migration routes (risk of conflict) 10. Market prices of key crops/livestock 11. Tourism opportunities as alternative livelihoods?	1. Min of Ag has map of cropped land 2. No data: this is often nomadic. Village LUPs have maps of grazing but not for villages w/o LUPs 3. Current:Maize, rice pap, sugarcane (advertised to investors in videos). Future: Avocado, sunflower, irish potatoes, soybean (Get Report from SAGCOT Forum Crops for the Future)? *Lucy mentioned this* 4. District Council Offices and Land Registrar. National-level layer on government-owned land that would be offered to investors 5. Land Act 1999. Market value varies a lot depending on location. Land with trees more valuable. Spatial autocorrelation of price with village distance. 6. Ministry of Livestock (maps of pasture lands) 7. Yes 8. SAGCOT boundaries flexible 9. Each district has a livestock migratory route 10. National Bureau of Statistics (daily basis) 11. Minstry of Nat Resources and Tourism
BIODIVERSITY 1. Maximise biodiversity protection and livelihood protection under the influence of mining concessions 2. Restore wildlife corridors to enhance connectivity of protected areas 3. Investigate potential of dynamic land cover change areas (e.g. increased forest cover) for biodiversity opportunities	1. Mining concessions 2. Where are wildlife corridors? 3. What species? 4. Ecosystems? 5. Protected area effectiveness? 6. Areas of land cover change	1. Map from Ministry of Energy and Minerals on concessions. Mining Committee has maps of minerals that can (*Lucy*) 2. TAWIRI 2009 and Elephant Plan 2010 3. NGOs 4. NAFORMA 5. Ministry of Nat Resources and Tourism (have information on staffing/rangers that is surrogate for effectiveness) 6. National Carbon Centre

WATER		
1. Ensure access to water by multiple use corridor (cropping and grazing) through protection of water sources and irrigation infrastructure - Clarify: protect vegetation near existing water sources (rainfall, river) 2. Where are the best places to put ponds to provide water during dry periods (alleviate dam problem) 3. Maintain productivity under drought	1. Where are the water sources? 2. Where is irrigation infrastructure? 3. Other importance water features?	1.High-rainfall vegetation (past and present): intersect with natural/uncleared veg 2. Good quality water: buffer river with uncleared vegtetation 2. Planned dams 3. Drought index (net primary productivity) from Vital Signs (Joseph and the University (Dr Proches Musigula) 4. Water use rights
GOVERNANCE		
1. Improve governance of natural resources at all levels of the landscape. 2. Investigate biodiversity opportunities and food security for villages with Land Use Plans (13%) compared with villages without Land Use Plans (87%). Are the "optimal" economic opportunities for maximising yields versus biodiversity protection equitable across villages? Can we ensure equity so that some villages do not bear the burden of protection?	1. Village governance (which villages have LUPS) 2. Village planning boundaries 3. District boundaries	1. Village governance (which villages have LUPS) Only a list is now available and maps may be available for those villages which have completed LUPs 2. Village planning boundaries See above 3. District boundaries Yes, online. Also Ward boundaries available online
CAPACITY BUILDING		
1. Develop a land use database 2. Improve the capacity of villagers to manage resources 3. Communicate crop suitability and priorities for investment to villages	1. Village planning boundaries 2. Crop suitability	1. Village planning boundaries See above 2. Crop suitability Yes (GAEZ, Ecocrop) 3. Living Standards Measurement Study also has information on extension services availability and the effectiveness of these extension services (ISA-Integrated Survey on Agriculture- how much $$$ from harvests, stats on av land sizes)