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Myanmar Programme Planning with DRD

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1. Introduction

1. The *Asian Community Access Partnership* (ASCAP) is a programme of research and knowledge dissemination funded by the UK government through the Department for International Development (DFID). ASCAP is part of the overarching *Research for Community Access Partnership* (ReCAP) which also includes *African Community Access Partnership* (AFCAP).

2. ASCAP is promoting safe and sustainable rural access in selected countries in Asia through research and knowledge sharing between participating countries and the wider community. In line with the overarching ReCAP strategy, it is intended that ASCAP work with up to 5 partner countries. The Inception Report identified 3 potential partners Nepal, Bangladesh and Myanmar with which to work with initially. Myanmar has indicated an interest to join ASCAP as a partner country, and as part of the ASCAP inception programme a preliminary scoping study on Myanmar was undertaken.

3. Between July and October 2015, preliminary discussions were held in Myanmar with the Department of Rural Development (DRD) within the Ministry of Agriculture, Fisheries and Rural Development and agreement was reached in principle to move forward towards an MOU. However, for the MOU to be approved by the Government of Myanmar, it was considered necessary to have an agreed outline programme of potential research areas together with a conceptual budget.

4. The purpose of this assignment was to identify likely areas of research, capacity development and knowledge transfer in which DRD would welcome ASCAP support and to broadly present these in terms of an outline country programme and concept budget. This outline programme of research areas was developed in conjunction with DRD and has their full support. An important secondary purpose of this assignment was to confirm areas within rural transport programmes of the World Bank, ADB and KfW that would benefit from cooperation and added value from ASCAP.

2. Rural transport programmes in Myanmar

5. In Myanmar, the World Bank, ADB and KfW all have rural road programmes in place or under preparation. These are summarized below.

2.1 Kreditanstalt für Wiederaufbau (KfW)

6. KfW is funding the *Rural Development Programme* (RDP) in Southern Shan State. The RDP includes the rehabilitation, upgrading and extension of rural roads (together with linked infrastructure such as markets and bus stops), as well as formal and on-the-job training of DRD staff and contractors, trials of road technology alternatives (e.g. surface trials) and development of rural road maintenance management systems. The road works have a budget of €5 million, while the training, standards and systems have a budget of €2 million. The programme started in November 2014 and will run till September 2017.

7. The first set of 9 roads (75 km) was recently tendered out with some contracts already awarded. A second set of roads is currently being prepared for tendering. The road works are based on DRD standards with slight adjustments to improve sustainability. Road surface trials for different pavement types are also under preparation, to be carried out in a 2.2 km section of road in relatively flat terrain between Taunggyi and Hehoe. RDP is also supporting DRD in developing a rural road and bridge inventory in Taunggyi District, developing software and providing training to DRD staff. Study tours to Cambodia and Birmingham University were also carried out.

2.2 World Bank

8. The World Bank is funding the \$530 million Community Driven Development (CDD) project together with the Government of Italy and the Government of Myanmar. The project started in 2012 and is expected to run till 2021. It is implemented by DRD in a limited number of townships and

operates at village tract level. Each village tract is provided with an annual block grant of approximately \$27,000 for prioritized infrastructure projects that benefit one or more villages within the village tract. Rural roads connecting villages to each other and to village tracts or townships are eligible for funding, although reportedly road projects are not often prioritized. Due to the limited budgets involved, road investments tend to involve only spot improvements.

9. The World Bank is furthermore preparing a \$212 million emergency response project following the damage from heavy rains and flooding caused by cyclone Komen in July 2015. One of the 4 components of this project is aimed at rural roads and bridges, with DRD offices at state/regional level as main counterparts. The rural road and bridge component is expected to cover Ayeyarwady, Bago, Magway, Sagaing, Yangon and Chin. The budget of this component is \$70 million, of which \$30 million is targeted at equipment recovery. The project will also look at improved surfacing to make the rural roads more climate resilient.

2.3 Asian Development Bank (ADB)

10. The ADB is also preparing an emergency response project that will finance rural bridge reconstruction works together with approach roads and river training works. In total 16 rural bridges have been identified for reconstruction. The total budget is \$36 million, with DRD as implementing agency. The project will be implemented in Ayeyarwady, Bago, Magway and Sagaing. Works will be carried out through national competitive bidding as much as possible. It is expected that the project will start in early 2017.

11. The ADB is currently also preparing a *Rural Access Program* with DRD. This program is expected to have a budget of \$50 million and will likely include rural road and bridge rehabilitation, upgrading and extension. The actual preparation of the program will start in early 2017, and currently a study is being carried out to develop an approach for identifying and prioritizing the road construction and upgrading needs. This study is looking at three pilot districts¹, and aims to prepare a road and village access inventory for each township, define a core rural road network² to connect all villages, and prepare a ranked rural road investment plan for completing the core rural road network and providing all villages with all-season road access. This study will run until the end of the year, and the study results and approach will subsequently be used to identify and select roads in the pilot districts and replicate the approach in other districts to be included in the Rural Access Program.

3. Proposed research areas for DRD

12. A meeting was held with Ms. Tin Moe Myint, Director of the Roads and Bridges Division of DRD on 26 of February 2016 to discuss possible research areas and to get a feeling for the areas of interest to DRD. Based on this preliminary discussion, a discussion note was prepared describing 11 possible research areas and estimated budget requirements (see **Annex 1**). This was sent to DRD on 16 February 2016 for review and internal discussion. On 22 March a meeting was held to discuss the proposed research areas and decide on the priorities for DRD. For this purpose a PowerPoint presentation was prepared, summarizing each of the research areas (see **Annex 2**). Participants in the meeting included Mr. Myint Oo, Deputy Director General of DRD, Mr. Zarni Minn, Deputy Director of DRD, Ms. Tin Moe Myint, Director of the Roads and Bridges Division of DRD, and Mr. Soe Soe Oo, Deputy Director of the Roads and Bridges Division of DRD. The proposed research areas have been grouped under three main headings and are listed in the box below.

¹ Hinthada District in Ayeyarwady Region, Myingyan District in Mandalay Region and Langkhe District in Southern Shan State.

² The core network is defined as the minimum network required to provide each village with single road access.

Table 1 Proposed research areas

- 1. Planning and budgeting**
 - 1.1. Rural road and bridge inventory and database
 - 1.2. Road selection and prioritization
 - 1.3. Strategic plan
- 2. Rural road standards and designs**
 - 2.1. Surfacing trials
 - 2.2. Road protection measures
 - 2.3. Complementary access infrastructure
 - 2.4. Construction technology
 - 2.5. Rural Road and Bridge Standards
 - 2.6. Research unit
- 3. Construction and maintenance management**
 - 3.1. Procurement
 - 3.2. Rural road maintenance

3.1 Planning and budgeting

13. Under this heading, three research areas were proposed, including i) the creation of a national rural road and bridge inventory and database, ii) preparing and implementing an approach for road selection and prioritization, and iii) preparing a strategic plan for the rural roads and bridges sector.

14. This area was considered a priority area by DRD, especially the development of an inventory and related database, and the preparation and implementation of an approach for identifying and prioritizing rural road and bridge investments (the strategic plan was considered a second level priority). In both these areas there is scope to work closely together with KfW and especially ADB. The final product will be a full inventory of existing rural roads and bridges as well as the identification of the minimum needs for construction and upgrading of rural roads and bridges with the aim of connecting all villages.

3.2 Rural road standards and designs

15. Under this heading, a total of six research areas were proposed, including i) surfacing trials in hilly, delta and dry zones, ii) trialing of road protection measures (drainage and slope protection), iii) investigation of possible complementary access infrastructure (footbridges, motorcycle paths, etc.), iv) improved construction technologies and equipment use, v) development of rural road and bridge standards, and vi) creation of a rural road and bridge research unit within DRD.

16. Surfacing trails and technology improvements are already included under the KfW project and may also be included under World Bank and ADB projects, and were therefore not a priority for DRD. DRD was very interested in investigating and trialing appropriate drainage and slope protection measures and complementary access infrastructure, something that was not yet being addressed under other projects. Here there is likely to be scope for further application under the planned ADB Rural Access Program. DRD was also very interested in developing a comprehensive set of Rural Road and Bridge Standards, incorporating existing standards as well as the results from different investigations and trials. Lastly, DRD was interested in creating a research unit within DRD to work on these and other research areas, and to continue research in the future.

3.3 Construction and maintenance management

17. Under this heading, two research areas were proposed, including i) improved procurement systems and capacities, and ii) improved rural road maintenance systems.

18. Both of these research areas were considered important by DRD, but were given a second level priority, with DRD's preference going to the other research areas. These are also likely areas that will be addressed through other projects, especially the ADB Rural Access Program.

4. Conclusion

19. DRD has prioritized a total of 6 research areas for ReCAP support as listed below. The estimated cost of the ReCAP support is £1,150,000.

Table 2 Tentative costs for ReCAP support

Research Area	Cost (GBP)
1. Rural road and bridge inventory and database	£225,000
2. Road selection and prioritization	£150,000
3. Road protection measures	£175,000
4. Complementary access infrastructure	£100,000
5. Rural Road and Bridge Standards	£200,000
6. Research unit	£300,000
Total	£1,150,000

4.1 Research Area 1: Rural road and bridge inventory and database

20. This research area will build on the current efforts of KfW and ADB to collect information on existing rural roads and bridges, as well as the needs for upgrading roads to all-season standard and constructing additional roads to connect remaining villages. This area will involve significant data collection and GIS mapping, as well as the development of a database to store the data. To support this, simple survey equipment and database software may be provided to DRD. Collaboration will be sought with KfW and ADB as well as World Bank, with ReCAP assisting in districts and townships where there is no other donor support. The required budget is estimated to be £225,000.

Table 3 Tentative costs for research area 1

Item	Cost (GBP)
Database development	£100,000
Support to data collection and GIS mapping	£100,000
Simple equipment for surveys or database	£25,000

4.2 Research Area 2: Road selection and prioritization

21. This research area will build upon the current piloting of the methodology for identifying and prioritizing road construction and upgrading needs being developed by ADB. It will assist DRD in developing the core road network approach in order to prioritize rural road investments, and will work together with ADB and other development partners in applying the approach throughout Myanmar with the aim of having a comprehensive overview of the construction and upgrading needs in the country. The process will work closely with the district and township staff of DRD. The estimated budget for ReCAP is £150,000.

Table 4 Tentative costs for research area 2

Item	Cost (GBP)
Piloting of core network approach	ADB
Support to expansion of approach to other districts	£150,000

4.3 Research Area 3: Road protection measures

22. This research area will aim to identify suitable low-cost measures to improve the drainage and slope protection in rural roads, two aspects that cause significant damage to rural roads and obstruct access of rural villages. A review will be made of existing best practices in Myanmar and in other countries, complemented by trials of promising measures. ReCAP will provide support in the preparation of model designs and technical standards and will organize an exchange visit to a country with good practices. It will also support DRD in carrying out trials of promising approaches, although the cost of such trials will be financed by DRD or other donors, with ReCAP supporting the monitoring and analysis. The tentative cost for ReCAP is £175,000.

Table 5 Tentative costs for research area 3

Item	Cost (GBP)
Preparation of model designs and technical standards	£100,000
Exchange visit	£25,000
Technical assistance for monitoring and analysis	£50,000

4.4 Research Area 4: Complementary access infrastructure

23. This research area will look how the benefits of road access can be extended to remote communities through low-cost basic access infrastructure such as footbridges and motorcycle paths. Although DRD has some experience with this in Chin State, it has not developed any standards or model designs. ReCAP will provide support in reviewing best practices in other countries and in developing standards and model designs. ReCAP will also organize an exchange visit to a country with extensive experience with such complementary access infrastructure (e.g. Nepal with its trail bridge programme). The estimated cost of this research area is £100,000.

Table 6 Tentative costs for research area 4

Item	Cost (GBP)
Preparation of model designs and technical standards	£75,000
Exchange visit	£25,000

4.5 Research Area 5: Rural Road and Bridge Standards

24. This research area will aim to develop a comprehensive set of Rural Road and Bridge Standards for DRD, building on existing standards and expanding these to cover new areas and incorporate the results of ongoing trials and research areas (e.g. surface trials, protection measures and complementary access infrastructure). These new standards would need to be aligned with other standards in use by the Ministry of Border Affairs and the Ministry of Construction, ensuring that similar standards will be used by all three ministries. The ReCAP assistance will follow a similar process as used in the recent preparation of rural road standards in Nepal with support from the DFID funded Rural Access Program. The estimated cost for this research area is £200,000.

Table 7 Tentative costs for research area 5

Item	Cost (GBP)
Preparation of detailed rural road and bridge standards	£200,000

4.6 Research Area 6: Research Unit

25. The final research area will aim to create a research unit within DRD's Road and Bridge Division, and to train its staff. This research unit will be responsible for coordinating all research activities together with other relevant units, for coordinating with technical assistance consultants involved in rural road research in Myanmar, and for continuing ongoing and new research activities (e.g. the road surface trials that need prolonged monitoring). The unit would be created in DRD Naypyitaw with an allocation of dedicated staff members. Under the ASCAP support, these staff members may receive training and capacity building as well as on-the-job training as part of the other research areas. The ASCAP program may also provide support in the procurement of necessary equipment related to research activities, including items such as computers, material testing equipment, quality control equipment (e.g. roughometer, falling weight deflectometer, etc.). The estimated cost is £300,000.

Table 8 Tentative costs for research area 6

Item	Cost (GBP)
Training and capacity building of research unit	£200,000
Procurement of equipment	£100,000

ANNEX 1

Discussion Note on Potential Research Areas

POTENTIAL RESEARCH AREAS IN MYANMAR

1. The *Asian Community Access Partnership* (ASCAP) is a programme of research and knowledge dissemination funded by the UK government through the Department for International Development (DFID), and forms part of the overarching *Research for Community Access Partnership* (ReCAP). ASCAP is promoting safe and sustainable rural access in selected countries in Asia through research and knowledge sharing between participating countries and the wider community. It builds upon the former South-East Asia Community Access Programme (SEACAP) that ran from 2004 to 2009. ASCAP is currently being targeted at Myanmar, Nepal and Bangladesh, with the possibility of being expanded to a further 2 countries in Asia.

2. As part of the ASCAP inception programme, a preliminary scoping study was undertaken in Myanmar. Between July and October 2015 preliminary discussions were held with the Department of Rural Development (DRD) within the Ministry of Agriculture, Fisheries and Rural Development and an agreement was reached in principle to move forward towards an MOU. DRD have explained that in terms of getting approvals for an MOU with the Government of Myanmar, it would be easier if an outline programme of potential research areas was agreed with a conceptual budget. Based on this requirement, a joint study is being carried out to identify the outline ASCAP/DRD programme and conceptual budget.

3. This document forms one of the first steps in that process, and proposes potential areas of research, capacity development and knowledge transfer based on preliminary discussions held with DRD on this topic in February 2016. Based on this document, it is the intention that the proposed areas be further discussed internally in DRD and complemented with other possible areas of interest identified by DRD. A next meeting between ASCAP and DRD will be held in the second half of March 2016 to discuss and preliminarily agree on the areas in which DRD would welcome ASCAP support. Once a preliminary agreement on the research areas has been reached, these will be worked out in further detail and presented in terms of an outline country programme and concept budget to be approved by DRD and ASCAP.

4. The proposed research areas in this document are grouped into three main areas: i) Planning and budgeting, ii) Rural road standards and designs, and iii) Construction and maintenance management. Each of these areas includes several areas that may be supported by ASCAP in terms of research, knowledge sharing or capacity building.

1. Planning and budgeting

5. Myanmar has a 20-year National Development Plan (NDP) that foresees roads connecting all villages by 2030. The NDP targets the construction of 10,000 km and the improvement of 19,000 km of village roads to macadam or bituminous standard. However, the NDP lacks information on the current access levels of different villages and the road construction and improvement needs to achieve the desired full access. Modeling carried out by the ADB in 2015 based on road lengths, numbers of villages, populations and land area, resulted in the conclusion that 25,000 villages lacked road access (affecting 9 million people) and that another 20,000 villages had only dry-season road access (affecting 11 million people), with an estimated 24 million people living more than 2 km away from an all-season road (giving a very low Rural Access Index of 36%). Of course there are significant differences between different states and regions, with especially Chin, Rakhine, Kachin, Kayin and Shan having low access levels. Road construction needs to connect all villages were estimated to be in the order of 100,000 km, with an additional 75,000 km requiring upgrading to all-

season standard. Most of this requirement relates to rural roads under the responsibility of DRD. The needs therefore seem much greater than estimated in the NDP, and without a better understanding of the needs, proper planning and budgeting become impossible. At the same time, funding levels for rural roads have increased significantly, both as a result of greater government budget allocations and through external financing from development partners. The result is that the NDP has become outdated as a strategic plan to guide investments in the rural road sector, and needs to be replaced.

1.1 Rural road and bridge inventory and database

6. DRD has information on the different roads making up the rural road network in each state and region. It also has GIS data for a portion of the rural road network under its management. However, this data is not always complete, and it is not properly organized and accessible for planning and monitoring purposes. This research area would provide technical support to expand the existing data sets into a full-fledged database, with links to available GIS data (and possibly at a later stage including GIS mapping). This would make this data available for planning and monitoring at national and subnational level. To further facilitate this, the database and maps would be made accessible remotely.

7. The KfW supported Rural Development Programme (RDP) is currently providing technical assistance for the recording of road and bridge features and the preparation of a rural road and bridge register. This research area would build on that initiative, further developing the data recording procedures and the database, and supporting DRD in collecting and entering the data.

8. The database will also be expanded to include information on villages not currently connected by DRD (or MOC) roads. This will allow the future construction needs to be identified for each state/region, district and township. As such, the database would form the basis for any planning and budgeting.

Table 1 Tentative costs for research area

Item	Cost (GBP)
Database development	£100,000
Support to data collection and GIS mapping	£100,000
Simple equipment for surveys or database	£25,000

1.2 Road selection and prioritization

9. The current road selection process for annual DRD programmes lacks clear selection and prioritization procedures and does not take proper account of existing needs. Road needs are identified by villages and presented to the village development committees at village tract level. At this level a set of priority projects for different sectors are identified and forwarded to the township development committees, at which level DRD becomes involved (together with other development agencies). However, the prioritization and selection process at village tract level is not very transparent, with anecdotal evidence of richer and larger villages being able to include their road improvement wishes in the priority list at the cost of the road construction needs of poorer and smaller villages, even where the lack of road access forms a serious problem for these poorer villages. DRD is not able to verify the prioritized list received from the village tract level as it does not have comprehensive data on access levels and road needs. The collection of data on road connection needs of each village would enable a more transparent process to be introduced, using clear prioritization criteria (e.g. based on cost, population served, traffic levels, etc.).

10. To further facilitate this process, it has been recommended to introduce the core road network concept in Myanmar. The core road network is the minimum road network needed to connect all villages, ensuring that each village is connected by at least one classified road. This process requires the definition of a core road network at township and/or district level, based on the inventory of existing roads and village locations. For villages lacking road access, tentative core road alignments are identified and the length of core roads to be constructed is calculated. Core roads would receive

priority over non-core roads in construction, upgrading and maintenance, avoiding that some villages have access through multiple roads, while other remain without any road access. This supports the NDP in providing all villages with road access, ensuring the most efficient and effective use of available funding in achieving this goal.

11. Once the network of core roads has been identified (including core roads for future construction), a set of prioritization criteria needs to be developed to prioritize interventions. This may give priority to specific types of interventions (e.g. maintenance before new construction, new construction before upgrading), to specific roads (depending on population served, traffic volumes, cost, etc.), to specific states/regions, etc. This may also be combined with budget allocation according to intervention type or state/region. The identification of the selection and prioritization criteria is a process that needs to be worked out with proper support to DRD, to ensure a fair and efficient planning and budgeting procedure is developed.

12. The ADB is currently supporting the piloting of the core road concept and the identification of road needs in three districts (Hinthada, Myingyan and Langkhe) representing respectively the delta zone (Ayeyarwady), the dry zone (Mandalay) and the hilly zone (Shan South). This pilot may be further expanded to cover other districts and townships with the support of ASCAP, assisting DRD in getting a complete overview of the minimum road development needs to connect all villages. This would be supported by the development of the road database described under the previous research area.

Table 2 Tentative costs for research area

Item	Cost (GBP)
Piloting of core network approach	ADB
Support to expansion of approach to other districts	£150,000

1.3 Strategic plan

13. The National Development Plan does not include a proper assessment of needs, and with the recent budget increases and support being provided by international development partners, this plan has become outdated. Once the database of existing roads and bridges and future needs has been developed, and selection and prioritization criteria have been identified, the next step will be to prepare a new strategic plan for the next 5 to 10 years. This will be based on the total needs in terms of rural road and bridge construction, upgrading and maintenance. It will identify all the needs as well as the required budget, and aim to identify suitable funding sources and implementation timeframes. Apart from a focus on road and bridge investments, the strategic plan would also look at the institutional development of DRD over time, and that of the private sector in providing the necessary services.

14. ASCAP may provide support to the development of such a strategic plan. In this process, it may also provide support to DRD for the creation of a road and bridge planning unit under the Roads and Bridges Division of DRD. This unit would become responsible for the preparation of the strategic plan, and for the preparation of annual plans on the basis of the strategic plan. This would ensure sustainability of the approach and create the necessary planning and monitoring capacity in DRD. DRD would need to allocate staff to the proposed planning unit, who may receive training and capacity building with support from ASCAP. This may also include the procurement of some very limited equipment to support the planning process (e.g. computers, GPS equipment, etc.)

Table 3 Tentative costs for research area

Item	Cost (GBP)
Preparation of a Strategic Plan for rural roads	£50,000
Training and capacity building of planning unit	£75,000

2. Rural road standards and designs

15. DRD has rural road design standards that look at road width, base width, shoulder width, maximum gradient, length of continuous grade, horizontal alignment, curvature, radius, super elevation, and sight distance. There are also standard designs for penetration macadam, dry bound macadam and earthen roads. These standards were largely taken over from the Ministry of Border Affairs, with some adjustments made by DRD. These road standards and designs need to be reviewed and further worked out to provide a solid basis for DRD in the development of the rural road network.

2.1 Surfacing trials

16. DRD has a set of three standard surfacing options that it applies in most of the rural road network, including penetration macadam, dry-bound macadam, and earthen surface. Although these are proven surfacing standards, there are more effective and cost-efficient surfacing options available that are better suited to the different parts of Myanmar (delta zone, dry zone or hilly zone).

17. Surfacing trials are currently being implemented under the KfW Rural Development Programme (RDP) in Southern Shan State. The KfW surface trials will be carried out in a 2.2 km section of road in relatively flat terrain between Taunggyi and Hehoe. These surface trials include the following 5 surfacing options:

- Penetration Macadam (PM) using standard DRD construction techniques of Single Bituminous Surface Dressing (SBST) over a penetration macadam base (as control section)
- Double Bituminous Surface Treatment using hot bitumen (DBST) over a Dry Bound Macadam (DBM) base and subbase (with improved bitumen heating)
- Double Bituminous Surface Treatment using an emulsion (DBSTe) over a DBM base and subbase
- Non-Reinforced Concrete (NRC) over a DBM subbase
- Concrete Blocks (CB) over a DBM subbase

18. Under the ASCAP programme, these surface trials may be further expanded to hilly terrain in order to assess their suitability to withstand the effects of rainfall and erosion, and their potential to be used as spot improvements in difficult sections.

19. The surface trials may also be expanded to assess unsealed surface standards, based on the widely used dry bound macadam (DBM) with gravel wearing courses.

20. Lastly, the surface trials may be expanded to include trial sections in the delta zone and in the dry zone. The delta zone has very soft soils that require stronger surface treatments to prevent damage, while the dry zone has relatively few problems with rainfall and erosion and may be able to have simpler surface standards. The trialing in these different zones will allow suitable standards to be identified for each zone.

21. All trials will look at construction as well as maintenance requirements in terms of requirements for equipment, materials, skills and costs. This will require prolonged monitoring of the trial sections by DRD, and interpretation of the results. ASCAP cannot support the actual construction works for the trials (these may be carried out with government funding or with support from development partners), and can only fund the technical assistance for monitoring and analysis.

Table 4 Tentative costs for research area

Item	Cost (GBP)
Construction of surface trials – Delta zone 2.5 km	£150,000
Construction of surface trials – Dry zone 2.5 km	£150,000
Construction of surface trials – Hilly zone 2.0 km	£150,000
Technical assistance for monitoring and analysis	£100,000

2.2 Road protection measures

22. The rural road network managed by DRD is currently susceptible to frequent damage due to a lack of protection measures, specifically related to drainage and slope protection. Under this research area, technical designs and standards would be prepared for different low-cost protection measures suitable to rural roads, some of which may be trialed in DRD roads. Exchange visits may also be included, allowing DRD staff to gain experience and knowledge from best practices in other countries in the region.

23. The lack of side drainage and adequate cross drainage is resulting in damage from erosion in hilly zones and ponding in the delta zones. DRD is currently lacking model designs and technical standards for drainage measures. A set of technical standards for side drainage and cross drainage, as well as a set of model designs for these drainage measures (e.g. unlined and lined side drains, scour checks, pipe and slab culverts, etc.) may be prepared with support from ASCAP. This would build on experiences from other countries, including the trials of the SEACAP programme.

24. Many rural roads in hilly terrain lack proper slope protection measures, resulting in frequent landslides and damage to the roads. Under this research area, technical designs and standards may be prepared for the implementation of slope protection measures. This will include solutions involving only bioengineering or improved cut/fill slopes, but will also include retention wall design using different materials (e.g. dry-stone, gabion, stone masonry, concrete). Here again, use would be made of experiences from other countries, including those of the SEACAP programme.

25. This research area related to road protection measures may be limited to preparing model designs and technical standards for application based on existing domestic and international experiences, but it may also include trialing of a selected range of solutions. However, ASCAP is unable to fund the construction works related to trials and can only fund technical assistance for monitoring and analysis. It is further possible to include an exchange visit to a country in the region with extensive experience in slope protection and drainage (e.g. Nepal for hilly and dry zones, Bangladesh for delta zones).

Table 5 Tentative costs for research area

Item	Cost (GBP)
Preparation of model designs and technical standards	£100,000
Exchange visit	£25,000
Trials	£200,000
Technical assistance for monitoring and analysis	£50,000

2.3 Complementary access infrastructure

26. The positive benefits of road access can be expanded to communities and households beyond the direct area of influence of the road by constructing footpaths, footbridges and other basic access infrastructure that may be used by pedestrians and even motorcycles. This allows remote communities to gain access to the roads and benefit from the motorized access, at a much lower cost than the provision of road access (including bridge construction for 4-wheeled vehicles).

27. DRD is currently constructing narrow tracks and bridges for motorcycle access in Chin State, but does not have proper standards in place to guide this work, nor does it apply this concept in other areas where it may provide basic access at a low cost (e.g. delta zone or other states in the hilly zones).

28. This research area would develop a set of technical standards and model designs for basic access infrastructure to complement the rural road and bridge network. The designs and standards would be based on existing domestic and international experiences. This area of support may also include an exchange visit with a suitable country in the region with extensive experience in basic access infrastructure (e.g. Nepal which has a very successful trail bridge program).

Table 6 Tentative costs for research area

Item	Cost (GBP)
Preparation of model designs and technical standards	£75,000
Exchange visit	£25,000

2.4 Construction technology

29. Road construction in Myanmar makes use of very basic technologies and equipment. Equipment is generally limited to dump trucks for transporting materials to the road and static rollers for compaction. Labour is generally used for spreading the materials. Bitumen tends to be heated on wood fires and spread by hand. Although labour-based methods can result in good quality works, this requires clear procedures and proper supervision, both of which are often lacking in Myanmar. Especially bitumen heating is problematic, with overheating of bitumen often resulting in a reduction of the pavement life. The spreading of aggregate and bitumen also often lacks precision, leading to poor compaction and adhesion, further reducing the lifespan of the road.

30. Under this research area, several types of low-cost equipment would be introduced and tested to address the main problem areas in rural road construction, upgrading and maintenance. This may include bitumen heaters, bitumen sprayers, manual or truck-based chip spreaders, aggregate spreaders, alternative compaction equipment, etc. Based on the trial results, amended standards may be set for construction contracts, ensuring that contractors use appropriate technologies to ensure higher levels of quality. ASCAP is unable to finance the procurement of construction equipment or the construction costs related to trials, and can only fund technical assistance for the monitoring and analysis.

Table 7 Tentative costs for research area

Item	Cost (GBP)
Procurement of equipment	£200,000
Trialing of construction technologies	£50,000
Technical assistance for monitoring and analysis	£50,000

2.5 Rural Road and Bridge Standards

31. Based on the support areas listed above, it is recommended develop a comprehensive set of rural road and bridge standards, building on a review of the existing standards. These new standards would need to be aligned with other standards in use by the Ministry of Border Affairs and the Ministry of Construction, ensuring that similar standards will be used by all three ministries. ASCAP may provide support in this process, following a similar approach as used by the DFID supported Rural Access Programme in Nepal where new rural road standards were recently prepared and approved by government.

Table 8 Tentative costs for research area

Item	Cost (GBP)
Preparation of detailed rural road and bridge standards	£200,000

2.6 Research unit

32. The research areas listed above may be supported by technical assistance under the ASCAP programme and through other development partners. However, to ensure greater sustainability of the research results and the procedures used, and to allow future replication of similar research, it is recommended that DRD create a research unit under the Roads and Bridges Division. This research unit would be responsible for coordinating all research activities together with other relevant units, for coordinating with technical assistance consultants involved in rural road research in Myanmar, and for continuing research activities beyond the end of the ASCAP support (e.g. for the road surface trials that need prolonged monitoring).

33. The unit would be created in DRD Naypyitaw with an allocation of dedicated staff members. Under the ASCAP support, these staff members may receive training and capacity building as well as on-the-job training as part of the other research areas. The ASCAP program may also provide support in the procurement of necessary equipment related to research activities, including items such as computers, material testing equipment, quality control equipment (e.g. roughometer, falling weight deflectometer, etc.).

Table 9 Tentative costs for research area

Item	Cost (GBP)
Training and capacity building of research unit	£200,000
Procurement of equipment	£100,000

3. Construction and maintenance management

34. DRD has only recently become responsible for the management of rural roads. It has greatly expanded its staff numbers to cope with this new responsibility. Budget allocations have increased significantly in recent years, and several externally financed projects have recently started or are about to start. DRD needs to improve its capacity and procedures in order to be able to cope with the large number of rural road works. Although construction is a field where DRD already has several years of experience (and has attracted engineers with a lot of experience), it is still facing difficulties regarding procurement, especially in light of the increasing numbers of contracts. Rural road maintenance is another area where DRD lacks experience, with a maintenance budget only introduced for the first time in 2014.

3.1 Procurement

35. DRD contracts out all road construction works to local contractors. The procurement process is not yet fully developed, leading to issues of transparency and complicating the procurement of smaller maintenance works. The KfW supported Rural Development Programme is introducing FIDIC-based contracts and alternative procurement systems are being applied by the consultancy firm responsible for procurement under that programme. In the proposed World Bank and ADB emergency recovery projects, other procurement systems will need to be applied, while for the upcoming ADB Rural Access Program, the procurement systems may be different again.

36. The increasing budgets available to DRD and the different procurement modalities it needs to apply, make it clear that DRD requires support in the development of the procurement capacity at both central, state/region and district levels. This will require the development of appropriate procurement systems and bidding documents that can be used in different projects, that ensure transparency and timeliness of procurement, and that can be applied to maintenance contracts as well as construction contracts. ASCAP may support this process, helping the development of improved procurement systems and model bidding documents, and providing capacity building to DRD procurement staff at the different levels

Table 10 Tentative costs for research area

Item	Cost (GBP)
Procurement system and bidding documents	£100,000
Capacity building of DRD procurement staff	£150,000

3.2 Rural road maintenance

37. Maintenance of the rural road network in Myanmar is very limited. DRD only received a maintenance budget for the first time in 2014, most of which was used for interdistrict roads and for roads around Naypyitaw. It is expected that the maintenance budget will increase over time, and that maintenance works will form a greater portion of DRD's portfolio.

38. In some roads routine road maintenance is currently carried out by villagers on a voluntary basis, but this generally lacks sufficient inputs and is improperly timed, while villagers lack the necessary skills to ensure proper quality. Larger maintenance works are contracted out to local contractors, although this has proven difficult under current procurement systems. As a result, DRD is opting to carrying out the maintenance works through force account, procuring maintenance equipment for the district DRD offices (the World Bank emergency recovery project is expected to provide significant equipment to DRD). This move is in contradiction to the rest of the government, where implementation units are being corporatized and privatized, and maintenance works are being contracted out. It is also considered to be a less effective option in terms of effectiveness and cost-efficiency, with government implementation generally performing more poorly than well-managed private sector implementation.

39. It is expected that in the long run, DRD will follow a similar path as the rest of the government, and that the current move towards force account operations comes from a desire to be able to maintain the rural road network in a cost effective and timely manner. This research area will support DRD in this aim, but focusing on the outsourcing of maintenance activities. A suitable combination of community-based maintenance and contractor-based maintenance will be sought, developing appropriate contracting and payment modalities for both options.

40. There has been extensive experience with community-based maintenance of rural roads, which has recently focused on road maintenance groups as a cost effective means of carrying out rural road maintenance. Successful experiences with road maintenance groups exist in Nepal and just across the border in China in Yunnan Province. Bangladesh has a similar experience where road maintenance groups are subcontracted by contractors. These experiences may form the basis for a similar approach in Myanmar. The road maintenance groups are paid a fixed amount per kilometre per year for carrying out basic maintenance activities, whereby they have to comply with minimum performance standards regarding the resulting road condition. Where funding is limited, the activities of the road maintenance groups may be complemented by voluntary labour contributions by community members. Under this research area, the road maintenance group approach will be adapted to Myanmar, and piloted in a set of representative rural roads. Based on the results of the pilot, it may be decided to expand the approach to the rest of the rural road network.

41. For larger maintenance works, local contractors are more suitable. To avoid excessive costs and delays in procurement, alternative contracting modalities may be developed and tested. This may include performance-based maintenance contracts such as those applied in rural roads in Bangladesh, or term-based maintenance contracts such as those that are about to be piloted in Nepal under the DFID supported Rural Access Programme. ASCAP may support the development and testing of different contracting modalities, including the identification of suitable costing mechanisms.

42. In support of both community-based and contractor-based maintenance modalities, ASCAP may also support an exchange visit to one of the other ASCAP countries. In Nepal this may involve a review of the road maintenance group system that is widely applied in rural roads, as well as some of the contractor-based maintenance contracts being applied there. In Bangladesh this would focus on the performance-based maintenance contracts with local contractors, and the subcontracting of road maintenance groups. This research activity may also form part of a regional research programme for the three ASCAP countries.

Table 11 Tentative costs for research area

Item	Cost (GBP)
Road maintenance group pilot (including TA support)	£200,000
Development and testing of contracting modalities	£250,000
Exchange visit	£50,000

ANNEX 2

Presentation on Potential Research Areas

Proposed Research Topics for Discussion

Department of Rural Development (DRD)

Serge Cartier van Dissel
Naypyitaw, March 2016

- Asian Community Access Partnership
 - Nepal, Bangladesh and Myanmar (Afghanistan and Pakistan at a later stage)
- DFID funding for research, capacity building and knowledge management
- Follow up on South East Asia Community Access Program (SEACAP)
 - Vietnam, Laos, Cambodia
 - Strong focus on technology development (trials, standards, etc.)
 - Limited sustainability of research results and procedures
- ASCAP has a strong focus on sustainability of research results
 - Adoption of norms and standards, policies, etc.
 - Creation of institutional capacity for replication
 - Cooperation with other development partners
- No funding of works or procurement of heavy equipment
 - Co-funding with government or development partners
 - ASCAP to provide technical assistance support
- Focus on support over next 4 years up to 2020

Possible Research Topics

1. Planning and budgeting

- 1.1 Rural road and bridge inventory and database
- 1.2 Road selection and prioritization
- 1.3 Strategic plan

2. Rural road standards and designs

- 2.1 Surfacing trials
- 2.2 Road protection measures
- 2.3 Complementary access infrastructure
- 2.4 Construction technology
- 2.5 Rural Road and Bridge Standards
- 2.6 Research unit

3. Construction and maintenance management

- 3.1 Procurement
- 3.2 Rural road maintenance

1. Planning and Budgeting

1.1 Road and Bridge Inventory Database

- Develop a rural road inventory database
 - Link to road survey forms
 - Complete existing inventory data
 - Enter data into a simple database
- Include data on village access (including villages that are not connected)
- Make data available remotely
- Use of simple software/hardware

Item	Cost (GBP)
Database development	£100,000
Support to data collection and GIS mapping	£100,000
Simple equipment for surveys or database	£25,000

1.2 Road Selection and Prioritization

- Identify core road network
 - Identify existing rural roads
 - Select priority core rural roads – one road connecting each village
 - Identify additional road construction needs to connect remaining villages
- Determine construction and upgrading needs
- Determine costs of required interventions
 - Unit costs by type of intervention
- Prioritize interventions
 - Determine road prioritization criteria (cost, population served, traffic volume, etc.)
 - Construction versus upgrading
 - Rank roads by priority

Item	Cost (GBP)
Piloting of core network approach in 3 districts	ADB
Support to expansion of approach to other districts	£150,000

1.3 Prepare Strategic Plan for Rural Roads

- Based on identified core rural road network for the whole country
 - Determine road construction and upgrading needs and costs
- Determine total budget needs to connect all villages
- Identify sources of funding
- Prepare strategic plan (5-10 years)
 - Sources and amounts of funding
 - Prioritization of works according to criteria
 - Define additional criteria for fund allocation (e.g. by state/region)
 - Timeframe for completion of different works
- Create a planning unit under the Roads and Bridges Division
- Also additional institutional strengthening of DRD Roads and Bridges Division

Item	Cost (GBP)
Preparation of a Strategic Plan for rural roads	£50,000
Training and capacity building of planning unit	£75,000

2. Rural Road Standards and Designs

2.1 Road Surfacing Trials

- KfW surface trials in flat terrain near Taunggyi
 - Penetration Macadam (control)
 - Double Bituminous Surface Treatment (DBST) – hot bitumen and emulsion
 - Concrete Blocks
 - Non-Reinforced Concrete
- Expand trials
 - Unsealed road surfaces
 - Hilly terrain – suitability to withstand erosion (spot improvements)
 - Dry zone and Delta zone
- Pilot construction works themselves cannot be financed by ASCAP/ReCAP
 - Only technical assistance and interpretation of results

Item	Cost (GBP)
Construction of surface trials – Delta zone 2.5 km	£150,000
Construction of surface trials – Dry zone 2.5 km	£150,000
Construction of surface trials – Hilly zone 2.0 km	£150,000
Technical assistance for monitoring and analysis	£100,000

2.2 Road Protection Measures

- Drainage measures (lateral and cross drainage)
 - Appropriate drainage measures (build on SEACAP experience)
 - Technical standards
 - Model designs
- Slope protection
 - Appropriate slope protection measures (build on SEACAP experience)
 - Technical standards
 - Model designs
- Include exchange visit to learn from other countries (e.g. Nepal)
- Possible trialing of specific measures (cannot be funded by ASCAP/ReCAP)

Item	Cost (GBP)
Preparation of model designs and technical standards	£100,000
Exchange visit	£25,000
Trials	£200,000
Technical assistance for monitoring and analysis	£50,000

2.3 Complementary Access Infrastructure

- Low cost extension of road access benefits
 - Footpaths, footbridges and other basic infrastructure
 - Use by pedestrians and motorcycles to access the road network
 - High impact at low cost
- Some experience in Chin State
 - Expand to other states/regions as appropriate
- Develop appropriate standards and designs
 - Technical standards (tracks or roads, footbridges or motorable bridges)
 - Model designs
- Exchange visit to see similar infrastructure and programs
 - E.g. Nepal (trail bridge program)

Item	Cost (GBP)
Preparation of model designs and technical standards	£75,000
Exchange visit	£25,000

2.4 Construction Technology

- Current technologies in Myanmar very basic, resulting in low quality
 - Bitumen overheating – reduced lifespan
 - Aggregate spreading by hand not always properly done
 - Materials not always of proper quality
- Currently greater access to suitable equipment
 - Testing of low-cost equipment
 - Developing proper standards for equipment use were justified
- ASCAP/ReCAP unable to fund procurement of equipment or implementation of works

Item	Cost (GBP)
Procurement of equipment	£200,000
Trialing of construction technologies	£50,000
Technical assistance for monitoring and analysis	£50,000

2.5 Rural Road and Bridge Standards

- Develop and issue a comprehensive set of standards for rural roads and bridges
 - Building on existing standards
 - Complementing with results of the different research topics
- Ensuring that standards are comprehensive
 - Surfacing thresholds
 - Thresholds for introducing road and motorable bridge access

Item	Cost (GBP)
Preparation of detailed rural road and bridge standards	£200,000

2.6 Research Unit in DRD

- Create a sustainable support to rural road research
 - Supported by consultants in research funded by ASCAP or others
 - Under the DRD Roads and Bridges Division
- Can continue existing and introduce new research topics
 - E.g. continued monitoring of surface trials
- ASCAP support in training of staff
- Possibly complemented by providing small research equipment
 - E.g. GPS equipment, falling weight deflectometer, roughometer, database software

Item	Cost (GBP)
Training and capacity building of research unit	£200,000
Procurement of equipment	£100,000

3. Construction and Maintenance Management

3.1 Procurement

- Procurement in DRD still problematic
 - Lack of procurement capacity
 - Issues with procurement (e.g. maintenance)
- Procurement volume to increase due to increasing budgets
- Additional procurement systems to be introduced
 - KfW, World Bank, ADB, ReCAP all have own procurement requirements
- Improve DRD procurement capacity
 - Training of staff
- Development of improved procurement procedures and bidding documents
 - Potentially used by projects

Item	Cost (GBP)
Procurement system and bidding documents	£100,000
Capacity building of DRD procurement staff	£150,000

3.2 Rural Road Maintenance

- Lack of rural road maintenance - Maintenance funding increasing
 - Voluntary contributions insufficient
 - Procurement of contractors for maintenance not very successful
- Move towards force account – procurement of equipment
 - Contrary to government approach – unlikely to be successful
- Identify suitable modalities
 - Road maintenance groups for routine maintenance
 - Contractors for larger maintenance works
- Develop suitable contracting modalities
 - Performance-based maintenance, term-based maintenance
- Exchange visit to see implementation in other countries (Nepal, Bangladesh)

Item	Cost (GBP)
Road maintenance group pilot (including TA support)	£200,000
Development and testing of contracting modalities	£250,000
Exchange visit	£50,000

Overview

Research Topics

	Cost	Priority
1. Planning and budgeting		
– 1.1 Rural road and bridge inventory and database	£225,000	1
– 1.2 Road selection and prioritization	£150,000	1
– 1.3 Strategic plan	£125,000	2
2. Rural road standards and designs		
– 2.1 Surfacing trials	£100,000	X
– 2.2 Road protection measures	£175,000	1
– 2.3 Complementary access infrastructure	£100,000	1
– 2.4 Construction technology	£ 50,000	X
– 2.5 Rural Road and Bridge Standards	£200,000	1
– 2.6 Research unit	£300,000	1
3. Construction and maintenance management		
– 3.1 Procurement	£250,000	2
– 3.2 Rural road maintenance	£500,000	2