

# Scoping Mission on Integrated Solid Waste Management (ISWM) to Myanmar

Report of findings – June 2017

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*Cover photo: Car tyres reused as waste bin in Mandalay.*

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### Abbreviations

EfW	Energy from Waste	ODA	Overseas Development Assistance
EIA	Environmental Impact Assessment	PCCD	Pollution Control and Cleansing Department
EPR	Extended Producer Responsibility	SEZ	Special Economic Zone
ISWM	Integrated Solid Waste Management	SWM	Solid Waste Management
MCDC	Mandalay City Development Committee	WWTP	Waste Water Treatment Plant
MRFs	Material Recycling Facilities	YCDC	Yangon City Development Committee
MMK	Myanmar Kyat (exchange rate 120417: 1 EUR = 1,417 KS)		

## Summary

The Netherlands and Myanmar enjoy a constructive relationship, working hand in hand on enhancing Myanmar's resilience to floods in view of its large delta areas, rivers and coastal zones. It was observed that in some areas, effective action to mitigate the risk of floods was impeded by the tremendous amounts of litter and waste scattered over river banks and clogging up drainage systems. In order to properly assess the situation and identify opportunities for cooperation and business, an Expert Team carried out a scoping mission in the period 13-24 March 2017. The focus was on Yangon, Meiktila and Mandalay. The mission concluded with a seminar on waste management in Myanmar and opportunities for cooperation, with a participation of almost 40 waste sector representatives from Myanmar.

The Expert Team concluded that waste is indeed a big problem in Myanmar. Litter is all around, creating health hazards, obstruction of waterways and an unattractive public environment. All in all Myanmar's 57 million inhabitants produce around 20,000 tons of waste per day, or 0.35 kgs/pppd. In spite of lower official figures, the "guestimate" of the Expert Team is that in Yangon and Mandalay, the waste output is in the range of 0.8 kgs/pppd. Waste collection and transport leave much to be desired and the waste is disposed in thin layers on large dump sites without proper infrastructure. From an institutional point of view, there is a lack of specific legislation for the waste sector, and there appears to be a disconnection between the federal and city authorities when it comes to waste management.

There are encouraging signs, however. One of the first official acts of the de facto leader of the country Mrs. Aung San Suu Kyi was to take to the streets of Myanmar to pick up rubbish, stating "*Garbage collection is the first thing we can do to serve the people*". Some organizations and individuals have followed her example. Yangon and Mandalay have banned the use of plastic bags, and City Mart has its "*No Plastic Bag Day*". As a heritage of the years of isolation when resources were scarce, there is a pretty strong (be it largely informal) recycling sector.

The Expert Team encountered a remarkable consensus among waste sector representatives in Myanmar on the road ahead. "*What we need is awareness raising and Waste to Energy*". In spite of some initiatives in Waste to Energy, the Expert Team recommends to put this option on hold for the foreseeable future as it is way too expensive compared to other options. Awareness raising is indeed very valuable, but only in case a proper waste infrastructure and a sustainable financial base for the waste sector are created at the same time.

There are quick wins in upgrading Myanmar's waste sector. In its recommendations the Expert Team focuses primarily on Yangon as the biggest single source of waste in the country. The first recommendation is capacity building among present and future staff in waste management. Then the waste collection and transport system can be optimized. The development of waste transfer stations will save costs and ease traffic. Yangon's dumpsites need an upgrade from the current "pancake disposal" strategy towards a controlled landfill with liners, methane extraction, daily coverage, leachate treatment and possibly an on-site separation / recycling facility. The system of fee collection needs to be improved so the overall system becomes self-sustainable at city level. The recycling industry can be professionalized, building on the already existing infrastructure. In Mandalay, cooperation can be sought with the cement industry to see whether part of the waste can serve as alternative fuel.

The Netherlands is planning to organize a (one week) seminar on Sustainable Waste Management in October or November 2017 for CDC representatives and other stakeholders. Under the right circumstances, the Netherlands is also willing to investigate the feasibility to introduce the so called "Holland Model" of waste management in Yangon: a professional SWM organization, a basic sanitary landfill, suitable logistics and transfer stations and financial self-sustainability of the overall system.

For the moment, business opportunities in waste management in Myanmar for Dutch suppliers of products and services will oftentimes be related to Overseas Development Assistance. The strategy outlined above will undoubtedly lead to additional opportunities. In view of the strong connection in Myanmar between water safety challenges and waste problems, it is worth investigating whether projects can be initiated in the framework of the Sustainable Water Fund program of RVO.

## အနစ်ချုပ်

နယ်သာလန်နိုင်ငံနှင့် မြန်မာနိုင်ငံသည် အပေါင်းလက္ခဏာဆောင်သည့် ဆက်ဆံရေးရှိပြီး မြန်မာနိုင်ငံ၏ ကျယ်ပြန့်သည့် မြစ်ကမ်းပေါ်ဒေသ၊ မြစ်များ၊ချောင်းများနှင့် ကမ်းရိုးတန်းဒေသများတွင်ဖြစ်လေ့ရှိသော ရေကြီးရေလျှံမှုများကို ခံနိုင်ရည်စွမ်းအား မြှင့်တင်ရန်ရည်သန်လျက် နှစ်နိုင်ငံ လက်တွဲဆောင်ရွက်လျက်ရှိပါသည်။ အချို့နေရာများတွင် ရေကြီးရေလျှံမှုအန္တရာယ် လျော့နည်း စေရန်အတွက် ထိရောက်သည့် ကြိုးပမ်းဆောင်ရွက်မှုများ လုပ်ဆောင်ရာတွင် မြစ်ကမ်းပါးနံဘေးတွင် ပြန့်ကျဲနေသော အလွန်တရာ များပြားလှသည့် အမှိုက်များ၊ ရေစီးရေလာစနစ်များကို ပိတ်ဆို့စေသည့် အမှိုက်သရိုက်များနှင့် စွန့်ပစ်ပစ္စည်းများက အတားအဆီးများဖြစ်ပေါ်စေလျက်ရှိကြသည်။ နယ်သာလန်နိုင်ငံမှ ကျွမ်းကျင်သူများပါဝင်သည့် လေ့လာ ရေးအဖွဲ့တစ်ဖွဲ့က စွန့်ပစ်ပစ္စည်းများ စီမံခန့်ခွဲမှုအခြေအနေများကို စနစ်တကျ လေ့လာသုံးသပ်ရန်၊ အတူတကွ ပူးပေါင်း ဆောင် ရွက်ရန် နှင့် စီးပွားရေးအခွင့်အလမ်းများ ဖော်ထုတ်နိုင်ရန်အတွက် ၂၀၁၇ ခုနှစ် မတ်လ ၁၃ -၂၄ ရက်နေ့အတွင်း မြန်မာနိုင်ငံသို့ လာရောက်ခဲ့သည်။ အဆိုပါအဖွဲ့အနေနှင့် ရန်ကုန်မိတ္ထီလာနှင့်မန္တလေးမြို့များကို အဓိကထား လေ့လာသုံးသပ်ခဲ့ကြသည်။ အဆိုပါ လေ့လာရေးအဖွဲ့၏ ခရီးစဉ်အဆုံး၌ မြန်မာ နိုင်ငံတွင် ‘စွန့်ပစ်ပစ္စည်းစီမံခန့်ခွဲရေး နှင့် ပူးပေါင်းဆောင်ရွက်ခြင်း အခွင့်အလမ်းများ’ ဆိုင်ရာ နီးနောဖလှယ်ပွဲ တစ်ရပ် ကျင်းပနိုင်ခဲ့ပြီး ထိုနီးနောဖလှယ်ပွဲတွင် မြန်မာနိုင်ငံရှိ စွန့်ပစ်ပစ္စည်း ကဏ္ဍမှ ပြည်တွင်းပြည်ပကိုယ်စားလှယ်များ၊ နိုင်ငံတော်ဝန်ထမ်းများ၊ လုပ်ငန်းရှင်များ စုစုပေါင်း ကိုယ်စားလှယ်ဦးရေ(၄၀) ခန့် ပါဝင် တက်ရောက် ဆွေးနွေးခဲ့သည်။

မြန်မာနိုင်ငံတွင် စွန့်ပစ်ပစ္စည်း ပြဿနာ သည် အထူးအလေးထားရမည့်ပြဿနာတစ်ရပ် ဖြစ်ကြောင်း ကျွမ်းကျင်သူများ အဖွဲ့က သုံးသပ်ခဲ့သည်။ နေရာအနှံ့တွင် ရှိနေသည့် အမှိုက်များက ကျန်းမာရေးအတွက် အန္တရာယ် ဖြစ်စေသည့်အပြင် ရေလမ်းကြောင်းများကို ပိတ်ဆို့စေကာ အများပြည်သူသွားလာသည့် ပတ်ဝန်းကျင်နေရာများကို အကျည်းတန်စေသည်။ ၅၇ သန်းသော မြန်မာပြည်သူတစ်ရပ်လုံးက တစ်နေ့လျှင် အမှိုက် တန် ၂၀,၀၀၀ (တန်ချိန်နှစ်သောင်း) ခန့် (သို့) လူတစ်ဦး တစ်နေ့လျှင် ၀.၃၅ ကီလိုဂရမ်ခန့် စွန့်ပစ်နေသည်။ တရားဝင်ထုတ်ပြန်သော ကိန်းဂဏန်းများအချက်များအရ နည်းနေ သော်လည်း ကျွမ်းကျင်သူများအဖွဲ့၏ ‘တွေးဆခန့်မှန်းချက်’ များအရ ရန်ကုန်နှင့် မန္တလေးမြို့များတွင် လူတစ်ဦး တစ်နေ့ လျှင် စွန့်ပစ်သည့် အမှိုက်ပမာဏမှာ ၀.၈ ကီလိုဂရမ်မျှ ရှိမည်ဖြစ်သည်။ အမှိုက်သိမ်းစနစ်နှင့် အမှိုက်သယ်ယူ စနစ် တို့မှာ လိုအပ်ချက်များစွာရှိသည့်အပြင်၊ အမှိုက်ပုံသည့်စနစ်မှာလည်း အခြေခံအဆောက်အအုံ စနစ်တကျမရှိသည့် နေရာ များ၊ ရှိပြီးသားအမှိုက်ပုံများပေါ်တွင် စွန့်ပစ်ပစ္စည်းများ ထပ်ခါထပ်ခါ ဖြန့်ကျဲကာ စွန့်ပစ်သည့်စနစ်ကို သုံးနေခြင်းများကို မြင်တွေ့ရသည်။ အဖွဲ့အစည်းရှုထောင့်မှာကြည့်လျှင်လည်း မြန်မာနိုင်ငံတွင် စွန့်ပစ်ပစ္စည်း ကဏ္ဍအတွက် သီးသန့်ဥပဒေ မရှိသည်ကို

တွေ့ရှိရပြီး စွန့်ပစ်ပစ္စည်းစီမံခန့်ခွဲမှုအတွက် ပြည်ထောင်စုအစိုးရနှင့် သက်ဆိုင်ရာမြို့တော်နှင့် မြို့နယ် စည်ပင်သာယာရေး အာဏာပိုင်များကြား အဆက်ပြတ်နေသည့် အခြေအနေများကို အထင်အရှားတွေ့မြင်ကြရသည်။

သို့သော်လည်း အားတက်စရာလက္ခဏာများစွာလည်း တွေ့ရှိရပါသည်။ လူထုခေါင်းဆောင် ဒေါ်အောင်ဆန်းစုကြည် ဦးဆောင်သည့် ပထမဦးဆုံး တရားဝင်လှုပ်ရှားမှုများတွင် 'အမှိုက်ကောက်ခြင်းမှအစပြု၍ ပြည်သူ့အကျိုး သယ်ပိုး ကြပါစို့' ဟူသော လှုံ့ဆော်ချက်ဖြင့် လမ်းပေါ်တွင် အမှိုက်ကောက်သည့် လှုပ်ရှားမှုတစ်ရပ် ပါဝင်ခဲ့သည်။ သူမ ဦးဆောင်သည့် လှုပ်ရှားမှုကို အဖွဲ့အစည်းအချို့ နှင့် တစ်ဦးချင်းပုဂ္ဂိုလ်များမှ လိုက်နာလုပ်ဆောင်ကြသည်။ ရန်ကုန် နှင့် မန္တလေး မြို့များတွင် ပလပ်စတစ်အိတ်များ သုံးစွဲခြင်းကို ပိတ်ပင်လိုက်ပြီး စီးတီးမတ်ကလည်း 'ပလပ်စတစ်အိတ် မသုံးရနဲ့' သတ်မှတ်ပေးထားသည်။ နှစ်ပေါင်းများစွာ အထီးကျန်နေထိုင်လာခဲ့သည့် အကျိုးဆက်အဖြစ် ရင်းမြစ်များ ရှားပါးကာ (အများအားဖြင့် နည်းလမ်းတကျမဟုတ်သော) ပြန်လည်အသုံးပြုသည့်ကဏ္ဍ အားကောင်းနေသည်ကို တွေ့ရှိရသည်။

မြန်မာနိုင်ငံ၏ ရှေ့ဆက်လျှောက်လှမ်းရမည့် လမ်းခရီးတွင် စွန့်ပစ်ပစ္စည်းကဏ္ဍနှင့်ပတ်သက်၍ 'ကျွန်ုပ်တို့ လိုအပ်သည်မှာ အသိပညာပေးခြင်း နှင့် စွန့်ပစ်ပစ္စည်း မှ စွမ်းအင် ဖြစ်စေရန်' ဖြစ်သည်ဟူသော ထူးခြားသည့် သဘောတူညီချက်တစ်ရပ်မှာ စွန့်ပစ်ပစ္စည်းကဏ္ဍဆိုင်ရာ ကိုယ်စားလှယ်များအကြားတွင်ရှိနေသည်ကို ကျွမ်းကျင်သူများအဖွဲ့အနေဖြင့် မြင်တွေ့ခဲ့ရပါသည်။ အမှိုက်မှ စွမ်းအင်ထုတ်ရန် အစပျိုးလုပ်ဆောင်မှုများ ရှိသော်လည်း အခြား နည်းလမ်းများနှင့် နှိုင်းယှဉ်ပါက ကုန်ကျစားရိတ် အလွန်ပင် ကြီးမြင့်သောကြောင့် ထိုကိစ္စကို အချိန်ကာလ တစ်ခုအထိ ခေတ္တဆိုင်းငံ့ထားရန် ကျွမ်းကျင်သူများအဖွဲ့က အကြံပြုခဲ့သည်။ အသိပညာပေးလုပ်ငန်းများ ပြန့်ပွားအောင် လုပ်ဆောင်ခြင်းမှာ အကျိုးရှိသော်လည်း စွန့်ပစ်ပစ္စည်း စီမံခန့်ခွဲရေးကဏ္ဍဆိုင်ရာ စနစ်ကျနသည့် အခြေခံအဆောက်အအုံနှင့် ရေရှည်တည်တံ့သည့် ဘဏ္ဍာရေး အခြေခံတို့ကို တပြိုင်နက်တည်း ဖန်တီးနိုင်ရန် လိုအပ်သည်။

မြန်မာနိုင်ငံ၏ စွန့်ပစ်ပစ္စည်း ကဏ္ဍကို မြှင့်တင်ရာတွင် လျင်မြန်စွာ ကျော်လွှားနိုင်သည့် အချက်များလည်း ရှိပါသည်။ ကျွမ်းကျင်သူအဖွဲ့၏ အကြံပြုချက်များတွင် တစ်နိုင်ငံလုံး အတိုင်းအတာနှင့်ကြည့်ပါက ရန်ကုန်မြို့သည် စွန့်ပစ်ပစ္စည်းအများဆုံးထွက်သည့် နေရာဖြစ်သဖြင့် ပထမဆုံး အာရုံစိုက်သင့်သည့်မြို့အဖြစ် သုံးသပ်အကြံပြု ထားသည်။ ပထမဆုံး အကြံပြုချက်မှာ စွန့်ပစ်ပစ္စည်းပြဿနာကို စီမံခန့်ခွဲသည့် လက်ရှိတာဝန်ထမ်းဆောင်နေသော ဝန်ထမ်းများနှင့် အနာဂတ်တွင် တာဝန်ထမ်းဆောင်မည့် ဝန်ထမ်းများ၏ စွမ်းဆောင်ရည်ကို မြှင့်တင်ပေးရန်ဖြစ်သည်။ ထို့နောက် အမှိုက်သိမ်းစနစ်နှင့် သယ်ယူပို့ဆောင်သည့်စနစ်ကို ပိုမိုကောင်းမွန်အောင် ဆောင်ရွက်ပေးရန်ဖြစ်သည်။ စွန့်ပစ် ပစ္စည်းများကို ယာယီအမှိုက်စုဆောင်းသိမ်းဆည်းလက်ခံနေရာများကို ဖော်ဆောင်ပေးခြင်းဖြင့် ကုန်ကျစားရိတ် သက်သာစေပြီး လမ်းပိတ်ဆို့မှု ပြဿနာကိုလည်း လျော့နည်းစေမည် ဖြစ်သည်။ ရန်ကုန်မြို့ရှိ အမှိုက်စွန့်ပစ်သည့်နေရာများကို လက်ရှိအသုံးပြုနေ သည့် မြေပြင်ညီနေရာပေါ်တွင် စွန့်ပစ်ပစ္စည်းများကို ဖိအားသုံးကာ ကျစ်လစ်စေပြီး အကြိမ်ကြိမ် ထပ်မံစွန့်ပစ်သည့် နည်း (Pancake Disposal Strategy) မှ သတ်မှတ်နေရာတွင် စွန့်ပစ်ပစ္စည်းများမစွန့်ခင် သဘာဝပတ်ဝန်းကျင် ပျက်စီးမှု လျော့နည်းအောင် မြေပြင်ပေါ်တွင် လိုင်နာခံပြီး ထိန်းချုပ်ပေးသည့်စနစ်၊ စွန့်ပစ်ပစ္စည်းများမှ မီသိန်းဓါတ်ငွေ့ ထုတ်ခြင်း၊ စွန့်ပစ် အမှိုက်များ ကို နေ့စဉ်မြေဖြင့် ဖုံးအုပ်သည့်စနစ်၊ စွန့်ပစ်ပစ္စည်းများမှ ထွက်ရှိလာသည့် အဆိပ်အတောက်ပါဝင်သည့်အရည်ကို အန္တရာယ်လျော့နည်းအောင်ပြုပြင်ပေးသည့်စနစ် နှင့် ဖြစ်နိုင်ပါက စွန့်ပစ်သည့်နေရာတွင် ပစ္စည်းအမျိုးအစား ခွဲခြား ခြင်း/ ပြန်လည်အသုံးပြုနိုင်သည့်နေရာများဖြင့်

အစားထိုးအဆင့်မြှင့်တင်ပေးရန် ဖြစ်သည်။ အမှိုက်သိမ်းခ ကောက်ခံ သည့်စနစ်အား ပိုမိုကောင်းမွန်အောင်ပြုပြင်ပါက မြို့တော်အဆင့် စနစ်တစ်ခုလုံး ကိုယ်တိုင်ရပ်တည်၍ ရေရှည် တည်တံ့နိုင်မည်ဖြစ်သည်။ လက်ရှိအခြေခံအဆောက်အအုံပေါ် မူတည်၍ စွန့်ပစ်ပစ္စည်း ပြန်လည်အသုံးပြုသည့် လုပ်ငန်းများကို ပိုမိုစနစ်ကျအောင် လုပ်ဆောင်နိုင်သည်။ မန္တလေးတိုင်းဒေသကြီးအတွင်းရှိ ဘီလပ်မြေထုတ် လုပ်သည့်လုပ်ငန်းများနှင့် ပူး ပေါင်းကာ စွန့်ပစ်ပစ္စည်းအချို့ကို အစားထိုးလောင်စာအဖြစ် ပြန်လည်အသုံးပြုနိုင်ချေ ရှိ/မရှိ ကိုလည်းလေ့လာ ဆန်းစစ်ကြည့် နိုင်ပါသည်။

နယ်သာလန်နိုင်ငံအနေဖြင့် ရေရှည်တည်တံ့မည့် စွန့်ပစ်ပစ္စည်း စီမံခန့်ခွဲမှုဆိုင်ရာ နီးနှောဖလှယ်ပွဲကို မြို့တော်စည်ပင် သာယာရေး ကော်မတီများ မှ ကိုယ်စားလှယ်များ နှင့် အခြား သက်ဆိုင်သူများ အတွက် ၂၀၁၇ ခုနှစ် အောက်တိုဘာ လ သို့မဟုတ် နိုဝင်ဘာလတွင် (တစ်ပါတ်ကြာ) ကျင်းပရန် အစီအစဉ်ရှိပါသည်။ အခြေအနေပေးပါက 'ဟော်လန် စံနမူနာ' ဟုခေါ်ဆိုနိုင်သော ကျွမ်းကျင်သည့် စွန့်ပစ်အစိုင်အခဲ စီမံခန့်ခွဲမှု အဖွဲ့အစည်း၊ သန့်ရှင်းသည့် အခြေခံ အမှိုက်စွန့်ပစ် စနစ်၊ သင့်လျော်သည့် ထောက်ပံ့ပို့ဆောင်ရေးအစီအစဉ်များ၊ စွန့်ပစ်ပစ္စည်းများ ယာယီသိုလှောင်သည့် နေရာများ နှင့် စနစ်တစ်ခုလုံးအတွက် မိမိဘာသာရပ်တည်နိုင်ပြီး ရေရှည်တည်တံ့သည့် ဘဏ္ဍာရေးစနစ် တို့ပါဝင်သည့် စွန့်ပစ်ပစ္စည်း စီမံခန့်ခွဲမှုပုံစံကို ရန်ကုန်မြို့တွင် စတင်မိတ်ဆက်နိုင်ချေ ရှိ/မရှိ လေ့လာဆန်းစစ်ရန်လည်း နယ်သာလန်အစိုးရက လိုလားလျက်ရှိပါသည်။

လက်ရှိအနေအထားတွင် ဒတ်ချ် ကုန်ပစ္စည်း ထုတ်လုပ်ရောင်းချသူများ နှင့် ဝန်ဆောင်မှုပေးသူများသည် မြန်မာနိုင်ငံ၏ စွန့်ပစ်ပစ္စည်း စီမံခန့်ခွဲမှုဆိုင်ရာ စီးပွားရေး အခွင့်အလမ်းများ လုပ်ကိုင်ဆောင်ရွက်ရန် 'နိုင်ငံရပ်ခြား ဖွံ့ဖြိုးတိုးတက်မှု အကူအညီအစီအစဉ်' နှင့် မကြာခဏဆိုသလို ချိတ်ဆက်လုပ်ကိုင်ရမည်ဖြစ်သည်။ အထက်ဖော်ပြပါ နည်းဗျူဟာမှ အခြား အခွင့်အလမ်းအသစ်များဆီသို့ ဦးတည်ခေါ်ဆောင်သွားမည်ဆိုသည့်အချက်မှာ ယုံမှားသံသယဖြစ်စရာမရှိချေ။ မြန်မာနိုင်ငံ နှင့် ဆက်သွယ်မှု အားကောင်းနေခြင်းကြောင့် 'နယ်သာလန် စီးပွားရေးလုပ်ငန်းများဆိုင်ရာ အေဂျင်စီ' (အာရ်စီအို) အနေဖြင့် မြန်မာနိုင်ငံတွင် ကြုံတွေ့နေရသည့် စိတ်ချရသည့် သောက်သုံးရေရရှိရေးလုပ်ငန်းဆိုင်ရာ စိန်ခေါ်မှုများ နှင့် စွန့်ပစ်ပစ္စည်း ပြဿနာများအကြား၊ ရေရှည် တည်တံ့နိုင်သည့် သောက်သုံးရေလုံလုံရေး ရံပုံငွေအစီအစဉ်၏ မူဘောင်အတွင်း စီမံကိန်းများ စတင်နိုင်ချေ ရှိ/မရှိ လေ့လာဆန်းစစ်မှုများ ပြုလုပ်နိုင်လျှင် အကျိုးရှိနိုင်မည်ဖြစ်ပါသည်ဟု တင်ပြလိုက်ရပေသည်။

# 1. Introduction

A strategic location between the rapidly growing markets of India and China, diverse reserves of natural resources and a huge consumer market within its reach: Myanmar has it all to be the next “Asian Tiger”. A sustained economic growth of 8%-9% per annum is expected for the coming years. Opportunities arise for Dutch companies, especially in agriculture, water, infrastructure, logistics and energy.

In 2011, Myanmar started to democratize and to open up its economy. The EU member states and most other countries have lifted their sanctions against the country. Currently, economic growth has increased to 8.5% annually. Myanmar is in a perfect position to enjoy a long period of high growth. The country is one of the last untapped markets: it has plenty of unused arable land, vast oil and gas reserves, more fresh water resources than any other country in the region, and one of the world’s largest gemstone deposits. Perhaps more importantly, located between China, India and Thailand, Myanmar lies in the heart of the world’s fastest-growing regional economy. It is estimated that in 2030 half of the world’s consumers live within a five hour flight of Myanmar.

The country faces enormous environmental challenges. The 2014 Environmental Performance Index ranks Myanmar 164th out of 178 countries. In almost every other aspect of performance related to regulation or infrastructure, Myanmar scores among the lowest globally.

The Dutch water sector is already active in Myanmar, providing support in enhancing its resilience to floods in view of its large delta areas, rivers and coastal zones. One of the most important issues in water management is the presence of both solid waste, causing extreme levels of pollution and urban floodings, and liquid waste polluting the fresh water resources that are currently still abundant.

Myanmar’s 57 million inhabitants produce an estimated 20,000 tons of solid waste per day, a good part of it in the main cities Yangon and Mandalay. This volume is expected to rise rapidly and will cause serious (health and environmental) problems if not properly dealt with. At the same time it may provide a future market with opportunities for companies and institutions in Myanmar and the Netherlands.

In order to explore such opportunities for cooperation and business, in the period 13-24 March 2017 a Dutch Experts Team on Integrated Solid Waste Management (ISWM) carried out a scoping mission to Myanmar. Team members included Mr. Herman Huisman of Rijkswaterstaat Leefomgeving, Mr. Hans Breukelman of BreAd BV and Mr. Bert Keesman of MetaSus. The team cooperated closely with the Dutch Ambassador to Myanmar Mr. Wouter Jurgens and his team, notably Miss Carola Baller and Miss Sandar Myint. Further support was provided by Yangon based private consultant Mr. Felix Haas.

The goal was to assess the situation regarding waste management in Myanmar (focusing on the cities Yangon, Mandalay and Meiktila) and to explore opportunities for future public and private sector cooperation and business in ISWM between the Netherlands and Myanmar. To facilitate the latter, an ISWM workshop was held on March 23 in Yangon with a broad participation of almost 40 representatives of the public and private sector in waste management in Myanmar. For a list of contacts the reader is referred to Annex 1.

In this report, an overview of the findings of the Experts Team is presented. It is not meant as a comprehensive or scientific overview of the waste situation in Myanmar. For this, the reader is referred to publications such as the IGES and GRET reports as listed under “Sources”. The purpose of the current report is to serve as a basis to draft a cooperation strategy (a “Roadmap”) between Myanmar and the Netherlands on ISWM.

### Box 1. Water and Waste: a potentially fatal combination

The scoping mission on waste originated out of the ongoing cooperation program on water management between The Netherlands and Myanmar. It was observed that the rampant littering and dumping of waste in many places in Myanmar creates an urgent threat to water safety:

- Blockage of drainage systems leads to flooding, especially in the monsoon season
- Blockage of sewer systems leads to flooding of sewerage causing cholera outbreaks
- Waste dumped in surface water damages ecosystems and contaminates water resources for drinking water and irrigation purposes
- Waste in pools, directly adjacent to residential areas and markets, creates the ideal breeding ground for vector-borne diseases
- Plastics dumped into rivers eventually end up in the ocean, adding to the “plastic soup”

Myanmar clearly has a problem in this field. Especially in the highly populated metropolitan area of Yangon, where according to the “estimate” of the Expert Team one million tons of waste is left in the streets each year. The upside is that one can kill two birds with one stone: by improving Myanmar’s waste management the water situation will become more sustainable at the same time.



Piles of litter along the rivers



Water and waste in close contact



Pools of dirt next to food on the market



Water ways clogged up with waste

## 2. A bird's eye on Myanmar

### 2.1 A brief introduction

“We have been asleep for sixty years, and now we're waking up”. Such was the summary of the current situation in Myanmar (formerly known as Burma) shared with the Experts Team by the Mayor of Mandalay Dr. Ye Lwin (photo right). After decades of military regime, in November 2010 the ruling Union Solidarity and Development Party (USDP) decided to free the leader of the democratic movement Mrs. Aung San Suu Kyi. In the November 2015 free elections her party National League for Democracy (NLD) gained an overwhelming majority in parliament. Parallel to these changes, Myanmar has opened up to the outside world and is now seeking to claim its position in the international business community.



Myanmar is part of South-East Asia and borders Bangladesh, India, China, Laos and Thailand. With its 676,577 km<sup>2</sup> of surface area, the country is roughly the size of France and 16 times the Netherlands. All in all the country is home to around 57 million inhabitants. The main cities are Yangon (formerly Rangoon, over 7 million people), Mandalay (1.2 million) and Naypyidaw (about 1 million). Yangon used to be the capital, but in November 2005 the Myanmar Government decided to build a new capital 320 kms to the north and name it Naypyidaw.

Myanmar is subdivided into 22 administrative divisions. Yangon and Mandalay are both separate regions. The city of Yangon and the Yangon region pretty much coincide, whereas Mandalay region is significantly larger than the city with over 6 million inhabitants. The mayors of the cities also hold key positions in the region. As an example, the Mayor of Mandalay Dr. Ye Lwin is also the Minister for Development Affairs of the Mandalay region.

The current scoping study focuses on Yangon and Mandalay as the main concentrated sources of waste in the country. Additionally Meiktila was visited for a brief assessment of the waste situation in a smaller city (115,000 inhabitants). This does not mean that elsewhere in the country the problems regarding solid waste are not equally severe. Actually, in some rural areas the problem may be worse due

to the lack of waste collection services. However, because of their size and resources, it is more likely that Yangon and Mandalay will be able to implement effective measures to improve their waste situation. In the future these cities may serve as reference points for solid waste management improvements for the rest of the country.

Yangon and Mandalay are roughly in the center of Myanmar with a flat geography and approximately at sea level. They are 700 kms apart. Both cities are situated along the Irawaddy river, which can be considered the logistical artery of Myanmar. The majority of the population of the Yangon and Mandalay

regions is ethnically Bamar (Burmese), whereas some more remote states in Myanmar are home to ethnic minorities such as the Chin, Kachin, Kayin, Kayah, Mon, Rakhine and Shan. In some cases there are tensions in the remote areas, notably with the Rohingya ethnic group in the western Rakhine state. Other areas are rich in metals, ores, industrial minerals and/or coal, which in itself is a blessing for the country but cannot be explored to the full because of civil unrest or the fact that some areas and resources are controlled by warlords.

## 2.2 Myanmar in a global perspective

Myanmar is in a special phase of its development. The parameters below can help to put the country in perspective relative to other countries.

### **Per capita income**

According to the World Bank (2015 figures), Myanmar's GDP is EUR 1,097 per year, right between Bangladesh and Cambodia. Neighboring Thailand scores an annual GDP of EUR 5,492, exactly five times as much. In many ways Myanmar and Thailand are comparable. The difference in GDPs shows the amount of ground Myanmar still has to cover but also the tremendous potential now that the country is opening up.

### **GDP Growth**

With an annual GDP growth rate of 7.3% in 2015, Myanmar came in 9th in the list of fastest growing countries in the world.

### **Trade freedom**

In terms of Trade Freedom, the Heritage Foundation places Myanmar in the "Mostly Unfree" category on place 146 (between Sierra Leone and Vietnam). Ominous as this may sound, since 2010 the country has experienced a continuous upward trend of 36.7% trade freedom to 52.5% (75.8% for the Netherlands).

### **Corruption**

On the 2016 corruption perceptions index of Transparency International Myanmar ranks # 136 out of 176 countries in the list. Again, since 2010 the country's performance has consistently improved.

### **Education**

On the UNDP education index Myanmar is at place 150, between Angola and Rwanda.

All in all, it is evident that the "60 years of sleep" have taken their toll on Myanmar's development, but the changes in the past years towards a more democratic form of government have sparked a period of stable growth in many aspects.

### 3. Current ISWM situation in Myanmar

#### 3.1 Waste production and expected growth

Yangon and Mandalay are the largest cities of Myanmar. According to the last census of 2015 the Yangon metropolitan area houses 7.4 million inhabitants of which 5.2 million are living in the urban areas and 2.2 million in the rural parts. The average household has 4.4 members. Mandalay’s last census was in 2014 and showed 1.5 million inhabitants, of which 1.3 million lived in the urban areas. The average household in Mandalay has 4.9 members. These population figures should be treated with some caution. Both cities are home to large numbers of informal “floating” settlers who are not included in the census data.

Annual population growth is expected to be around 2.5% for Yangon and 2.0% for Mandalay. This leads to extrapolations of the population figures as shown in table 1 below.

Year 20→	15	16	17	18	19	20	21	22	23	24	25	26
Yangon	7.4	7.6	7.8	8.0	8.2	8.4	8.6	8.8	9.0	9.2	9.5	9.7
Mandalay	1.5	1.5	1.6	1.6	1.6	1.7	1.7	1.7	1.8	1.8	1.8	1.9

**TABLE 1. PROJECTED POPULATION FIGURES FOR YANGON AND MANDALAY IN MLN 2015 - 2026**

When it comes to municipal waste production, the uncertainty in the available data becomes problematic. The Yangon City Development Committee (YCDC), the agency in charge of waste management, reports a per capita production of 0.41 kg of municipal waste per day whereas Mandalay’s MCDC provides a figure of 0.65 kg/day. A closer look at these figures reveals that they reflect the volume of waste reaching the cities’ dumpsites and do not include waste not collected, burned, dumped elsewhere or recycled / reused. Based on international data and both cities’ GDP, for the purpose of this report a current average production of 0.8 kg per capita per day in both cities is assumed, growing towards 1.0 kg per capita per day in 2025. This leads to the waste volumes as presented in table 2.

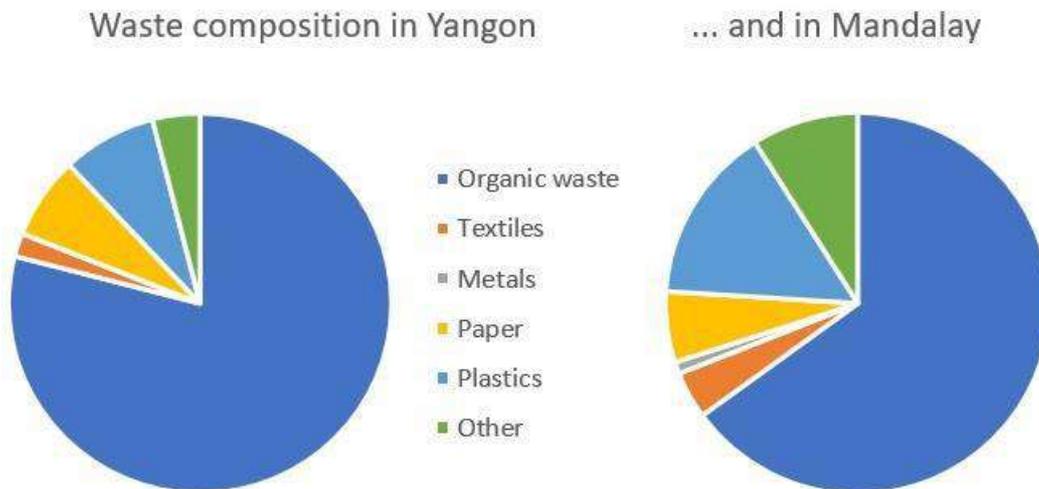
Year 20 ..	15	16	17	18	19	20	21	22	23	24	25	26
Yangon	5,920	6,220	6,531	6,853	7,188	7,535	7,895	8,268	8,656	9,057	9,473	11,651
Mandalay	1,200	1,261	1,324	1,389	1,457	1,527	1,600	1,676	1,755	1,836	1,920	2,362

**TABLE 2. DAILY WASTE PRODUCTION IN YANGON AND MANDALAY IN TONS/DAY 2015 - 2026**

Currently Yangon’s dumpsites receive an average 2,500 tons of waste per day and the ones in Mandalay 900 tons. In line with our assumption of a daily waste output of 0.8 kg/pppd, a daily 3,500 tons in Yangon and 300 tons in Mandalay do not reach the dumpsites and are “lost” somewhere in the urban areas.

## 3.2 Waste composition

The composition of Yangon's and Mandalay's waste is reported by a number of sources, all mentioning a considerable content of organic waste and plastics. This composition generates opportunities in treatment by composting/digestion and sorting.



Visits to dumpsites in both cities showed evidence for this composition as illustrated by the pictures below.



## 3.3 Waste collection, transfer, treatment and recycling

### 3.3.1 City cleaning and waste collection

City cleaning and the collection and treatment of waste in most cities in Myanmar is dominated by the City Development Committees (CDC's). These public authorities are able to operate highly centralised services on city cleaning and waste collection for the entire metropolitan areas. Private companies are virtually absent, apart from some initiatives on "cash for trash".



The Yangon City Development Committee (YCDC) has divided its services into four districts (north, east, south and west) covering 33 townships. City cleaning has serious deficiencies. Apparently, the central business parts of the city are serviced with daily sweeping and cleaning, but outside these areas such services are not provided. At times, the poorer parts of the city and the industrial areas show extreme littering.

Extreme littering and the near absence of city cleaning appear to be the most important waste problem in Yangon. Litter is all around, even in the wealthier areas of the city. Most inhabitants seem to be reluctant (or unaware) to cooperate in keeping their city clean. Waste is thrown out of apartment buildings into the alleys and open areas and is not removed by municipal services. Street-sweeping services are deployed primarily during (early) morning hours but in many areas they are absent.

### Box 2. Unveiling the beauty of Yangon: the Alley Garden Project by Doh Eain



The abundant litter in Yangon literally hides the city's beauty, both to residents and visitors. A few weeks before the Expert Mission visited, Yangon based Doh Eain social enterprise started to convert the back alleys of Yangon into alley gardens. This initiative is spearheaded by Dutch national Emilie Röell, who lives in Yangon herself. The first activity was to convert 20 meters of alleyway on lower 27th street into a vegetable garden, a children's playground and a place for socialising. The initiative received a great response from local media and the authorities, suggesting that the abundant litter is widely perceived as a problem and the possibility of using these mini dumps as public spaces recognised. The mayor of Yangon Mr. U Maung Maung Soe came by and ordered the whole alley to be cleaned up. As a next step Doh Eain intends to clean up 1 km of alleyway. Their campaign can be followed through Facebook at: <https://www.facebook.com/DohEainYGN/> or on [www.doheain.com](http://www.doheain.com). Contact: Mrs. Emilie Röell, [emilieroell@gmail.com](mailto:emilieroell@gmail.com), Tel. 95 9 789749423.

The waste is covering the streets and public areas and is piling up between houses, at market places and in drainage systems. It leads to direct and daily contact of Yangon's inhabitants with waste, to contamination

of food and drinking water, to adverse effects of waterborne diseases and to blocking of sewerage systems leading to sewage floods in the rainy seasons. Apart from these health effects it leads to a reduced attractiveness of the city and to the discharge of waste and plastics into the rivers, deltas and the sea.



Yangon claims a more than 90% coverage of waste collection but data indicate otherwise. Our estimate is that only 45% of the waste is reaching the dumpsites. There is some separation of recyclables by informal collectors but the percentage does not exceed 5%. So around 50% of the municipal waste stays behind somewhere in the city. This percentage equals a daily 3,000 tons. Spread out over Yangon’s surface this means that on a yearly basis every square meter has to deal with 1.4 kg of littered waste.

The situation in Mandalay appears to be a little better. Litter is all around too, but city cleaning and waste collection seem to be more effective. A mere 25% of the waste does not reach the dumpsite and stays behind in the city (equaling 0.3 kg/m<sup>2</sup>.year).

Municipal solid waste collection systems in Myanmar cities are labour intensive and rely on both manual workers and non-specialised vehicles. In general, the current waste collection system seems to be a closely-knit network, centrally and top down organised by the CDC’s. Collection takes place in different forms such as door-to-door (bell collection), block, and container collection methods. The primary waste collection system is carried out by push carts and tricycles while secondary collection system is performed mainly with tipper trucks (dumpers). These systems are connected at the collection points or dump yards. Yangon has reported the operation of 946 of these yards throughout the metropolitan area.

Table 3 summarises the deployment of employees, vehicles and carts in both cities (based on a population of 7 million in Yangon and 1.5 million in Mandalay).

	employees		vehicles		push carts	
	total	inhabitants per employee	total	inhabitants per vehicle	total	inhabitants per push cart
Yangon	4.900	1.429	355	19.718	1.086	6.446
Mandalay	2.200	682	211	7.109	179	8.380

**TABLE 3. WASTE EMPLOYEES, VEHICLES AND PUSH CARTS IN YANGON AND MANDALAY**

The above figures show striking differences between Yangon and Mandalay. Yangon has way less employees and vehicles taking into account its population. This goes a long way towards explaining Mandalay’s better performance in waste management.

Informal collection by waste pickers is said to have reached quite some importance in Myanmar. The NGO CESVI claims that already in 2013 the informal circuit of collectors and wholesalers reached a market share of 10% of the total waste flow of Yangon (and almost 50% when related to the inert fraction alone). These figures may be “too good to be true” as this would mean that already the majority of plastics finds its way in the recycling market. An educated guess, based on international experience but also on our observations in both cities, may go no further than 1% or 2%.

Nevertheless the importance of this informal sector must not be underestimated. It already provides an income to thousands of families in Myanmar. At a small waste transfer station in Mandalay, a group of MCDC staff making 3,600 MMK/day was working together with some waste pickers sorting out the recyclables of the delivered waste piles. The waste pickers made around 10,000 MMK each a day. At the end of the month they shared some of their income with the MCDC staff.

Obviously, there is some money to be made in recycling in Myanmar. And the future outlook may even be brighter as this informal sector has the potential to become an important element of the future backbone of Myanmar’s recycling industry.

### 3.3.2 Transfer sites

Transfer sites are defined as facilities that allow transferring and bulking of waste, collected in dedicated collection vehicles of up to 8 tons, into large bulk volume trucks, carrying over 30 tons, taking their freights to the dumpsites. Transfer stations can be very beneficial, especially under Yangon circumstances considering the city’s geography, size and traffic problems.

Neither Yangon nor Mandalay makes use of such large size transfer stations. There are quite a number of road side facilities (collection points) where waste from tricycles and other small capacity collection vehicles is bulked and moved into larger containers and collection trucks of up to eight tons. At most of these facilities labour intensive transfer and compaction operations were observed; all inadequate, inefficient and dangerous for the workers involved. At some of the facilities on-site separation of plastics and paper was performed by informal workers.





YCDC waste dump truck in Yangon



HEIL waste compactor truck in Yangon



Hyundai truck at Htain Bin dumpsite Yangon



Chinese Chenglong truck at Htain Bin



Forland truck at DOWA in SEZ Yangon



Chinese SKAT truck in Meiktila (US\$ 15,000)



MCDC Side loader (Mandalay)



Chinese DFAC hook lift trailer in Mandalay

FIGURE 1. WASTE COLLECTION VEHICLES IN YANGON, MEIKTILA AND MANDALAY

### **Box 3. The key role of transfer stations**

The primary role of transfer stations is to bring together small freights of waste coming from collection vehicles and bulk it in large volume trucks. These trucks are capable of carrying over 30 tons of waste and are able to transport this bulk freight to the landfill site in a very efficient and cost effective way. But there are many other advantages, the most important ones being:

- It leads to an immediate and substantial increase of the collection capacity at no extra cost because collection vehicles and employees are able to double or even triple their number of daily rounds.
- Transfer stations allow the temporary storage of waste in case of emergencies and during short periods like weekends. 24/7 opening hours of landfill sites are no longer required.
- Transfer stations allow flexibility as collection and transport are “disconnected”. Waste collection can be carried out during night shifts. Vehicles can be used 24/7, for example by carrying out door-to-door collection during daytime and market waste collection during the night.
- The stations are able to serve as distribution centres, directing inert waste to landfill sites, organics to composting sites etc.
- Transfer stations will lower the required number and capacity of roadside collection points (because small collection vehicles will deliver their waste directly to the stations) and will enable more adequate operations at the remaining points. The latter can be promoted by providing these points with dedicated low-height containers. The manual transfer of waste from tricycles and push-carts into these containers is easy, safe and fast. Dedicated small trucks can take care of replacing the full containers with empty ones and transporting the containers from the roadside collection points to the transfer stations.
- The stations can be used as Household Waste Recycling Centres where households can leave their source separated waste.
- The stations can include recycling plants and facilities for parking and maintenance of the collection fleet.

### 3.3.3 Treatment facilities

The number of treatment facilities for specific types of waste is limited. The expert team was able to gather information on (and in some cases visit) the examples below.

#### ***Waste to Energy***

Interest in Waste to Energy is unusually strong in Myanmar. Most of the authorities’ representatives mentioned WtE as at least one of the solutions in SWM they are looking for. This interest is most likely sparked and stimulated by a number of countries and companies looking for new markets for their WtE products and industries. Japan has made a sizable contribution to this situation by promoting WtE in strategic studies but also by co-investing in Myanmar’s first WtE pilot plant in Yangon.

Construction of this plant in the north of Yangon is now completed and the plant is under commissioning. The investments amounted to US\$16 million. Half of this amount was financed by YCDC and the other half by Japan. Engineering, construction and commissioning are carried out by the Japanese firm JFE (<http://www.jfe-eng.co.jp/en/>). This pilot facility has a capacity of 60 tonnes of municipal waste per day, mainly from the townships of Insein, Shwe Pyi Thar, North Okkalar and Mingalardon. The electricity production capacity is 700 kW. 300 kW of this is being used for internal consumption of the plant. The remaining 400 kW is fed into the grid.



Both from a waste treatment perspective and from an electricity production perspective, this pilot WtE plant is considered very expensive and will need gate fees on the waste side way beyond Yangon's capacity. Apart from that YCDC and the plant will be faced by serious challenges with regard to feeding into an unstable electricity grid and by years of dependency on Japan's input on operating and maintaining this high-technology facility.

### *Hospital waste*



Not far from the largest dumpsite of Myanmar, in Htainbin at the northwest side of Yangon, there is a large cemetery and cremation facility. Part of the cremation capacity at this site is used to incinerate hospital waste (human remains). Other types of hospital waste such as discarded medicines and instruments are buried just outside the cremation facility in a concrete bunker. Mandalay applies open pit burning to this type of waste.

In general the impression is that the authorities in Yangon and Mandalay are well aware of the hazardous nature of hospital waste and try to manage it as best they can through regular and separate collection and treatment schemes.

### 3.3.4 Recycling

There is a sizable reuse and recycling chain in Myanmar. According to some sources, the origins of this situation lie in the fact that Myanmar has been isolated for decades. For a number of materials such as paper and plastics, the country had to be self-sustainable to the extent possible, which created a market for reused products (including repair shops) and recycled materials. This sector was and is heavily dependent on informal workers and low wages. Now that Myanmar is opening up, recycled materials are in some cases replaced by virgin materials. The business model for recycling is therefore changing rapidly and the sector may have to undergo a modernization and professionalization in order to stay competitive.

## *Plastics recycling*

The issue of plastic litter is receiving increasing attention in Myanmar, both from the public and from the private sectors. In 2009, authorities in Mandalay banned the use of plastic bags and in April 2011 Yangon followed suit. At some point along the road the Expert Team stumbled upon a sign 'Plastic Bag Free Zone'. This was considered encouraging, especially because a road sign 'End of Plastic Bag Free Zone' was never encountered.



### **Box 4. A supermarket chain trying to get rid of plastic bags**

City Mart is Myanmar's leading supermarket chain with 28 stores. As part of their environmental responsibility, in 2013 the company started the "No Plastic Bag Day" campaign. NPBD takes place on two fixed days every month. On these days City Mart does not hand out plastic bags. Instead, the company encourages its customers to bring their own reusable bags. They also can purchase City Mart's reusable bags. Regular plastic bags are still available, however, on No Plastic Bag Day they cost 100 MMK (EUR 0.07) each. All sales revenues of the reusable bags and plastic bags go to the Forest Resource Environment Development and Conservation Association (FREDA). According to the Myanmar Centre for Responsible Business (MCRB), City Mart is the country's frontrunner in terms of Corporate Social Responsibility. Contact: Mr. Hninn Lae Wai, email: [hninlaewai@city.com.mm](mailto:hninlaewai@city.com.mm).



Plastics recycling is starting to become a regular industry inside Myanmar. Yangon houses three larger plastic factories and various small factories. The estimated production of chopped plastic bottles is 1.000 tons per month. Mandalay shows a similar situation with an estimated production of 700 tons per month.

### **Box 5. Mount Zwegabin Plastic Free Zone**

Hpa An is the capital of the Kayin State: a picturesque town on the eastern bank of the Salween river, about 270 kms east of Yangon. One of the main attractions in this area is the sacred and monolithic Mount Zwegabin, which is 700 mts high. During the annual Tabaung festival, approximately 100,000 people visit this mountain every day, leaving a humongous amount of trash. For the March 2016 edition of the festival, Kayin based Mrs. Sophia Naing launched the "Zwegabin Plastic Free Zone" initiative (with support of a Swiss company and Coca Cola). On the last day of the festival, about 350 volunteers from various organisations plus residents from 20 villages cleaned up the plastic rubbish left by visitors. The collected plastic items were then handed over to the Hpa-an municipal authorities. Contact: Mrs. Sophia Naing (photo), Peace Nexus Foundation Myanmar, +95 9 401546605, [sophianaing@gmail.com](mailto:sophianaing@gmail.com).





Waste sorting at roadside transfer station



Sorting out recyclables at community transfer station



Harvesting recyclables at dumpsite



Processing plastic waste near Mawlamyine<sup>1</sup>



Processing recyclables at DOWA site in Yangon



Chu Chu shop with articles made out of recycled plastic in Yangon



Pilot Waste to Energy plant in Yangon



Recyclables ready for export in Mandalay

**FIGURE 2. IMAGES OF THE RECYCLING CHAIN IN MYANMAR**

<sup>1</sup> Formerly Moulmein, the sixth largest city of Myanmar, 300 kms south east of Yangon.

A visit to one of Yangon's industrial areas showed considerable private activities in wholesale and trading of bulked plastic waste to foreign countries such as China. Another interesting initiative was the so called "Chu chu store" in Yangon's suburb of Dala. "Chu chu" in Myanmarese means "small plastic bag". As a result of a project by the Italian NGO CESVI, a business has been set up where 30 people (mostly women) working from their home manufacture products such as handbags from discarded plastics. The plastics (e.g. wrappings) are collected from markets by the women themselves, so they are relatively clean. Sales at the "Chu chu store" in Yangon's suburb Dala currently amount to US\$ 5,000-6,000 per month.

In spite of these initiatives, it is safe to conclude that the country still has a long way to go before plastics collection and recycling will reach a scale with sufficient impact on waste reduction.

### *Cement industry*

Myanmar's cement industry, most of it located around Mandalay, could play an important role in Myanmar's future waste treatment infrastructure. Considering the country's interest in WtE-concepts it is strange to see that this interest is virtually bypassing the opportunities offered by the cement industry.

### *Paper industry*

Information on Myanmar's paper and pulp industry is hard to find. One of the larger pulpers in the country appears to be the Thabaung plant in the Ayeyarwady region west of Yangon. Data on consumption of waste paper in this production facility are not available. Nevertheless it is safe to assume that there is a good potential in recycling waste paper inside the country.

## 3.4 Waste disposal

Myanmar's disposal infrastructure primarily consists of open dumpsites with almost no measures to prevent the entrance of citizens, to avoid nuisance and fires and to prevent or contain leachate, dust and landfill gas emissions. Operations on the Mandalay and Yangon dumpsites are pretty much limited to the registration of incoming waste volumes. Spatial planning and landscaping are not applied. Heavy equipment (bulldozers, compactors, dumpers) is almost absent, making it impossible to pile up waste in thick layers, to construct temporary roads for collection trucks and to perform daily coverage of the waste with a layer of soil. In most cases, the result is a thin pancake of waste, no more than four to six meters high, covering large stretches of land, openly exposed to wind, sun and rain and open for uncontrolled entrance by scavengers.

Apart from the above shortcomings the dumpsites look relatively well organized. The sites are well embedded in the CDC organisations, the waste input is registered and even the scavengers are registered in the sites' administration.

The tables and maps below provide an overview of currently operational dumpsites in both cities.

Waste dumpsites Yangon				Waste dumpsites Mandalay			
Dumpsites Yangon	Area (ha)	Used (ha)	Disposal (ton/day)	Dumpsites Mandalay	Area (ha)	Used (ha)	Disposal (ton/day)
Htain Bin	61	28	1,111	Kyar ni Kan	5	2	450
Htawe Chaung	60	20	945	Thaung Inn Mount	12	4	300
Da La	0.5		350				
Seikkyi Khanaung To	0.1		7				
Mingalardon	0.4		70				
Shwe Pyi Tar	0.4		70				

The Htain Bin and Htwei Chaung dumpsites in Yangon will remain open in the upcoming years. Both sites have a substantial remaining capacity (see Box 6).

YCDC, with the aid of JICA, has already selected nine new sites around Yangon, which are to replace Htain Bin and Htwei Chaung in the future. This strategy is however considered costly (land prices are high) and unnecessary. As described, there will be no need for replacement as the present capacity will be more than sufficient in the case of optimised operations.

Although at a smaller scale, the same conclusion holds for the two Mandalay dumpsites.

A properly designed landfill was encountered in the Thilawa Special Economic Zone. The Japanese private firm DOWA (in Myanmar: Golden DOWA Eco System) invested US\$ 36 million in this facility. Apart from on-site waste disposal the company provides transportation, pre-treatment and recycling of waste. Clients include the companies at the Thilawa SEZ but also domestic and industrial facilities elsewhere. DOWA's 500,000 m<sup>3</sup> landfill (capacity for 40-50 years) has been designed according to international standards for the disposal of hazardous waste (US EPA). Before disposal the waste is stabilized. There is also an on-site waste water treatment plant with a biological and coagulating sedimentation process. Currently the plant is processing 100 tons of waste per month. The DOWA waste processing facility is not cheap: a bottle filling company in the SEZ pays more than US\$ 500 per ton to get its waste processed there. YCDC is cheaper but the company chose DOWA because of its proximity. Contact: Mr. Kei Nagata, Golden DOWA Eco-System Myanmar, nagatak@golden-desm.com.



Pile of waste next to restaurant



Waste pool next to food items at market



Pile of waste next to an outdoor market



Weighing station at Mandalay waste dump



“Pancake disposal” at Meiktila dump site



Waste pickers at Mandalay dumpsite



Concrete storage of hospital waste Yangon

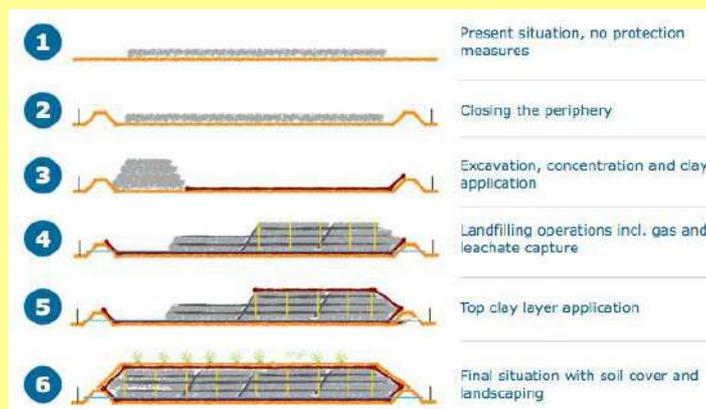


Modern landfill at DOWA site on SEZ Yangon

FIGURE 3. IMAGES OF WASTE DISPOSAL IN THE STREETS AND AT DUMP SITES IN MYANMAR

### Box 6. Opportunity: Raising the life expectancy of Yangon's landfills

Yangon's two main landfills Htain Bin and Htwei Chaung are occupying a combined area of 120 hectares of which around 50 hectares are covered with an average five meters of waste. If the entire area of these two sites would be used to landfill up to an average of 40 meters this would yield a remaining capacity of almost 40 mln m<sup>3</sup>. That would be enough for Yangon's waste production in the coming 15 years. Pre-treating the incoming waste by simple and cheap separation/composting/stabilisation and using the compost for the daily coverage of the waste, would reduce the volume to be landfilled by at least 60%. This would result in a remaining life expectancy of the two sites of 30 to 40 years and would also provide the critical mass needed for investments in leachate and landfill gas catchment and treatment systems.



## 3.5 Costs, fees and affordability

### 3.5.1. Current costs and fees

The current costs of the waste collection and treatment systems in Myanmar can only be estimated on a rough basis.

City cleaning is carried out by street sweepers earning an average of 3,600 MMK per day, or EUR 60 per month. Assuming Yangon presently employs 1,000 street sweepers, this leads to a cost per household of EUR 0.30 per month.

Table 4 below provides an estimate of how high the collection costs would be based on collection in an eight ton truck with five workers, working 20 days a month and with the capacity to make two collection rounds in one day (considering distance and traffic jams). This estimation would lead to overall collection costs of no more than EUR 1.50 per household per month. The result of course is heavily dependent on the number of rounds that can be made in one day. An average of two rounds may be accurate under Yangon circumstances. For Mandalay it will be more like three to four rounds. In general it can be stated that doubling the number of rounds will lead to cutting the costs in half, which is in fact the result that can be achieved by operating a network of transfer stations.

In the current situation, an average of three rounds per day and collection coverage rate of 50% lead to average costs per household of no more than EUR 0.50 per month.

Cost factor per waste truck	#	Salary per employee (EUR/month)	Costs (EUR/day)
Driver	1	120	6
Assistant	1	100	5
Loaders	3	80	12
Salaries total (EUR/day)			23
Depreciation, maintenance, insurance, interest of vehicles (EUR/day)			175
Diesel (EUR/day)	based on 5 ltrs/hr, 10hrs/day, EUR 0.5 per ltr		25
Total costs (EUR/day)			223
Costs per ton (EUR/ton)	based on 8 tons/truck, 2 rounds per day		13.94
Costs per household (EUR/month)	based on 4.4 members/household with 0.8 kg/pppd		1.48

**TABLE 4. COST OF WASTE COLLECTION MODEL IN YANGON (100% SERVICE COVERAGE)**

The costs of dumping under today's Myanmar circumstances must be extremely low considering the limited number of staff and equipment employed on these sites. It seems safe to assume that these costs are no higher than EUR 0.05 per household per month.

The overall costs of the current inadequate system of city cleaning, waste collection and treatment (administration/management included) in Yangon will be no higher than EUR 1.00 per household per month or EUR 20 million per year. For Mandalay (with shorter transport distances and a higher collection coverage) the figure will be more or less the same, leading to yearly costs of approximately EUR 4 million.

Current monthly fees in Yangon and Mandalay are summarised in table 5 (expressed in Myanmar Kyats. Not included in this table: both cities also provide on-call services with payments per trip).

	households	commercial	hospitals
Range	Min - Max	Min - Max	Min - Max
Yangon	300 - 600 <sup>2</sup>	500 - 550,000	1,500 - 300,000
Mandalay	300 - 900	11.000/ton	No data

**TABLE 5. CURRENT MONTHLY WASTE FEES IN YANGON AND MANDALAY (IN MMK)**

Data on the effectiveness of fee collection (which % of households is actually paying?) are not available. As EUR 1.00 equals approximately MMK 1,400, the above figures lead to the conclusion for Yangon that

<sup>2</sup> Central area 600 MMK/month; suburban areas 450 MMK/month; centralized townships: 300 MMK/month.

present revenues do not cover present costs. Similarly, Mandalay's fee system appears not to cover the total costs of the current services. In fact, according to the MCDC, only one eighth of the costs of waste management is currently covered directly through the waste fees.

### 3.5.2. Costs and fees for adequate facilities and operations

For proper city cleaning the service needs to be improved substantially. Deployment of more workers, proper operations and improved equipment will lead to costs running up to EUR 1 per household per month. A system for collection and transport, making use of transfer stations and proper equipment, is expected to cost no more than EUR1 per household per month as well. Upgrading the dumpsites into basic but adequate landfills will cost no more than EUR 0.50 per household per month. The combined cost of a functional and well performing SWM backbone in Yangon and Mandalay is therefore estimated to be no more than EUR 2.50 per household per month.

### 3.5.3. Affordability

The minimum wage in Myanmar is MMK 3600 per day, a little more than EUR 2,50. Assuming a minimum and average household income of EUR 80 and EUR 220 per month respectively this means that adequate SWM services would be affordable to the average family in Myanmar (costing about 1% of their income) but may be too expensive for the poor (3%). In order to accommodate this a system of fee differentiation is recommended.

## 4. Waste policies, laws and regulations

In most countries, the system of environmental laws and regulations is a top-down structure, where municipal rules are formulated within the framework of national and (possibly) provincial legislation (in the Netherlands, the EU legislation and goals are the starting point). In the case of Myanmar, however, there appears to be hardly a connection between national and municipal rules on waste management. National rules are generally vague and not specifically designed for waste management, so it is up to the cities and townships to define their own environmental rules and strategies. For the big cities this appears to work out satisfactorily at the moment, but small cities (not the subject of this study) undoubtedly lack the expertise to properly plan and execute their waste management operations. In the future, when waste management will be dealt with at a supra-municipal level and concepts such as Extended Producer's Responsibility get introduced in Myanmar, a well developed national framework specifically for waste management will be indispensable.

### 4.1 National legislative framework

Year / Law	Remarks
1994: Myanmar National Environmental Policy	Environmental regulations on the utilization, conservation, and prevention of environmental degradation including water, land, forest, mineral, marine resources, and other natural resources
1997: National Agenda 21	Implementation of integrated management of natural resources providing a blueprint for achieving specific targets on environmentally sustainable development
2009: National Sustainable Development Strategy	To ensure development remains in harmony with the three main pillars of sustainability: economic, environmental and social objectives
2012: National Environmental Conservation Law	An enforcement mechanism to protect and conserve nature. This law prescribes the requirements for Environmental Impact Assessments (EIA) and Environmental Management Plans (EMP) for e.g. investment projects.
2014: Environmental Conservation Rules	

**TABLE 6. LEGISLATIVE FRAMEWORK FOR THE WASTE SECTOR AT THE NATIONAL LEVEL**

Table 6 shows the Myanmar laws and regulations applicable to the waste sector. The regulations are still of a very general nature. The Union Ministry of Natural Resources and Environmental Conservation (MoNREC) together with the Institute for Global Environmental Strategies in Japan has recently formulated a waste management strategy at the national level as well as for Yangon, Mandalay and Naypyidaw. Unfortunately, the resulting policy document has turned out to be vague, without a true strategy on how to achieve the set targets and a proper assignment of responsibilities.

### 4.2 Local level

As stated in the introduction, waste management related policies and their implementation are predominantly taken up on a local level through the municipalities. The so called City and Township Development Committees (CDC's) take up waste management as a principal responsibility. In particular, the CDC's of Yangon, Mandalay and Naypyidaw (YCDC, MCDC and NCDC) have a strong role and

certain policy making responsibilities due to the significance of these urban centers. The CDC's in the cities have a Pollution Control and Cleansing Department (PCCD) in charge of household solid waste, industrial and hazardous waste management. They also have a Department of Water and Sanitation with responsibility for wastewater and sewerage waste management. Other departments within the Township Development Committees (e.g. City Planning) equally have a role in handling of waste related matters.



Staff at the PCCD Yangon; left to right at the table: Daw Khin Hnin Aye, Assistant Engineer; U Saw Win Maung, Deputy Head of Department; Dr. Aung Myint Maw, Deputy Head of Department and Assistant Chief Engineer; and (separately to the right) Lt. Col Cho Tun Aung, Head of Department

### 4.3 Example: The Concept Waste Master Plan for Yangon 2040

With the help of the Japan International Cooperation Agency (JICA), Yangon is working on a draft Master Plan for Waste Management. It has a technical component and a soft component. Table 7 shows the outline of the plan in the short, medium and long term.

	Technical component	Soft component
Short term	<ul style="list-style-type: none"> <li>• Site selection of Yangon eastern and southern dump sites</li> <li>• Site selection of western transfer station</li> </ul>	<ul style="list-style-type: none"> <li>• Budget allocation for Yangon Waste to Energy development</li> <li>• Capacity building of PCCD</li> </ul>
Medium term	<ul style="list-style-type: none"> <li>• Master plan on SWM</li> <li>• Recycling center / Composting plant</li> </ul>	<ul style="list-style-type: none"> <li>• Citizen's awareness campaign</li> <li>• Capacity building</li> <li>• Privatization of SWM services</li> <li>• Legislation establishment</li> <li>• Budget allocation</li> </ul>
Long term	<ul style="list-style-type: none"> <li>• Waste to Energy</li> <li>• Integrated collection system</li> <li>• Workshop improvement</li> <li>• Expansion of Yangon</li> </ul>	<ul style="list-style-type: none"> <li>• Citizen's awareness campaign</li> <li>• Capacity building</li> <li>• Privatization of SWM services</li> <li>• (Establishment of Waste Authority)</li> <li>• Budget allocation</li> </ul>

**TABLE 7. CONCEPT MASTER PLAN OF THE PCCD YANGON MARCH 2017**

This plan will have to help Yangon to deal with the effects of future population growth, population density growth and an increase in the waste per capita. There is also an increasing land scarcity problem (and high land prices), so the choice to develop new dump sites may not be the best option. Extending the life span of the current locations is much cheaper. Another way to optimize the use of financial resources will be to upgrade the overall waste system (including recycling, composting etc) rather than betting on expensive waste to energy plants.

## 4. Private sector opportunities

### 4.1 Waste related private sector in Myanmar

#### 4.1.1 Myanmar companies

The private sector in Myanmar related to waste management is as yet of modest proportions. Below a list of useful contacts is provided; some already working in the waste management field, others working in adjacent areas but with the potential to become useful business partners for Dutch waste related companies. Although companies in waste (water) management can be 100% foreign owned in Myanmar, a reliable local business partner is considered very important to successfully operate in the country.

<p><b>Environmental Quality Management Co</b></p> <p>EQM is a professional services company specializing in environmental, social and health impact assessments (ESHIA). The company has worked with the Ministry of Natural Resources and Conservation (MoNREC) and IGES Japan on a waste management strategy for Myanmar and its main cities. It is also currently involved in an inventory of hazardous waste in Myanmar on the basis of a questionnaire (a project supported by Norway).</p> <p>Contact: Mrs. Ohnmar May Tin Hlaing, Director, +95 1 2333994, <a href="mailto:contact@eqm-myanmar.com">contact@eqm-myanmar.com</a>, <a href="http://www.eqm-myanmar.com">www.eqm-myanmar.com</a></p>	
<p><b>Zeya &amp; Associates</b></p> <p>Family owned business, part of the RGK+Z&amp;A Group. With its approx. 300 staff it is a leading engineering, procurement and construction services company in Myanmar. Zeya works for the Government (incl. PPP arrangements) and for private clients. In 2013 the company won a YCDC tender to build a 600 tons/day Waste-to-Energy facility in Yangon. Eventually it was not built because the gate fees turned out to be insufficient and the necessary power tariff was considered too high by the authorities.</p> <p>Contact: Mr. Sabarinathan Ravichandran, Associates Director, +95 9 5034252, <a href="mailto:sabari@rgkzna.com">sabari@rgkzna.com</a>, <a href="http://www.rgkzna.com">www.rgkzna.com</a>.</p>	<p>RGK+Z&amp;A Group</p> 
<p><b>SMART Group of Companies</b></p> <p>Since 1994, SMART Group of Companies is an important technical services provider in Myanmar for customers from the oil and gas, marine and offshore, engineering and other industries. Its Director U Kyaw Kyaw Hlaing worked for Schlumberger Technical Services as Field Engineer/Data Services Manager from 1981 to 1994 in Myanmar and abroad. He now is involved in environmental activities including a video awareness program entitled “Stop Using Plastic Bags”.</p> <p>Contact: U Kyaw Kyaw Hlaing, Director, Tel. +95 1 441189, <a href="http://smartmyanmargroup.com">http://smartmyanmargroup.com</a></p>	

Back in 2014/2015, the YCDC made an attempt to outsource waste collection services in Yangon to the private sector. The companies that were competing for this concession were Shwe Myan Star (Myanmar), Advance Technology International, Zeya & Associates (Myanmar), AOSORA, TYTC Waste Equipment (Australia), Future Unodex (Myanmar) and Kyaw Htet Kyaw (Myanmar). The concession was never awarded though.

Table 8 provides some additional contacts in fields adjacent to waste management.

Name company	Activities	Website
AMD Trading Ltd	Portable waste water treatment systems	<a href="http://www.amdmyanmar.com">www.amdmyanmar.com</a>
ARCADIS	Built asset design and consultancy, incl. water treatment	<a href="http://www.arcadis.com">www.arcadis.com</a>
CAG Engineering	Building automation, incl. WWTPs. Planning to organize a seminar on waste	<a href="http://www.cagengineering.com/">http://www.cagengineering.com/</a>
CEA Project Logistics	Logistics services. The manager John L. Hamilton has worked in waste in Hong Kong / Thailand	<a href="http://ceaprojects.com/">http://ceaprojects.com/</a>
Energize Myanmar	Development of private power plants. May be a useful contact for WtE projects in the future	<a href="http://www.energizemyanmar.com">www.energizemyanmar.com</a>
Environmental Myanmar Cooperative Co., Ltd	Environmental consulting, incl. EIAs	<a href="http://emc-myanmar.org">http://emc-myanmar.org</a>
Myanmar International Consultants	Consulting in public infrastructure, including energy and water. No specific waste projects yet	<a href="http://mmicltd.com">http://mmicltd.com</a>
Royal HaskoningDHV	Engineering and consultancy in infrastructure incl. water	<a href="http://www.royalhaskoningdhv.com">www.royalhaskoningdhv.com</a>
Safege (SUEZ Myanmar)	Improving water management plus studies to improve public services in Mandalay (incl. waste management)	<a href="http://www.safege.com/en">http://www.safege.com/en</a>
Supreme Group of Companies	Turnkey water installations and WWTPs	<a href="http://supremegroupcompanies.com/">http://supremegroupcompanies.com/</a>
Wa Minn Group of companies	Project developer, also WWTPs (Kubota Johkasou system)	<a href="http://www.waminn.com/">http://www.waminn.com/</a>

**TABLE 8. SOME ADDITIONAL ENVIRONMENT RELATED COMPANIES IN MYANMAR**

Danish Ramboll and Australian SMEC are also active in Myanmar.

International cooperation is still an important factor in Myanmar, and may even be picking up as a result of the opening up of the country. Table 9 provides an overview of the countries and NGO's which are currently active in the country in waste management and associated issues.

NGO	Activities	Contact
CESVI	Institutional capacity building in Yangon, mapping waste streams with GIS tech, awareness raising. Notable result: 30 people making products from discarded plastic and selling them through "Chu Chu" store in Dala	Mr. Friedor Jeske Governance Sector Coordinator +95 9 254 049 065 <a href="mailto:fjeske@gmail.com">fjeske@gmail.com</a>
DFID UK	Working on cities and infrastructures for growth, would be interested to cooperate on waste management	Mrs. Kirstyn Thomson / DFID Myanmar +95 9 250534039 <a href="mailto:kirstyn-thomson@dfid.gov.uk">kirstyn-thomson@dfid.gov.uk</a>
GRET	Carried out a data collection on waste management in Yangon, Mandalay and Monywa for UN Habitat. Plans to organize a one day seminar on waste management in October 2017 for some 150 participants	Mr. Thibaut Le L'Och GRET Myanmar +95 9 452102989 <a href="mailto:le-loch@gret.org">le-loch@gret.org</a>
Norway	Making an inventory of the generation of hazardous waste in Myanmar with support of the company EQM	Mr. Einar Rystad, Norway Embassy +95 (1) 513459, <a href="mailto:einar_rystad@mfa.no">einar_rystad@mfa.no</a>
UNIDO	Plans to establish the Resource Efficient and Cleaner Production (RECP) programme (mainly waste prevention, funded by Switzerland)	Mr. Michele Boario, CTA Myanmar +95 9 420118981 <a href="mailto:m.boario@unido.org">m.boario@unido.org</a>

**TABLE 9. NGO'S CURRENTLY WORKING ON WASTE MANAGEMENT IN MYANMAR**

The Asian Development Bank (ADB) has waste management activities in Myanmar under the Mandalay Urban Services Improvement Project (ongoing) and the Third Greater Mekong Subregion Corridor Towns Development Project (planned). Details of these projects are uploaded and bidding documents for procurement packages will be advertised on the ADB website ([www.adb.org](http://www.adb.org)).



Contact: Ms. Eri Honda, Urban Development Specialist, Asian Development Bank, +63 2 632 5464/6891, [adb\\_irts@adb.org](mailto:adb_irts@adb.org).

The World Bank has a dedicated website on Myanmar: [www.worldbank.org/en/country/myanmar](http://www.worldbank.org/en/country/myanmar). The European Investment Bank (EIB, [www.eib.org](http://www.eib.org)) can finance capital investments related to projects on climate change mitigation, sanitation infrastructure and local private sector development. EIB is currently not involved in waste-related activities in Myanmar.

#### 4.1.2 Myanmar (sectoral) trade support organizations

For Dutch companies wishing to become active in Myanmar, the Dutch Embassy is the first recommended port of call. It is a relatively new Embassy. It (re-)opened in October 2016 after almost 50 years of absence. The Embassy has a dual focus of supporting the development of the country and promoting business ties between the Dutch and Myanmar private sectors. One of the thematic focus areas of the Dutch Embassy is water management. The efforts in waste management originate from this focus, as it was observed that the waste situation is having a very tangible impact on Myanmar's water problems, e.g. because the overwhelming amount of litter is clogging up waterways.

The Dutch Embassy is located at No. 43/c Inya Myaing Road, Shwe Taung Kyar 2 Ward, Bahan, Yangon. The seat of the Myanmar Government nowadays is Naypyidaw, 320 kms to the north. For the foreseeable future the Embassy will stay in the business hub Yangon, but the day may come that it will have to move to Naypyidaw.

The Dutch trade support team in the Yangon Embassy is depicted below. The general email address of the Royal Dutch Embassy in Yangon is [yan@minbuza.nl](mailto:yan@minbuza.nl).



Mr. Wouter Jurgens  
Ambassador  
Tel. +95 9 455 31 1135  
Email: [wouter.jurgens@minbuza.nl](mailto:wouter.jurgens@minbuza.nl)

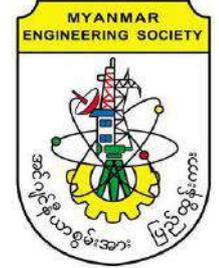


Miss Carola Baller  
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Apart from the Dutch Embassy, a number of (sectoral) trade support organizations can be very useful in finding ones way in the business environment in Myanmar.

<p><b>Eurocham</b></p> <p>Launched in Dec 2014, the European Chamber of Commerce in Myanmar represents the interests of European business in the country. In July 2013, Myanmar was reinstated as a beneficiary of the “Everything But Arms” initiative under the Generalised Scheme of Preferences (GSP). This allows Myanmar companies to enjoy duty-free and quota-free access to the EU market. EuroCham offers assistance to European businesses interested in commercial endeavors in Myanmar, in the form of advocacy, services, studies, or other related activities. Eurocham is led by Dutch national Filip Lauwerysen.</p> <p>Contact: Filip Lauwerysen, Executive Director, 95 9 45058 2335, <a href="mailto:director@eurocham-myanmar.org">director@eurocham-myanmar.org</a></p>	
<p><b>Union of Myanmar Federation of Chambers of Commerce &amp; Industry</b></p> <p>The UMFCCI is the National Chamber of Commerce and Industry in Myanmar. Founded in 1919, UMFCCI comprises 16 regional and state Chambers of Commerce and Industry, nine border trade associations, 48 affiliated associations and about 30,000 members. Apart from representing the Myanmar private sector in its dealings with the Myanmar Government, UMFCCI organizes trade promotion events with foreign companies.</p> <p>Contact: U Zaw Min Win, President, <a href="mailto:tommyzmin@gmail.com">tommyzmin@gmail.com</a>, <a href="http://www.umfcci.com.mm">www.umfcci.com.mm</a></p>	
<p><b>Myanmar Engineering Society (MES)</b></p> <p>The Myanmar Engineering Society was formed in 1995. It has 35,000 individual and corporate members in 20 branches countrywide. Half of the members are students. MES provides training in engineering courses including on environmental issues. Through its Environmental Committee the MES could mobilize participants in training courses on waste management, including staff members of City Development Committees. Another way to disseminate environmental information is through its quarterly publication "Tech Digest".</p> <p>Contact: Mr. U Aung Myint, President, <a href="mailto:mrcci.mdy@gmail.com">mrcci.mdy@gmail.com</a>, +95 92051063, <a href="https://www.facebook.com/myanmarengineeringsociety/">https://www.facebook.com/myanmarengineeringsociety/</a></p>	
<p><b>Directorate of Investment and Company Administration (DICA)</b></p> <p>As part of its efforts to establish a market oriented economic system in Myanmar, DICA was formed under the Ministry of National Planning and Economic Development in 1993. Apart from being Myanmar’s investment promotion agency, DICA registers companies and acts as a regulator on investment and business. For Dutch companies wishing to do business in Myanmar, DICA can provide a lot of information.</p> <p>Contact: Mr. San Myint, Deputy Director General, <a href="mailto:smusmyint3@gmail.com">smusmyint3@gmail.com</a>, Tel. +95 9 49205935, <a href="http://www.dica.gov.mm">www.dica.gov.mm</a></p>	

## 4.2 Dutch programs applicable in Myanmar

At this point, opportunities for Dutch waste related companies in Myanmar will oftentimes be related to (policy) advice or otherwise strengthening of the public sector. For such services it is important to know the Dutch set of instruments to promote cooperation and business with Myanmar. Table 10 on the next page provides an overview. Most of the instruments are administered by the Netherlands Enterprise Agency (RVO). More information on RVO’s programs can be found at <http://english.rvo.nl/>.

Instrument	Description
Matchmaking facility	Development of the local private sector by establishing long-term business relationships (investments, trade, transfer of expertise) between local and Dutch companies through tailor-made matchmaking. Myanmar SMEs with a solid financial base, at least 10 employees, and which are registered for at least two years are eligible for participation.
Netherlands Fellowship Programmes	The Netherlands Fellowship Programs (NFP) promote capacity building within organizations by providing fellowships for training and education for professionals. The NFP is initiated and fully funded by the Dutch Ministry of Foreign Affairs from the budget for development cooperation. Myanmar is a priority country, meaning it will receive relatively more fellowships.
PUM Netherlands senior experts	SME's and NGO's in a.o. Myanmar can make temporary use of the experience and skills of a retired Dutch manager or expert. The experts are independent and do their work as volunteers. In other words, they do not receive a fee for their services. The country coordinator for PUM in Myanmar is Mr. John de Bruijn, <a href="mailto:john.de.bruijn@pum.nl">john.de.bruijn@pum.nl</a> .
FDW Sustainable Water Fund	Through the Sustainable Water Fund the Netherlands promotes public-private partnerships in the water sector in developing countries such as Myanmar. The goal is to improve water safety and availability. Waste related projects are welcome in case they contribute to water safety. In view of the fact that in Myanmar the problems of water and waste management are intricately related (see also Box 1), finding waste related FDW projects with a positive effect on water safety will be relatively easy. Typical subsidy amounts per project range from 0.5 to 3 million euros. The next deadline for concept notes is December 8th, 2017.
Develop 2 Build / DRIVE	With DRIVE the Netherlands facilitates investments in infrastructural projects that contribute to a good business climate and entrepreneurship in the area of water, climate, food security and sexual and reproductive health (SRHR). Waste related projects may qualify if they contribute to the goals. Through (45%) DRIVE support Dutch companies can come up with a more competitive offer in infrastructural tenders. Develop 2 Build supports preparatory studies for DRIVE or otherwise funded projects.
DHI Program	The DHI scheme supports Dutch enterprises wishing to invest in or execute a project in emerging markets and in developing countries such as Myanmar. There are three modules: 1/ Demonstration projects: presentation of a technology, capital goods or service in one of the DHI countries; 2/ Feasibility studies: assessment of the profitability of a foreign investment in a product or service; and 3/ Investment preparation studies: assessment of the technical and commercial profitability of an investment in a company in one of the DHI countries. Currently the DHI program is closed.
Private Sector Development (PSD) support	PSD Instruments of the Dutch Embassy in Myanmar consist of several tools which add to local capacity building and simultaneously support Dutch organizations and companies in doing business in Myanmar. These instruments can be used to contribute to local development and to support investments of Dutch companies. Matchmaking, government to government assistance, training of managers and entrepreneurs, trade missions from and to Myanmar, transfer of knowledge between educational or knowledge institutes such as universities are some examples of those initiatives.
Dutch Good Growth Fund	The Dutch Good Growth Fund provides customised finance to Dutch and foreign SMEs (doing business) in developing countries and emerging markets. The DGGF supplements private investments through guarantees and direct financing with a repayment obligation, such as loans and equity investments in projects. It can also provide export credit insurance and export financing.
Partners for International Business / Impact Cluster	The PIB program is meant to create long-term positioning of Dutch companies in promising markets. The goal is to remove trade barriers and knowledge gaps, economic diplomacy and to promote industry. A PIB program needs a consortium of at least five companies and/or knowledge institutes. For Myanmar a PIB program may be a bridge too far. A so called "Impact Cluster" approach, with more emphasis on the public sector, may be more appropriate at this stage.

**TABLE 10. DUTCH POLICY INSTRUMENTS APPLICABLE IN MYANMAR**

### 4.3 Quick wins in waste and business opportunities

In the view of the Expert Team, business opportunities in the waste sector in Myanmar tend to be closely related to the “quick wins” outlined in table 11.

Quick win	Remarks
Put Waste to Energy on hold	WtE is currently not profitable in Myanmar compared to other options
Focus on capacity building	Start with basics in city cleaning and solid waste management for current and future staff in waste management
Use the full potential of dumpsites	Remediation, upgrading and expansion of current dumpsites is way cheaper than developing new ones
Improve fee collection	The goal should be a self-sustaining system in the long run. Improved fee collection should go hand in hand with better infrastructure and awareness
Develop transfer stations	Optimized waste logistics in the big cities including transfer stations reduces costs
Involve the cement industry	The cement industry could possibly incinerate part of the waste (esp. Mandalay)
Support the recycling industry	Build on / professionalize the current informal recycling sector

**TABLE 11. QUICK WINS FOR THE WASTE SECTOR IN MYANMAR**

Table 12 provides an overview of current business opportunities and an estimation of opportunities that may arise in the medium and long term in Myanmar.

Horizon	Business opportunities
Short term	<ul style="list-style-type: none"> <li>• Consultancy assignments in Overseas Development Assistance projects</li> <li>• Consultancy support in conversion of waste dump sites into controlled disposal sites</li> <li>• Basic (and/or second hand) waste collection and transport equipment (vehicles, containers) (Engineering services for) Waste transfer stations</li> <li>• Basic waste separation and sorting installations</li> <li>• Consultancy support for basic composting</li> <li>• Waste treatment installations in PPP structures</li> </ul>
Medium term	<ul style="list-style-type: none"> <li>• Equipment for recycling</li> <li>• Installations to produce RDF as a fuel for cement kilns</li> <li>• Equipment for treatment of special kinds of waste such as hospital waste, C&amp;D waste etc</li> </ul>
Long term	<ul style="list-style-type: none"> <li>• Suppliers of equipment related to EPR systems</li> <li>• Waste administration software</li> </ul>

**TABLE 12. WASTE RELATED BUSINESS OPPORTUNITIES IN MYANMAR**

For a first impression of whether a business idea in waste management could be profitable in Myanmar, the list below provides some key indicators.

- Household electricity price 0.04 - 0.08 EUR/kWhr
- Industry electricity price 0.2 - 0.3 EUR/kWhr (when a back-up generator is used due to frequent blackouts)
- Gas price (households / industry): 0.59 EUR/m<sup>3</sup>

- Minimum salary 75 EUR/month
- Import taxes 0% -40% (depending on the value of the imported goods)
- Revenue tax: 25%

International competition can be expected especially from China and Japan, although equipment from other countries is present as well. Interestingly, Japan and China appear to follow contradictory market entry strategies in Myanmar. Japanese firms such as DOWA and Mitsubishi are implementing high end installations for recycling and for waste incineration. These are currently expensive and not profitable but may serve as promotional tools for Japanese expertise and products in the long run. On the other hand, Chinese firms are entering the market with low cost equipment, such as the new waste collection vehicles in Meiktila at a cost of around US\$ 15,000. Not surprisingly, in the waste sector in Myanmar China is earning itself a reputation of affordability but not of quality and reliability.

## 5. SWOT overview

In table 13 an overview is provided of the current strengths, weaknesses, opportunities and threats related to the waste management system in Myanmar.

Strengths	Weaknesses
<ul style="list-style-type: none"> <li>• Myanmar enjoys strong economic growth</li> <li>• Waste management is centralized in the hands of the City Development Committees</li> <li>• Relatively well developed and diverse recycling sector because of the scarcity of materials during the years of isolation</li> <li>• End users are available for recycled materials such as RDF (Mandalay cement industry), paper, plastics and metals</li> </ul>	<ul style="list-style-type: none"> <li>• Myanmar's democracy is still in its infancy</li> <li>• Ethnic unrest and warlord activity remain in border areas</li> <li>• Weak national legislative and policy framework regarding waste, no connection with local implementation</li> <li>• Unreliable data on the waste sector</li> <li>• Deplorable litter situation to the point that it clogs up water ways</li> <li>• Incipient private sector in waste management</li> </ul>
Opportunities	Threats
<ul style="list-style-type: none"> <li>• Myanmar's awakening after decades of isolation is a good moment to become active in the country</li> <li>• The country's leader Mrs. Aung San Suu Kyi is well aware of the waste problem and motivated to take action (see Box 7)</li> <li>• A combined water and waste program could help solve two problems in one go</li> <li>• To develop a proper SWM system is affordable in the big cities</li> <li>• Bilateral and multilateral organizations are getting interested in investing in waste management</li> <li>• Quick wins can jumpstart improvements in waste management</li> </ul>	<ul style="list-style-type: none"> <li>• Widespread view in Myanmar that Waste-to-Energy is a viable option</li> <li>• Widespread lack of citizen's awareness on the importance of proper waste management</li> <li>• International competition, especially from Japan and China</li> </ul>

TABLE 13. SWOT OVERVIEW WASTE MANAGEMENT IN MYANMAR



**Box 7: A powerful ally: Mrs. Aung San Suu Kyi**

On December 13th 2015, after her historic election victory the month before, Mrs. Aung San Suu Kyi took to the streets in Kawhmu township on the outskirts of Yangon to pick up trash. Clutching a large white garbage bag and wearing protective gloves, Mrs. Suu Kyi rummaged through the dirt to pick up tangles of old plastic bags and other debris. In a statement, she stressed the importance of keeping Myanmar clean. Garbage collection is “the first thing we can do to serve the people”, she said.

## 6. Conclusions and recommendations for follow-up

### 6.1. Conclusions

Myanmar offers a “fresh” but still immature market for providers of services, knowledge and equipment related to waste management. Needs are still not well expressed and the buying capacity is low. The country lacks a good level of professional knowledge and experience. National planning is virtually absent. This leaves cities with lots of manoeuvring space but also leads to indecisiveness and differences in strategies and policies between the cities. Foreign companies will find many challenging, greenfield markets, not yet taken by competitors.

The country is open and susceptible to foreign advice. Sometimes too open, as illustrated by the preference for unaffordable technologies such as waste incineration and waste-to-energy as offered by the Japanese government and companies.

There's only little and unreliable data on waste production and the coverage of collection and city cleaning in the main cities Yangon and Mandalay. This being the case, there is no risk in concluding that both cities provide an enormous economy of scale when it comes to developing proper private and public infrastructure and services. This economy of scale can be explored to the full as most cities are still under central metropolitan governance.

Littering is omnipresent and probably the most important shortcoming in Myanmar's waste management. It heavily affects the country's and cities' water quality and water management. Improving waste collection will therefore only be credible and feasible when developed hand in hand with substantial programs on city cleaning and public awareness.

Same as in many developing countries, Myanmar lacks an adequate backbone of waste management infrastructure and services. The country should focus on:

- improving overall levels of knowledge and skills
- increasing the coverage and quality of waste collection
- introducing waste transfer stations to cope with distances and traffic jams
- remediation, upgrading and upscaling of its dumpsites
- increasing the revenues of fees and the quality of fee collection

All in all Myanmar is considered a market “in preparation”. Dutch companies and institutions may find opportunities in specific disciplines (especially on knowhow and on equipment for city cleaning and waste collection) but in general solid, exponential growth is not expected in the coming (three) years. For the Netherlands as a whole the best thing to do at this moment is to participate in Myanmar's “preparation” by building up a good reputation and thus creating fertile ground for future trade.

### 6.2. Recommendations for follow-up

The Expert Team sees the following opportunities for follow-up:

1. A one week seminar on Integrated Solid Waste Management
2. A preparatory project for an upgrade of Yangon's waste management system
3. Implementation of an integral upgrade of Yangon's waste management system
4. An exploratory study into the possibility of waste incineration in cement kilns in Myanmar

Recommendations (2) and (3) are based on the so called “Holland Model”, a practical and sustainable approach to upgrade the waste management system at (major) city level as advocated by the Expert Team in developing countries such as Myanmar (see also Box 8).

#### **Box 8. “Holland model” on Solid Waste Management**

The Netherlands is amongst the best performing countries in the world when it comes to solid waste management (SWM). The country reaches out to cities and regions in developing countries to help them improve their practices in this field. Not by transferring high tech technology but rather by contributing to the development and maintenance of a basic and sustainable backbone of solid waste facilities, operations, services and cashflows.

The **Holland Model** comprises:

- implementation of professional, public SWM organisations with adequate mandates, autonomy, authority and budgets
- design and operation of basic sanitary landfills able to treat municipal, commercial and, if necessary, hazardous waste for many years and also able to accommodate recycling and treatment initiatives
- improvement of city cleaning, collection and transport through suitable logistics and transfer stations
- cost coverage by fee collection systems making use of existing collection schemes and differentiated according to household-income
- additional support, if needed, on national planning, standards and guidelines and producers responsibility schemes

The **Holland model** aims at:

- cleaner and healthier cities through practical solutions
- adequate public services with 100% coverage
- sustainable operations, affordable for all households
- sound financial basis with 100% cost coverage paid by waste producers
- investment/labour balances resulting in maximum employment
- increased awareness among the population

Below the different elements of the proposed strategies are further explained.

#### 1/ A one week seminar on Integrated Solid Waste Management

An opinion frequently expressed to the members of the Dutch Expert Team was the need for capacity building on ISWM. At this stage of development in Myanmar, the potential impact of capacity building on the direction which waste management will take is considered very significant. Besides, capacity building is considered a great way to strengthen and expand the Dutch network of contacts in the waste sector in Myanmar.

It is therefore proposed to organize a (max) one week seminar on ISWM with the following subjects (each to be covered in one day):

- Legislation, planning and institutional framework
- Waste logistics and transfer stations
- Sustainable landfilling
- Waste recycling and valorization strategies
- Financials, fees, organisation and governance

Participants in the seminar could be staff of the City Development Committees / PCCD's of Yangon and Mandalay plus CDC staff of the 10 or 20 next biggest cities in Myanmar, as well as additional waste sector representatives as deemed appropriate. This seminar (content and logistics) could be organized together with the YCDC/PCCD and with the Myanmar Association of Engineers, which has already expressed interest.

It is important to coordinate the organization of the seminar with the NGO GRET Myanmar. GRET is also planning to organize a seminar on waste management in the second semester of 2017. In their case a strong emphasis will be on getting to know the needs of the participants in terms of capacity building, so the GRET event can serve as an input to the Dutch ISWM seminar.

It is expected that the seminar can be organized in October or November 2017.

### 2/ A preparatory project for an upgrade of Yangon's waste management system

In the opinion of the Dutch Expert Team, there is no doubt that the Dutch practical and cooperative approach and decades long experience can have tremendous added value in upgrading the waste management system in Myanmar. It is recommended to implement such upgrade in the main city Yangon for the following reasons:

1. Urgency: Waste management is a big problem in Yangon and it can grow out of control in the coming years
2. Economy of scale: Yangon is the largest city in Myanmar with the biggest resources to invest in proper waste management
3. Role model: Yangon is the reference city for the rest of Myanmar

The Expert team assessed the situation in Mandalay as well, but the waste is managed a little better there and besides, the city is receiving support from Japan and the Asian Development Bank in this area.

The Expert Team proposes an overall upgrade of the waste management system in Yangon. This is consistent with the opinion of the Mayor of Yangon Dr. Maung Maung Soe, who prefers to build on and improve the current waste management system rather than leap-frogging to concepts such as Waste-to-Energy. The Expert team proposes to focus on the following elements:

- I. Increasing the coverage and quality of waste collection
- II. Introducing a system of waste transfer stations to cope with distances and traffic jams
- III. Remediation, upgrading and expansion of the Htain Bin dump site into a proper landfill
- IV. Increasing the revenues of fees and the quality of fee collection

In reality, this upgrade requires a triple focus on the waste infrastructure in Yangon, the fee collection system and the awareness on the part of the citizens. The preparatory project is meant to investigate whether such approach is supported by the authorities and other stakeholders, especially the YCDC / PCCD. At the same time, it will be investigated whether other actors such as financing institutions are willing to join the project. The end result of the preparatory project should be a Memorandum of Understanding on how to jointly develop and implement the overall upgrade.

### 3/ Implementation of an integral upgrade of Yangon's waste management system

In case the former step leads to a signed MoU, the preparatory studies for the overall upgrade of the waste system in Yangon can be set in motion. The studies are expected to take a year approximately.

When all studies have been finalized satisfactorily, the implementation of the project can be set in motion. The preferred situation is that in this phase of the project, a coalition of stakeholders and financiers has been formed that jointly takes on the project.

#### 4/ An exploratory study into the possibility of waste incineration in cement kilns in Myanmar

The concept of Waste-to-Energy (W2E) obviously has gained a lot of support in Myanmar as part of a future solution to the waste problem. In the opinion of the Dutch Expert team, W2E is not a viable option for Myanmar because it is way too expensive compared to other options. The exception may be waste incineration in cement kilns in the vicinity of Mandalay. The Netherlands has a lot of knowledge and experience with this kind of technology and it may be considered to carry out a feasibility study to evaluate its applicability.



You are cordially invited to join the LinkedIn Group "Netherlands-Myanmar cooperation and business on Solid Waste Management" at:

<https://www.linkedin.com/groups/13516372>

## 7. Sources

- Doh Eain Renewing Yangon (2016), “The Alley Garden Project”, Power point presentation.
- Eurocham Myanmar (2016), Manufacturing Guide 2016.
- GRET (July 2016), "Data Collection of Urban Services Business Operations Plans - Reports on Yangon, Mandalay and Monywa Solid Waste Management Service".
- IGES Institute for Global Environmental Strategies (January 2017), "Waste Management in Myanmar: Current Status, Key Challenges and Recommendations for National and City Waste Management Strategies", ISBN 978-4-88788-197-6.
- Yangon City Development Committee (March 2017), “Solid Waste Management in Yangon City”, Power point presentation by Dr. Aung Myint Maw of the PCCD Yangon, presented at the occasion of the Myanmar - Netherlands Workshop on Integrated Solid Waste Management on 23 March 2017.

## Annex 1. List of contacts

M = Meeting with (member of) Expert Team?

W = Participated in the Workshop?

Type? 1=Public authority; 2=Dutch Embassy network in Myanmar; 3=Business Associations; 4=Private sector; 5=Dutch companies in Myanmar; 6=NGO's

Note: A list of contact details is available upon request

M?	S?	Type	Organization / Location	Name representative
1	1	6	Alley Garden Project	Emilie Röell
1		5	ARCADIS Design & Consultancy	Tanya Huizer
	1	5	ARCADIS Design & Consultancy	Johannes de Groot
	1	6	BORDA	Han Thi Htun
1		6	British Embassy	Dr. Khine Zar Lin
1		4	CAG Engineering Co., Ltd	Myo Myint Aung
1		4	CAG Engineering Co., Ltd	Ne Myo Thein (George)
1		4	CAG Engineering Co., Ltd	Ye Hein Aung
1		4	CEA Projects Co Ltd	John L Hamilton
1	1	6	CESVI	Friedor Jeske
	1	6	CESVI	Patrizia Gattoni
	1	4	City Mart Holdings	Hnin Lae Win
1		1	City of Mandalay	H.E. Dr. Ye Lwin
1		1	City of Yangon	H.E. U Maung Maung Soe
1		4	Coca Cola Pinya Beverages Myanmar Ltd	Sandy Chapman
1		4	Coca Cola Pinya Beverages Myanmar Ltd	Zeyar Chit
1	1	6	DFID/British Embassy	Kirstyn Thomson
1		6	DFID/British Embassy	Robin Cross
1		1	DICA	San Myint
1	1	2	Embassy of the Netherlands	Wouter Jurgens
1	1	2	Embassy of the Netherlands	Carola Baller
1	1	2	Embassy of the Netherlands	Sandar Myint
1		2	Embassy of the Netherlands	Aung Myint Oo
1	1	4	Energize Myanmar	Billy Harkin
1	1	4	Environmental Quality Management	Ohnmar May Tin Hlaing
	1	6	EU Delegation	Adrius Kuduba
1	1	3	EuroCham	Filip Lauwerysen
	1	4	Founder/ Crazy About Water	Frodo van Oostveen
	1	6	Frontier	Jared Downing
1		4	GEA	Jord Figuee
1		4	Golden Dowa Eco-System Myanmar Co.	Kei Nagata

1		6	GRET	Thibaut Le Loc'H
1		4	JFE Engineering Corporation	Tsutomu Oyama
	1	4	JFE Engineering Corporation	Hideki Ito
	1	4	JFE Engineering Corporation	Tomoharu Gentsu
	1	6	JICA	Noriko Sakurai
	1	4	Local Architect, Article 25	Juila May Thandar Soe
1		4	Mandalay cement industries co. ltd.	Aung Zay Ya (Ethan Hong)
1		3	Mandalay Myotha Industrial Developmen	Yan Naung
1		3	Mandalay Myotha Industrial Development	Dr. Tun Tun Aung (Jack Hong)
1		3	Mandalay Reg. Cc. Commerce and Industry	Dr. Maung Maung
1		3	Mandalay Reg. Cc. Commerce and Industry	Kyaw Min
1		3	Mandalay Reg. Cc. Commerce and Industry	Myo Kyaw.Win
1		3	Mandalay Reg. Cc. Commerce and Industry	Aung Than
1		1	Meikhtila Town Development Committee	Nila Win
1		1	Meikhtila Town Development Committee	Myo Htet Zaw
1		6	MER commission	Arend Kolhoff
1		1	Ministry of Agriculture, Livestock, Forestry and Energy, Government of Yangon Region	H.E. U Han Htoon
1		1	Ministry of Health and Sports	Khin Maung Lwin
1		1	Ministry of Natural Resources and Conservation (MoNREC)	Khin Thida Tin
1	1	6	Myanmar Centre for Responsible Business	Mrs Vicky Bowman
1		3	Myanmar Engineering Society	Aung Myint
1	1		Orgaworld/Moduworld	Julius L. de Jong
	1		Orgaworld/Moduworld	Aung Nay Lin
1	1	6	Peace Nexus Foundation	Sophia Naing
1		4	Property Solutions	Myo Maw Oo
	1	6	Pyoe Pin	Kyawe Phyto Pyo Aye
	1	4	Royal Haskoning DHV	Kyaw Lin Htet
	1	4	Royal Haskoning DHV	Boy Santhos van der Sterre
	1	4	Royal Haskoning DHV	Rebecca Groot
1	1	6	SMART Myanmar	Mr Jacob Andrew Clere
	1	6	SMART Myanmar, Document & Compliance	Moo Kho Paw
	1	6	SMART Myanmar, Document & Compliance	Myo Maw Oo
	1	6	Social Entrepreneur	Harald Friedl
1		4	SUEZ SAFEGE	Gary Moys
1		4	Trade Wind Co. Ltd	San Oo
1	1	6	UNIDO	Thant Zin
1		6	UNIDO	Michele Boario
1		4	VS Hem (1970)	Seree Laisanitseeekul
1		4	Wa Minn Group	U Naung Kun Myint Wai

1		6	World Wildlife Fund	Gaurav Gupta
	1	4	XtP DevCo	Frank Raschke
1	1	1	YCDC Pollution Control / Cleansing Dept	Dr. Aung Myint Maw
1		1	YCDC Pollution Control / Cleansing Dept	Lt. Col. Cho Tun Aung
1		1	YCDC Pollution Control / Cleansing Dept	Khin Hnin Aye
1		4	Zeya and Associates	Sabarinathan Ravichandran