Final Report
on the Process Documentation of
Green Construction Materials for Socialized Housing
(June 2012)

Green Jobs in Asia Project
Executive Summary

The Green Jobs Promotion in Socialized Housing Sector Project of the International Labour Organization (ILO) under the Green Jobs in Asia Project intended to address overarching triple bottom-line goals of sustainability by (i) stimulating the creation and development of green enterprises; (ii) promoting green jobs with particular focus on decent work; and (iii) facilitating the overall transformation of the socialized housing sector towards sustainability.

The Green Jobs Promotion in Socialized Housing Sector Project of the Philippines aims to enhance capacities of workers’ and employers’ organization to contribute fully to the development and implementation of just transition measures of green jobs in socialized housing construction. Socialized housing sector have possible environmental benefits that could be achieved through the introduction of green jobs in the socialized housing construction.

The pilot site of the demonstration project was further narrowed down to a resettlement area in Rodriguez (formerly Montalban) town, Rizal province which was managed by the NHA. The components of the Green Jobs in Socialized Housing Demonstration Project include (a) Application of Green Products to create Green Jobs, (b) Technical Skills Training incorporating greening and decent work, (c) Formation of Enterprises and Workers Guild, (e) Promotion of Occupational Safety and Health, (f) Crafting of Green Guide for Socialized Housing and (g) Mainstreaming Gender

Two green building products for green jobs promotion were chosen for the demonstration project “Green Jobs promotion in the Socialized Housing Sector” under the Green Jobs in Asia Project of the International Labour Organization (ILO). These were Modified Concrete Hollow Blocks (mCHB) using coco fiber reinforcement and Coco Coir based erosion control systems

Modified Concrete Hollow Blocks (mCHB)

Modified concrete hollow blocks (mCHB) are fibre reinforced concrete masonry units that may incorporate alternative inert materials such as Polyethylene Terephthalate (PET) or ligno cellulosic fibers such as coco coir. The main proponent for the mCHB is MCM Eco Chem Corporation (MCM). The activities conducted for the application of mCHB were (a) development of mCHB Learning Module by Architect Engell Fagaragan, a member of the Philippine Green Building Council (PHILGBC), (b) Occupational Safety and Health (OSH) in
construction training held on April 27, 2012, (c) Orientation on Green Jobs, (d) Orientation and training for mCHB, (e) Training cum Production for mCHB, (f) Application of mCHB in a prototype walling system.

Some of the advantages of mCHB product over regular/commercial CHB are the perceived weight, use of coconut or PET fiber, reduction in cement use, cheaper cost, sound-absorbing characteristics of raw material. As the training cum production progressed, a shift was made from the manual production of mCHB to a mechanical production to meet the daily production target since the mechanized approach using a molding machine was more efficient and less tiring for the workers. By the end of August 2012, the remaining four trainees were able to produce around 825 pieces of mCHB using two mechanized machines. In the last week of August to the 1st week of September 2012, the output during the training cum production were successfully applied to build a prototype house and the mCHBs used initially passed the load requirements when applied to a walling system of a house but further laboratory tests are ongoing in the formulation of the generic mix.

Coco Net Systems

The main proponent for the application of coco systems is Coco Technologies Corporation (Coco Tech). The activities conducted for the application of mCHB are (a) Coconet Learning Module Development, (b) Orientation on Green Jobs and OSH Training, (c) Orientation and training on making Coco twines, (d) Orientation and training on weaving Coco nets, (e) Training cum production for coco twines, (f) Ongoing Formation of Community Based Enterprise.

Coco erosion control systems generally consist of cocofiber nets, cocofiber logs, cocofiber-cement interlocking blocks, and selected grasses and plants to securely anchor these products to the ground thus preventing soil erosion on slopes and river banks. Some of the advantages of using coconet systems are its cheaper price than shot-crete and riprap systems, effective greener (vegetation-enhancing) erosion control systems than conventional Riprap and Shot-Crete technologies, and reduction the Green House Gas (GHG) emissions from lesser cement usage.

After the initial training involving lectures and demonstrations, the training of coco twine production shifted to a training cum production. As of end of August 2012, the trainees were able
to produce more than 10,000 pieces of coco coir twines. The trainees were successful in producing coco coir twines and are now moving towards coco net weaving.

The good practices that were observed during the application of the two green products are the reward system, effective motivation included in training cum production, creation of feasibility study before implementation, assignment of skilled personnel to stay in with the trainees for guidance and supervision, partnership with private entities that has a tested and established product and training program. On the other hand, the lessons learned are that the program should be able to connect with the motivation of participants to ensure that they continue with the training, gradual build up of the skills of trainees is vital for the mastery of green material production, and Public Private Partnership needed for the project to move forward.

**Formation of Community Based Enterprise (CBE) and Workers Guild**

After the skills training in the creation of green materials of coco coir last May 2012 by Coco Tech, a Community-based enterprises (CBE) of the Coco Coir workers was the next initiative of the Green Jobs Demonstration Project on Socialized Housing. The formation of the CBE was facilitated by ILO, NHA, and Mr. John Manzanas, the Enterprise Development Consultant. Prior to the formation of the CBE, Mr. Manzanas conducted various activities to prepare the Coco Coir workers in forming their own CBE and various actions to develop the appropriate CBE fit for the workers of the Coco Coir.

An orientation meeting on the formation of the worker’s association was conducted on September 4, 2012 with Mr. Manzanas, NHA, and ILO facilitating the meeting. A few days after the orientation meeting, the Coco Coir worker’s group decided to name their association the "Southville 8B Twining and Weaving Association". By the third week of September, the group of Coco Coir workers agreed to meet again to work on their Securities and Exchange Commission (SEC) registration. Instead of a CBE, the Coco Coir workers were organized in their own worker’s Association and registered as a business entity assisted by NHA project team. Female Coco Coir Workers were initially organized into a workers’ association as a first step towards the formation of a Community Based Enterprise. The good practices that were observed during the formation of the worker’s association are as follows:
Private and Public partners assisted the workers in initially organizing and preparing them in setting up an association.

The speaker discussed first to the Coco Coir workers the proper perspective and understanding on what an association is and how it functions and the features of a worker’s association before helping the set-up their own association.

The use of Tagalog language during the training to ensure that the message was conveyed and understood by the participants.

While the lessons learned are as follows:

- Commitment to the work is important for the residents to transition from being trainees and workers to establishing their own business.
- There needs to be one or two individuals in the group who are respected and have the vision to steer the workers towards organizing themselves for a business venture.
- From the pool of workers, there may be a few individuals who have the drive to excel or exhibit leadership and entrepreneurial abilities. These should be the focal points for assistance in developing the community enterprise for the group.
- The use of established products and technology of private partners in the formation of community based enterprise is essential to the sustainability of the enterprise.

**Green Masonry Skills Training (Greening the ‘Galing Mason’)**

The Green Skills Masonry Training was conducted on August 28, 2012 to September 10, 2012 at a day care center site located in Barangay Matictic in Bulacan. The Green Masonry Skills training was an initial implementation of the Green Masonry curriculum in the Masonry-NCII Training. The training program aims to integrate “Green Masonry” concepts into the existing NCII Masonry Training. The Green Skills Masonry Training conducted was the first to integrate Green Masonry concepts in the training program. Aside from the Holcim Philippines, the Technical Education and Skills Development Authority (TESDA), the Philippine Constructors Association (PCA), and the Association of Construction and Informal Workers (ACIW)–formerly the National Union of Building and Construction Workers were also involved in the training.

The 13 day training program consisted of two days to discuss concepts about “Green Masonry,” five days for the Masonry NCII Training, five days of actual application wherein the
participants built a fence and perform masonry works to apply the concepts taught, and one day about Labour Standards and Occupational Safety and Health and Waste Management.

After the training, the participants were assessed through a written and an oral examination prepared by TESDA which was their basis in providing the NCII certification. The participants were given certification when they passed both examinations. All of the 42 male participants who took the NCI certification exam passed, while only 25 out of the 42 who took the NCII exam passed. An evaluation meeting on the green skills masonry training was also conducted on September 17, 2012 involving all the training materials developer, facilitators and trainers during the training with the purpose of improving the program. The good practices that were observed during the training of the Green Masonry Skills Training are as follows:

- Trainees were encouraged to use Personal Protective Equipments (PPEs) during the training to prepare them for work in the industry
- Partnership with Holcim that has a tested masonry training program
- Assessment was conducted by TESDA to evaluate the trainees progress
- Certification by TESDA was conducted as proof of their skills development
- Knowledge of trainees were upgraded to industry standards and practices
- Able to introduce the impact of climate change and environmental impacts of masonry
- The set up of training cum production was effective in motivating trainees
- Evaluation of the Green Masonry training was conducted by the entities that conducted the training

While the lessons learned are the (a) need to develop assessment tools for the green concepts in masonry, (b) future trainings should use the Tagalog language to ensure that participants understand the training materials, (c) synergy of masonry training and green concepts is important for the success of green masonry program

**Promotion of Green Elements**

Promotion of green elements in the socialized housing demonstration project is handled by National Housing Authority (NHA) in coordination with the Philippine Green Building Council (PHILGBC). Activities for the promotion include the drafting green guide, awareness meeting and policy brief on the green guide draft, pilot training on the green guide in socialized
housing, orientation and validation on implementation plan, initial assessment of the green jobs
demonstration project with social partners, and gender sensitivity and awareness training for
social partners. The development of a Green Guide for Socialized Housing in the Philippines is
part of the advocacy efforts of the Green Jobs Promotion in Socialized Housing Sector Project of
the International Labour Organization (ILO) under the Green Jobs in Asia Project.

As a result of the awareness and pilot training seminar on the green guide, information on
environmental issues and challenges, existing policies by government, areas of opportunities for
green jobs creation, project-specific goals and objectives, and procedures on facilitating holistic
decision-making were included for the development of the green guide. Also, it helped
stakeholders understand how the green guide may enable the housing sector facilitate the shift of
existing jobs to green jobs. The seminar also brought out the commitments from PHILGBC and
NHA on the continued maintenance and enhancement of the green guide, creation of disaster
resiliency assessment framework, and institutionalization of the Green Guide.

A Policy Brief meeting for the Green Guide for Socialized Housing Projects in the
Philippines took place on September 19, 2012 comprised of representatives from Housing and
Land Use Regulatory Board (HULRB), Housing and Urban Development Coordinating Council
(HUDCC), NHA, PHILGBC, and ILO. The presentation of the Policy Brief covered the
Environmental Challenges, Socialized Housing Demand Scenario, Pursuing and Promoting
Green Jobs Creation, Encouraging Green Building as a holistic strategy for Socialized Housing,
and the Policy Recommendations. One of the outcome of open forum in the program deals with
how consultation meetings led to better understanding of policy challenges that needs to be
addressed to meet the needs of the sector. Also, the Policy Brief meeting made participants
aware how policy recommendations support the adoption of greening of communities and
sustainability practices in the socialized housing sectors.

It was also observed that exchange of ideas between partners to promote better
understanding of the green guide and policy brief, and that brainstorming on strategies for
promotion of green jobs in socialized housing projects from different partners. Some of the key
takeaway from the green guide and policy brief revolves on how the actual usage of green guide
and policy brief manual is vital for the implementation in local government levels. Another is
that current government regulations should be aligned with the green guide and policy brief
manual for effective implementation.
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1. Background of Green Jobs

1.1. Components of Green Jobs

The International Labour Organization (ILO) defines green jobs as “jobs that reduce the environmental impact of enterprises and economic sectors, ultimately to levels that are sustainable while also meeting the criteria for decent work – adequate wages, safe conditions, workers’ rights, social dialogue and social protection.”

Two components of Green Jobs surfaced from this definition. One is that it should be environmentally sustainable and another is that it should be decent work. The green jobs framework can be seen in Figure 1. Environmentally sustainable means that it should climate resilient, emit low carbon and environmentally friendly. Decent work on the other hand provides opportunities for women and men to obtain productive work in conditions of freedom, equity, security and human dignity. The International Labour Organization (ILO) in their Decent Work Agenda provided a framework with four strategic objectives: 1) Fundamental principles and rights at work and labour standards, 2) Employment and income opportunities, 3) Social Protection and Social Security, and 4) Social Dialogue and tripartism.

Figure 1 Components of Green Jobs

Green Jobs are one of the solutions (Sustainable production and consumption being the other) as part of the path to a low carbon economy (Green Economy) to the environmental, and employment and social challenge. The environmental challenge is characterized by changing climate due to global warming, lack of access to potable water and reliable energy and the fact...
that ¾ of the world’s poorest depend on the environment as a significant part of their daily livelihood. The employment and social challenge is characterized by unemployment (205 million globally), extreme poverty, lack of access to social protection, and increasing number of the working population.

1.2. Green Jobs in Asia and in the Philippines

The Green Jobs in Asia project started in 2010 by the ILO Regional Office in Asia and the Pacific with the Australian government. The main objective of the project is to deepen ILO constituents understanding and commitment for the promotion of Green Job opportunities and just transition for workers and employers towards a low carbon, climate resilient, and environmentally friendly development. This project is being implemented in Bangladesh, Indonesia, Nepal, Philippines and Sri Lanka over a two year period. The immediate objectives of the project are: 1) to promote the capacity of ILO constituents to engage in dialogue on green jobs, 2) to mainstream green jobs in national labour and social policy of participating countries and, 3) to have green jobs demonstration programs which respond to the different needs of men and women implemented in key sectors of interest.

The green jobs project in Asia is implemented in the Philippines through ILO constituents working with Filipino counterparts. The project aims to enhance capacities of workers’ and employers’ organization to contribute fully to the development and implementation of just transition measures of green jobs at the national level. The project will help employers increase market value, improve product handling and advance capacities on social dialogue. The workers, meanwhile, will experience benefits including employment creation, safety and social protection and improved quality of life. Lastly, the government will have the opportunity to improve its existing development thrusts while gaining institutional support and international prestige. The project will promote the creation of green jobs in the Philippines particularly in socialized housing construction.

2. Green Jobs and Socialized Housing

2.1. Social Housing in the Philippines

The National housing authority is the sole national agency mandated to engage in housing production for low income families. In the past, several agencies were created to
respond to separate and distinct shelter requirements but in 1975 by virtue of Presidential decree 757, all other housing agencies were abolished and the National housing authority took over and integrated all the functions of the abolished agencies. In 1978, the Ministry of Human Settlements was created and the National Housing Authority was placed as an attached agency to it. In 1986, the Ministry of Housing Authority was abolished through Executive Order 1 and the National Housing Authority was placed under the supervision of the office of the President. In the same year, Executive Order 90 was issued and mandated that the National Housing Authority as the sole government agency to engage in housing production. Furthermore, the same Order placed the National Housing Authority under the Housing and Urban Development Council (HUDCC), the umbrella agency for shelter charged with the main function of coordinating the activities of various government housing agencies engaged in production, finance and regulation.

In 1992, Republic Act 7279 was created. This was an act to provide for a Comprehensive and Continuing Urban Development and Housing Program. In 1998, Occupational Safety and Health was introduced to the construction industry through Department Order 13. Coco peat and coco coir fiber were then mandated to be used for soil conditioning and soil erosion control through Memorandum Circular 25 in 2002.

In 2004 through Executive Order 301, the Green Procurement Program was launched for all government agencies. In 2006, the Philippine Green Building Council launched the “Building for Ecologically Responsive Design through Excellence” (BERDE) project which is a voluntary rating system of sustainable/green buildings which guide member industries in their building construction. In 2010, the National Climate Change Action Plan lists climate adaptive housing and climate-proofing infrastructure as integral outputs. In 2011, the National Labour and Employment Plan 2011-2016 identified housing as a sector for employment generation of green jobs. Also in the same year, the Philippine Development Plan 2011-2016 identified decent and affordable housing as a means for inclusive growth.

The timeline of the Progression of socialized housing in the Philippines can be seen in Figure 2. It can be seen that socialized housing evolved from providing housing to low income families through the National Housing Authority to considering Occupational Safety and health in construction then to sustainable and environmentally friendly construction then finally to employment generation of green jobs.
Figure 2 Progression of Socialized Housing in the Philippines

2.2. Linkage of Green Jobs and Social Housing

The socialized housing sector was identified as the most viable sector for the implementation of a demonstration project in the Philippines. An initial employment scoping study found that it has a high potential for green jobs creation due to its numerous forward and backward linkages. Green Jobs in socialized housing is also a suitable entry point for decent work due to the existence of a construction tripartite body and workers’ unions which are actively engaged in the sector. Furthermore, there are possible environmental benefits that could be achieved through the introduction of green jobs in the socialized housing construction since buildings put a tremendous strain on our environment. Specifically, buildings has approximately 40% share in global energy use, more than 30% share in resource consumption, 30% of solid waste generation and 30% of green house gas emissions globally. Introducing green jobs into the
socialized housing construction sector could do its part in alleviating the strain that buildings put on the environment.

The components of the Green Jobs in Socialized Housing Demonstration Project include (a) Application of Green Products to create Green Jobs, (b) Technical Skills Training incorporating greening and decent work, (c) Formation of Enterprises and Workers Guild, (d) Promotion of Occupational Safety and Health, (e) Crafting of Green Guide for Socialized Housing and (f) Mainstreaming Gender. The pilot site of the demonstration project was further narrowed down to a resettlement area in Rodriguez (formerly Montalban) town, Rizal province which was managed by the NHA.

The demonstration of green jobs creation would be the enhancement of regulatory frameworks and standards, technical support towards the promotion of innovative green products with potential for employment creation, strengthening decent work through occupational safety and health interventions, advocacy of labour standards, and association building through the formation of workers’ guilds.

3. Framework for the creation of green jobs in socialized housing

3.1. Sustainable Construction Employment Creation Model

The strategy employed to create green jobs in the socialized construction sector includes three components and it is based on the construction of new-build projects involving multi-tiered approach with partners drawn from both the public and private sectors.

Application of selected green products

A feasibility study based on economic viability, environmental sustainability and potential for supporting decent work identified two building products for green jobs promotion:

- Modified Concrete Hollow Blocks (mCHB) using coco fiber reinforcement and
- Coco Coir based erosion control systems

Capacity Building and technical training

A three-tiered approach to training was applied:

1. Lower skilled on the job community based training for production of mCHB and Coco Coir nets and laying of Coco coir nets for those living within social housing communities
2. Curricular development of Green Masonry integrated in existing Masonry Curriculum
3. Development of a Green Social Housing Guide for training of professionals

Training and orientation for labour standards and Occupational Safety and Health (OSH) have been conducted through integration of these topics in the skills training provided to workers. Private developers and NHA would also be trained on Occupational Safety and Health as well as for the re-entry for OSH in institutions and organizations.

**Green Community Based Enterprise Development**

The activities involved in the formation of Community Based Enterprise are as follows:

- Formation of Community Based mCHB and Coco-net Enterprises through financial training and the provision of business development support, facilitation and supply chain linkages and certification by National Confederation of Cooperatives (NATCCO).
- Establishing of workers’ guilds and associations among community workers through assistance in organizational development and social dialogue and through partnership with trade unions.

The overall framework for the creation of green jobs in socialized housing construction can be seen in Figure 3.

**Figure 3 Framework for Promotion of Green Jobs in Socialized Housing Construction**
3.2. Structure, Roles and Responsibilities

3.2.1. Structure

The organization structure of the green jobs demonstration project can be seen in Figure 4. The International Labour Organization (ILO) partners with individual and institutional partners in implementing these demonstration project consultants for the module and business development were hired by ILO to assist in the project. ILO entered into a partnership agreement through the Memorandum of Understanding with the National Housing Authority to implement community based interventions at the project site. The resettlement area in Rodriguez was the chosen site for the project. The National Housing Authority, through recommendations made via feasibility study into a Public Private partnership with ILO and two supply contractors for the green products training and development.

![Figure 4 Organizational Structure](image)

3.2.2. Stakeholders, Roles and Responsibilities

The stakeholders of the demonstration project, their roles as well as the person-in-charge can be seen in Table 1.

<table>
<thead>
<tr>
<th>Organizations Involved</th>
<th>Role</th>
<th>Person-in-Charge</th>
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<tbody>
<tr>
<td>International Labour Organization (ILO)</td>
<td>Funding Agency</td>
<td>Carmen Baugbog</td>
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<td>National Housing Authority (NHA)</td>
<td>Partner Organization and Project Implementer</td>
<td>Architect Maria</td>
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<td>- Housing Technology Development Office (HTDO)</td>
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<td>Benita Regala-HTDO</td>
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<td>- Livelihood Development Department</td>
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<td>Department Head</td>
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<td>- Southville 8 Project Management Office</td>
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<td>Ms. Evangeline</td>
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<td>Equipaje</td>
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<td>Baque Corporation &amp; San Jose Builders</td>
<td>End-User and Green Product Supply Contractor</td>
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<td>MCM Eco Chem Corp</td>
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<td>Independent</td>
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<td>Green Masons Guild Formation and Green Masonry Training</td>
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<th>Joey Mamuyac and Maricris Constantino</th>
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<td>Eugenio Gonzales</td>
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<td>Mr. Hilario Famadico</td>
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**Forming of Contracts and Agreements**

The following are the roles and responsibilities of the identified stakeholders in the green jobs in socialized housing construction as identified in the terms of references:

1) ILO

- Support training of community based workers in acquiring green skills while producing modified Concrete Hollow Blocks (mCHB) and CoConet Systems (CCS);
- Assist in building the capacity of construction masons to gain knowledge and skills in green masonry practices;
- Participate in the development of mCHB, CCS, Green Masonry Skills Learning curriculum;
- Guide engineers, architects, safety engineers and construction supervisors in practicing occupational safety and health at designated construction sites;
- Contribute to CCS enterprises in startup business towards registration as community based enterprise;
- Provide technical assistance in community based enterprise development at the project site;
- Support towards the formation of construction workers’ guilds amongst construction workers in the project site;
• Support the drafting of a Green Guide on Socialized Housing;
• Support the preparation of a policy brief on Green Socialized Housing;
• Advocate for the integration of green components from said guide into the work of subcontractors, private developers, NHA architects and engineers

2) NHA

• The National Housing Authority through the Housing Technology Development Office, the Livelihood Development Department and the Project Management Office of Southville 8- NHA will take charge of the over-all monitoring of the conduct of the trainings.
• Recruit and select potential trainees who are presently low skilled and unemployed community residents (70% female; 30% male) preferably the out of schooled youth.
• Provide a production site for the trainees/workers at the community for MCM and CoCOTECH. MCM and CoCOTECH will train these recruited trainees, whom after the training, will produce the materials which they will sell later to CoCOTECH at the market prevailing price.

3.) MCM

• Assess and record existing raw materials for modified generic mix including necessary testing.
• Formulation of various samples of a generic mCHB mix including its additives including full documentation.
• Sign a donation agreement to the Housing Technology Development Office (HTDO) on the formulated generic mix (mCHB) including its full documentations and testing results for the purpose of the support to the mCHB community based enterprise formation at socialized housing sites.
• Train workers of the community based enterprise on how to formulate the generic mix, ensure quality control during its formulation at the initial business phase of the community based enterprise level including quality control and personal protection and environmental safety especially chemical handling, management and safety.
• Train the community based enterprise workers on the proper combination towards production of mCHB using the generic mix including proper use of equipment and machines including personal safety protection among workers and environmental safety.

4) CocoTECH
• The resource person and manager of the pilot training of coConet product making and supplier of the initial raw materials.
• CoCOTECH will train recruited trainees, whom after the training, will buy the products produced by these trainees at the market prevailing price.
• Give inputs to the content, especially in the areas of the modified concrete hollow block making process and procedures.
• Provide technical and quality control assistance during the production stage of the coConet Systems.

5) John Manzanas, Enterprise Development Consultant
• In consultation with DOLE, NHA, DTI, LGU and workers groups, prepare an enterprise development strategy for the entire housing project site involving trained workers, including the value chain of the main products.
• Work closely with the Field Project Facilitator hosted at the NHA Project Management Office to lead consultations and organizational meetings for the enterprise, including business registrations.
• Coordinate with the designated trainer on Training for Rural Economic Empowerment (TREE) to support community enterprises including ensuring that green elements, occupational safety and health and labour standards elements are integrated.
• Liaise with LGU, NHA, DTI, DOLE, and DOST towards recourses accessing especially in terms of registration requirements, resource mobilization including financial assistance for the initial startup of business.
• In consultation with the initial enterprise owners who are project site residents, prepare a business plan for the specific enterprise integrating environmental aspects, OSH and labour standards aspect of the plan, including supporting document towards its
registration with the Cooperative Development Authority, National Confederation of Cooperatives and other relevant institutions.

- Assist the enterprise in setting up their production area and facilities.
- Coach and provide hands on training/business advice to enterprise owners during the initial set up and operation of the business.
- Record critical milestones of the initial business startup.
- Prepare an inventory of potential buyers including the existing buyers (Housing site developers), financial institutions and other service providers than can assist the enterprise in moving towards full operation.
- Liaise closely with the Project Management Office of the NHA at Montalban Rizal, and the Livelihood Development Manager at the NHA.
- Prepare concept notes and project proposals in line with the above, and provide technical guidance and follow up on implementation, including liaising with donors as needed.

6) NUBCW

- To conduct a participatory validation of construction workers residing in the community based on existing skills inventories;/ conduct pre – evaluation of participants.
- To furnish all the partner agencies copy of the finalized learning module/ with HOLCIM/TESDA/ACIW including conforme of the TOR amongst training partners;
- To liaise with HOLCIM-ACIW and TESDA to support the development of a learning module on green masonry;
- To deliver training on production training on green masonry practices;
- To recruit potential members of the construction related skilled workers’ guild, including those who have completed previous mCHB and CCS green skills trainings;
- To facilitate meetings of the workers’ guild in close collaboration with technical experts and NHA Project Management Office.
- To provide technical guidance in the preparation of registration documents and requirements on the registration of the workers guild to the DOLE;
- To provide leadership mentoring thru the conduct of Leadership Enhancement Program to workers’ guild elected officers;
4. **Activities in the creation of green jobs in socialized construction**

4.1. Preparatory activities regarding training cum production of green construction materials

4.1.1. Public-Private partnership (NHA-MCM-CocoTech-Southville 8 residents)

According to the service contract between ILO and NHA made on March 30, 2012, the general tasks attributed to the collaborations of NHA with CoCOTECH and MCM can be seen in Table 2.

<table>
<thead>
<tr>
<th>ILO</th>
<th>NHA</th>
<th>COCOTECH</th>
<th>MCM</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Support training of community based workers in acquiring green skills while producing mCHB and CCS</td>
<td>• Support preparation of developer’s workers orientation seminar on green jobs in socialized housing and manage orientation seminar • Facilitate ground breaking ceremony of the construction of model units • Consultation regarding the development of CBE in the project site • Collaborate with the Enterprise Development Specialist towards the development of project site enterprises strategy • Monitor the process documenter and assist them during field visits and shoots • Together with LDD and PMO, monitor the pilot application</td>
<td>• Monitoring, setup, and operationalization of production site • Coordinate on the conduct of pilot on the job green skills training on the production of Coconet systems materials</td>
<td>• Monitoring, setup, and operationalization of production site • Organize pilot on the job green skills training on the production of mchb • Coordinate in its delivery, including ensuring gender balance of participants • Formulate generic mix of mCHB and donate to NHA</td>
</tr>
</tbody>
</table>
of green construction materials, and liaise with the designated green skills specialist during construction, formation of CBE and workers’ guilds

- Monitor MCM on the formulation of generic mCHB mix and facilitate signing of letter of donation to NHA
- Together with LDD and PMO, monitor the pilot application of green construction materials, and liaise with the designated green skills specialist during construction, formation of CBE and workers’ guilds

4.1.2. OSH in Construction Seminar

The Construction Safety Training for the Socialized Housing Sector was conducted last February 13-17, 2012 at the Occupational Safety and Health Center. The training is under the Green Workplace initiative of the International Labor Organization (ILO) and implemented by the Department of Labor and Employment’s Occupational Safety and Health Center (DOLE-OSHC) with the primary purpose of introducing occupational safety and health and green workplace concepts and principles in the construction industry especially those working for the socialized housing sector. A total of forty-two (42) participants joined the training mostly from stakeholders of the socialized housing sector representing the workers, developers and contractors, civic organizations and implementing government agencies.
The objectives of the training are:

1. To discuss green workplace concepts applicable in the construction industry;
2. To identify the importance of occupational safety and health in the industry;
3. To enumerate the various statistics and other data relating to the OSH and green workplace situation;
4. To explain the various types of hazards and risks confronting construction workers;
5. To discuss the range of control measures available for those in the industry;
6. To identify the local laws concerning OSH and the environment which impact on the industry;
7. To determine how to integrate international codes of practices for the greening of the workplace and the assurance of decent work to workers in the industry.

The methodologies used included interactive lectures, workshops, demonstrations and field or site visit to a construction site.

Range of topics discussed included the concept of green, socialized housing; the importance of safety and health; safety in construction site premises; safety in the use of construction machinery (both mobile and heavy lifting equipment); excavation safety; safety in the use of various tools and equipment; demolition safety; occupational health; environmental safety; and environmental issues on OSH. Some topics necessitated not only lectures but practical application and demonstration as safety in the use of temporary structures and routine site safety inspection. Discussion on specific tools such as job hazard analysis, accident investigation and tool box meeting that has proven to be very effective in on-site situation was given special emphasis. The complete array of personal protective equipment available for protection against various hazards, as well as considerations for their use, were shown and subsequently discussed.

At the end of the training an evaluation was conducted and the participants found that the training contributed to their knowledge and experience in designing and building housing projects that are not only low-cost but at the same time, safe, to the environment, builders and the eventual occupants.
4.1.3. Modified Concrete Hollow Block (mCHB)

Application of mCHB

Economic Benefits

Modified concrete hollow blocks (mCHB) are fibre reinforced concrete masonry units that may incorporate alternative inert materials such as Polyethylene Terephthalate (PET) or ligno cellulosic fibers such as coco coir. As much as 20-30% of conventional aggregates in conventional CHB may be replaced with these materials (Mamuyae, 2011). A comparison of commercial concrete hollow block and the modified concrete hollow block can be seen in Table 3 (Source: Annex B Cost Analysis)

Table 3 Comparison of Commercial CHB vs. mCHB

<table>
<thead>
<tr>
<th>Commercial CHB</th>
<th>Criteria</th>
<th>mCHB</th>
</tr>
</thead>
</table>

15
## Components

<table>
<thead>
<tr>
<th>Cement</th>
<th>River sand</th>
<th>Components</th>
<th>Cement</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>Modifications</td>
<td>Coco coir is an additive that replaces part of the sand used</td>
<td></td>
</tr>
<tr>
<td>28 days</td>
<td>Curing Time</td>
<td>15 days</td>
<td></td>
</tr>
<tr>
<td>300 psi</td>
<td>Average Compressive Strength</td>
<td>250 – 300 psi</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PhP 9.00 per unit</th>
<th>Selling Cost per Unit</th>
<th>PhP 8.50 per unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>PhP 9.802 per unit</td>
<td>Unit Cost</td>
<td>PhP 10.037 per unit (with PET Plastics)</td>
</tr>
<tr>
<td>PhP 9.802 per unit</td>
<td></td>
<td>PhP 9.677 per unit (with coco fiber)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Actual Measurement</th>
<th>Width</th>
<th>Length</th>
<th>Height</th>
<th>Thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>41 cm</td>
<td>40 cm</td>
<td>21 cm</td>
<td>9.8 cm</td>
<td>2.5 cm</td>
</tr>
<tr>
<td>18 and 19 cm</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 cm</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.0 cm</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Inner Hole | 0.012/CHB          | 0.007658/CHB |
| Outer Hole  | 0.002/CHB          | 0.00377/CHB |

| Mortar volume per CHB | 0.002286 cu.m           |
| Cost of mortar per CHB | Php 6.72 |

<table>
<thead>
<tr>
<th>Benefits and Advantages</th>
<th>Livelihood</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Green Job</td>
</tr>
<tr>
<td></td>
<td>Green Contributor</td>
</tr>
</tbody>
</table>

### Environmental Benefits

*Source: MCM*
Regular CHB is made from Cement and sand – sourced from local river banks (diminishes the river banks) mCHB is made from cement, sand and alternative materials. This slows the depletion of river banks, allows the exploration of alternative materials, lessens the cost of the material in some cases

Coconut husks are the number one agricultural waste in the country. These husks can clog waterways and cause floods in coconut-producing provinces. The use of coconut fiber as reinforcement in mCHBs will help reduce the waste piles created by billions of coconut husks in the rural areas every year.

In the urban areas, garbage collectors sometimes refuse to pick up coconut husks from public markets because these are difficult to handle and are perceived to be of no recycling value. One can find illegal dumpsites in or just outside cities where “buko juice” dealers clandestinely dump this bulky and problematic solid waste. Recovering and processing these husks can help alleviate this urban environmental dilemma.

Using coconut fiber in mCHB will reduce the need for cement and sand inputs in CHBs without sacrificing strength. The exact amount of reduction can be validated through ongoing experiments by MCM Eco Chem. The reduction should also still meet compressive strength standards for CHB.

Nevertheless, any reduction will result in less carbon emissions from cement production and a decrease in ecologically destructive sand quarrying activities. This reduction can be measured as many studies have already been conducted on the carbon footprint of the cement industry. The average world carbon intensity of emissions in cement production is 0.81 kg CO2/kg cement. (Hendriks, C.A., et. al., 2004)

Another positive impact of mCHB on the environment is the reduction of noise pollution. Studies (Zulkifli, M.J., et. al., 2008; Mahzan, S., et. al., 2010) have already been conducted on this subject matter all concluding that coconut fiber reinforced concrete has sound-absorbing characteristics comparable to commercial synthetic fibers such as rock wool. This is a welcome development given that the use of these synthetic fibers has recently raised health risk concerns. (Source: Green Jobs Feasibility Study)
As explained earlier under the Technical Criterion, mCHB has the same labour requirements as ordinary CHB. There is only a new ingredient, coco fiber, added to the process of making CHBs. There are no additional operations required. However, because the developer is willing to allow the on-site production of CHB, this will result in job opportunities for the residents in the socialized housing sites. This is an important consideration for NHA.

If there is widespread adoption of coco fiber reinforced CHBs in the socialized as well as non-socialized housing sectors, there will be increased demand for coconut fiber. The impact on employment and enterprise in the coco fiber sector can be measured only after the optimal proportion of coco fiber in mCHB is determined. This will come after the results of MCM’s experiments are known.

There will also be no change in the house construction work flow as mCHB is simply a direct product substitute for regular CHB. All the operations required in the use of regular CHB are also required for mCHB. However, from a “non-green” job of making regular CHBs that have no positive impact on the environment and the housing site, mCHB transforms this into a green job. The production of mCHB using coco fiber will reduce the amount of the country’s largest agriculture waste, reduce the quarrying of sand, and reduce noise pollution in housing sites.

If adopted in a socialized housing site constructing 4,000 housing units requiring 2,480,000 CHBs, on-site mCHBs production will result in the transformation of non-green jobs into green jobs for 32 resident-men working for 6.2 months. This is based on a production rate of 12,500 mCHBs/man-month. No women are involved directly in the manufacture of regular or modified CHBs.

Overall, mCHB production has a neutral impact on absolute employment creation in the construction industry. New green job creation will be realized only in the sourcing of the supply of coco fiber from the rural areas. This can be quantified when the optimal coco fiber content of mCHB is computed in ongoing experiments. (Source: Green Jobs Feasibility Study)
**Capacity Building and Technical Training of mCHB**

**Learning Module Development**

The learning module for mCHB is being developed by the ILO GJA Project Consultant Architect Engell Fagaragan who is also a member of the Philippine Green Building Council (PHILGBC). The following is the outline of learning module for mCHB *(Source: Learning Module for mCHB)*:

Introductory Presentation: Green Skills in Modified Concrete Hollow Block Production:

An Introduction

1. Objectives of the Learning Module

Part 1: Building according to Climate Change and the Provision of Decent Work

2. Building Strength Against Climate Change and the Philippine Weather
3. Green Building
4. Green Jobs and Decent Work
5. Labour Standards and Occupational Safety and Health

Part 2: Green Products and Green Skills: Modified Concrete Hollow Blocks

6. Modified Concrete Hollow Blocks
7. Hands-On Production
8. Opportunities for Employment and Work Ethics

**Training Program of Skills Training For mCHB Making**

Training for mCHB making is conducted for 2 days from 8am-5pm on April 25 to 26, 2012. The following is the program of activities for the said training program.
The activities shifted to the orientation and training of participants chosen from the project site which is in Southville 8B area in Rodriguez, Rizal province. The main proponent for the mCHB is MCM Eco Chem (MCM). MCM conducted an initial training for 63 male and 4 female residents, on April 25-27 using a manual mode of manufacturing mCHBs.

The training started with a series of lectures on the male participants. First, a discussion on the Climate Change and the Philippine weather was conducted. It was followed with a presentation on green building, green jobs and decent work as discussed by Ms. Carmen Baugbog from ILO on the first day of MCM training on April 25, 2012. The role of ILO,
government, workers, and employers in the development of decent work was emphasized through its “Green Jobs in Asia” project.

The second day of MCM training on April 26, 2012 started with the introduction of the mCHB by MCM to the participants. After the participants were lectured about mCHB, the training continued with the demonstration of the production of mCHB through a hands-on production approach. It is a learning-by-doing method where the lecture first gave a demonstration on the actual and basic activities of the hollow block making process followed by letting the participants do the actual task. With the supervision of various trainers of MCM, each of the participants were tasked to learn each process by employing a rotation of participants per participants; and then were asked to repeatedly do each process to gain familiarity and development of skills. After the hands-on production, the training concluded when the training participants were given a lecture on the topic of opportunities of employment and work ethics.

*Orientation on Labour standards, occupational health and safety*

*Discussion on Green Jobs and Decent Work*
Demonstration of mCHB production by an MCM Trainer

Hands-on Production by Participants

Training cum Production for mCHB

After the initial training employing lectures and demonstration, the training shifted to a training cum production phase. Training cum production is a production oriented training wherein the workers are simultaneously trained and also continuously conducting production. The workers were still under the supervision of MCM during the mCHB production and also
they were paid based on their daily output of mCHB per day. The training cum production gave the workers the opportunity to earn money and at the same time improve their skills in hollow block making.

Issues:

• Number of workers dwindled from initial number trained (~60) to just 2 in Kasiglahan
• Site of training cum production was changed 3 times
  o First transfer– problem with developer; no provision for electricity, water etc.; no more workers returned
  o Transferred to Kasiglahan and changed developer from Baque to New San Jose Builders
  o Second transfer – the electricity in the area was not to provide electric current for CHB machine including defective machine
  o Transferred to latest site which is also in the Kasiglahan area but there were still problems encountered such as the storage of finish goods. The mCHBs were not secured from contaminants and environmental hazards (e.g. rain). This had a bad effect to the production outputs. Further, the machines were also defective.

*First training cum production site*
Evaluation of Production Process for Modified Concrete Hollow Block (mCHB) Production using Manual Approach

The production process of mCHB using the manual approach was subjected to production management analysis using the 4Ms (man, machine, method, and materials). The high level process of mCHB production can be seen in Figure 5.

```
Figure 5 Modified Concrete Hollow Block (mCHB) – High Level Process
```

Breakdown of Processing Time of mCHB Production Approach

The process of producing mCHB was broken down into four major steps and the average time it takes to perform each step was gathered through observation of workers during production. The major steps and the time can be seen in Figure 6.
Figure 6 Processing Time for mCHB Production

- Process Time per Batch = 77 min / 48 mCHB
- Process Time per mCHB = 1.6 min / mCHB

**Recommendations**

Based on the production analysis, the manual approach of production mCHB was inefficient and insufficient to achieve the daily target of 300 mCHB per day. The workers should achieved the 300 daily target continuously in order to obtain the minimum wage of P 300 peso (workers were paid P1 per hollow block). Workers productivity decreased gradually over time due to the fatigue accumulation caused by manual handing of heavy objects. The analysis supported the proposal of MCM to shift into a mechanized system since the workers were not capable to produce 300 hollow blocks per day using the manual approach. For the details of the production analysis, please see APPENDIX C.

*Evaluation of Production Process for Modified Concrete Hollow Block (mCHB) Production using Mechanized Approach*

**Comparison between Manual and Mechanical Concrete Hollow Block (CHB) Making**
A comparison table is provided to show the difference between the mCHB produced in manual and mechanized methodology. The table shows that the size and volume of mCHB will remain the same if either approach is used. There is a slight difference in the thickness, area of inner and outer hole between the manual and mechanized approach. The area of the total hole of the mCHB produced in manual approach is slightly smaller than output of the mechanized approach. Thus, it can be said that the size differences in general are relatively the same. The difference is observed in the total cost of the mCHB. According to the computation of MCM, the CHB is the same. However, significance difference is evident in the mortar cost. The mortar cost in the mechanized approach is significantly greater than in the manual approach. The mortar is the substance that binds the CHB together and fills the gaps between blocks in the application. An estimated savings of Php 624 per 500 pieces of MCHB can be achieved when manual approach is used. Although the cost of production is higher in the mechanized approach, the option of using mechanized approach still outweighs the manual approach. This is because employing the manual approach cannot possibly reach the daily target of 300 mCHB per day that will enable the workers to earn a decent wage, based on the production analysis. Although employing the mechanized approach leads to higher cost, the cost increase will eventually become marginal since more outputs can be produced due to the utilization of a more efficient and productive approach. This finding still recommends the use of the mechanized approach over the manual approach.

Table 4 Comparison of Manual vs. Mechanical Concrete Hollow Block Making

<table>
<thead>
<tr>
<th></th>
<th>MANUAL</th>
<th>MECHANICAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>SIZE</td>
<td>10cmx20cmx40cm</td>
<td>10cmx20cmx40cm</td>
</tr>
<tr>
<td>thickness</td>
<td>2.5 cm</td>
<td>2 cm</td>
</tr>
<tr>
<td>volume</td>
<td>0.008 cu.m</td>
<td>0.008 cu.m</td>
</tr>
<tr>
<td>Inner Hole</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Area</td>
<td>0.007658 sq.m</td>
<td>0.012 sq.m</td>
</tr>
<tr>
<td>Outer Hole</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Area</td>
<td>0.00377 sq.m</td>
<td>0.002 sq.m</td>
</tr>
<tr>
<td>Total Hole</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Area</td>
<td>0.011428 sq.m</td>
<td>0.014 sq.m</td>
</tr>
<tr>
<td>Volume of Hole</td>
<td>0.002286 cu.m H=20cm</td>
<td>0.0028 cu.m H=20cm</td>
</tr>
</tbody>
</table>
Production management analysis was also conducted for the mechanized approach of producing modified concrete hollow blocks (mCHB). The details of the production analysis can be seen in APPENDIX D. The observations, issues and recommendations are as follows:

- The production schedule was really affected by the continuous bad weather in the area. Also, the production also halted due to the continuous machine breakdowns. MCM decided to replace the two machines.

- Mr. John Manzanas recommended that the shed covering the molding machine needs to be made more weather proof by strengthening the canvass covering to prevent leaks and expanding its coverage for better protection against the rain.

- The use of PPEs should be strictly implemented. Some workers did not have or were not equipped with the required PPEs for the task. The production site was also not equipped with a first aid kit.

- As of August 22, 2012, 420 pieces of mCHB (600 are required to build one house) were produced so far by 4 persons using 2 mechanized machines. The outputs were only few because of the weather condition.

- In terms of quality issue, the mechanized approach provided better quality mCHB outputs. The appropriate compression was provided by the molding machine as compared to the estimated methodology of the manual approach. The presence of the mechanized molding machine provided easier and faster work for the worker. However, damaged hollow block were also present due to the poor storage of the finished products. It is the reason why we want to secure the production area from the natural and manmade elements that will affect the output.

- Improvement of the storage of raw materials, machine and finished goods is needed. This is to ensure that all materials are secured from theft and from exposure of unwanted
elements and mixtures. Damages and wastes can be minimized or eliminated when proper storage is practiced. This will improve the quality of the outputs, productivity of the production system, and efficiency of the workers and machine.

4.1.4. Coco Net Systems

Application of Coco net system

Economic Benefits

Coco systems costs thirty percent (30%) less than concrete based erosion control systems. Operating costs are almost non-existent. Grasses go through an annual cycle wherein regrowth is automatic every rainy season. Being a by-product/waste product of the coconut industry, it is steadily available all year round. It is a gender neutral task and will readily provide employment for both men and women. Skills are readily available and producing coconets require very little hardware and/or technology. At present, there are at least 24 small enterprises that are benefitting from this technology and more are expected if NHA will make erosion control a standard part of site development requirements. This will serve as an addition to the existing jobs in the socialized construction sector. Currently, there is no focus on the importance of ecofriendly site development. The main markets for this technology are sites along riverbanks, coastal resources and sites with steep slopes. For this study 2 of the 3 site require erosion control. Coconut husks are largely unused in the Philippines, coco systems may be tapped as a poverty alleviation project to provide employment in the poorest regions in the country. (Annex A – Review of Green Products)

The design and price of the supplier of Coco Coir based Erosion Control Systems have already been accepted by the developer. The first installation is expected to be implemented in one area of the socialized housing site at the start of 2012. A total of 40 on-site jobs and 18 off-site jobs can be created by the coco systems. Demand for the products will increase due to increased government allocations for public housing. (Green Jobs Feasibility Study – Final Draft)

Environmental Benefits
Coco systems can protect housing sites from riverbank erosion more effectively than conventional riprap and shot-crete methods. Coco systems literally “green” the housing site as vegetation is a required component of these systems. Subject to further studies, coco systems may also reduce the amount of cement and sand used in constructing erosion control systems, as it acts as a substitute material. (*Green Jobs Feasibility Study – Final Draft*)

**Decent Work**

The use of coco erosion control systems generates green jobs both in the housing site and in the rural areas. In a specific installation requested by a developer, 44 on-site green jobs will be created and 18 households in a coconut-producing area will benefit in terms of livelihood activities.

*Capacity Building and Technical Training*

**Learning Module Development**

The learning module for coconet System was developed by ILO GJA Consultant Eugene Gonzalez. The following is the outline of learning module for coconet systems (Source: Outline of Learning Module for Coconet Systems):

**Part 1: Context – Climate Change and the Provision of Decent Work**

a. Session 1: The Climate, Environmental Situation, and Coco Coir Based Bioengineering Systems
   - Climate Change, Bioengineering and Erosion Control in the Philippines
   - Concrete-based Erosion Control
   - Use of Natural Materials for Erosion Control – Bioengineering & Coconet Systems

b. Session 2: Benefits of Coconet Systems in the Philippines
   - Cost Savings
   - Job Creation
   - Environmental Protection
   - Resource efficiency and waste management

c. Session 3: Labour
Part 2 (Session 4): Introduction to Coconet Systems and Application in Housing in the Philippines

- National Government Policy
  - DPWH “green engineering”
  - Pasig River Rehabilitation Program
- Coconets and fascines for slope and riverbank protection
  - International applications
  - Local applications
- Interlocking Blocks for reinforced riverbank protection
  - Local Applications

Part 3 (Session 5): Production of Coco Coir based Bioengineering Materials (c/o CocoTechnologies Corporation)

- Post-Training Expectations
- Brief Company Introduction
- Videos and Presentations on production of coco materials
- Twining of coco fiber ropes
- Weaving of coco ropes into coco nets
- Production of Interlocking blocks

Part 4: Employment Opportunities and Work Ethics

**Training Program of Skills Training For Coco Net Systems**

Training is conducted for 3 days from 8am-5pm on May 8-10, 2012. The following is the program of activities for the said training program:
OSH Orientation

Labour standards, occupational health and safety were discussed by Alex Sacabon from Bureau of Working Conditions of DOLE on the First day of training. It was held on May 8, 2012.
Orientation on Green Jobs

Green jobs and decent work was discussed by Ms. Carmen Baugbog from ILO on the first day of Cocotech training on May 8, 2012. The role of ILO, government, workers, and employers in the development of decent work was emphasized through its “Green Jobs in Asia” project. A workshop was also conducted to gain insights from the participant on how they can possibly help the environment while having a decent work. With this workshop, the participants were grouped into 5-7 members each and were tasked to write down on a manila paper their views on green jobs.

A total of 35 women attended the training which was conducted in a classroom setting with adequate space & presentation materials (training modules, projector, cooling fans & sound system) provided during the training. Only set-back was the inadequate lighting and noisy environment that disturb the participant’s training sessions.
Figure 7 Training Program for Day 2

Training on Twining and Weaving Erosion Control Geotextiles from Coco Fiber

After the orientation on Green Jobs and Decent work; and the labour standards and occupational safety and health, the training followed with the lecture about the production of Coconet systems. The lecture was followed by a hands-on production where the trainer of Cocotech introduced the machine used in the twining process, and the demonstrated the actual twining process flow. The demonstration was conducted by showing the proper way to prepare a fiber, how to use the twining machine, and how to control the quality of the outputs. After the demonstration, the workers were then taught to operate the machine. They took turns in collecting coco fibers, operating the machine, and forming the twine pieces. These activities composed the basic process of twining. The twining process should be conducted by a group of individuals. Thus, the workers were divided into groups in the hands-on production. The
groupings of the participants in the workshop were carried over in this activity. The hand-on production training on twining process concluded the second day of the training.

The third day of the training continued with the participants continuing with twining to develop their mastery on the production process. This was conducted with the continuous supervision of Cocotech. Then, Cocotech followed the activity with the demonstration of the weaving process of erosion control nets from coco fiber. The participants used their outputs from the twining hands-on production training as inputs to the weaving process. Each of the participants was given the chance to become familiar with the machine and how to conduct weaving using the machine. Two persons rotated in practicing the weaving process since this is the number of workers required to operate the machine. Then, a lecture on opportunities for employment and work ethics was given to the participants. The conclusion of the training by Cocotech concluded when Cocotech recognized and awarded the top five groups that were outstanding in performing the twining process. The criteria of the recognition by Cocotech were based on their observation of the quality of the twines produced and the number of twines produced by each group.
Lecture by Cocotech on Twining and Weaving of Coco Coir

Twining Demonstration and Training by Coco Tech

Weaving Demonstration and Training by Cocotech
Training cum Production

After the initial training involving lectures and demonstrations, the training of coco twine production shifted to a training cum production. The objective of the training cum production was to hone the worker’s skills in twine making. The batch of participants in the training cum production was not the same as those who attended on the first training conducted by Cocotech. Most of the original participants of the training did not continue with the training of the twining process prompting Cocotech and NHA to search and then recruit for a new batch of female participants coming from other blocks.

The CocoNet Systems Production was attractive to women for various reasons. The work is traditionally assigned to women as well as the workplace was home based. However, even if the CCS have contributed towards gainful employment and equal economic opportunities, initially women’s working hours (productive and reproductive work) have increased adding to the multiple burden of women.

During the training cum production, were producing twines but still under the supervision and training of Cocotech. Cocotech supervisors check each group of twine workers whom were doing twining outside their houses. The role of the supervisors was to check and improve the speed of the workers in producing a single twine, supervise their mastery of using the twine machine, and also check if the workers were producing the correct length and thickness of the twines which were the acceptable quality for Cocotech. The workers were paid Php 1.25 peso per twines they could produce.
There were around 42 female workers continuously producing the coco twines. According to Mr. John Manzanas, a block leader, Ms. Jocelyn Llaban, a resident of the area was assigned on the last week of July 2012 to assume the role of training of new workers who were not involved in the initial training. The block leader was also responsible in raw material replenishment, raw material distribution, collection of twine outputs, collects payment from NHA, and then distributed the compensation to the workers. The role of the block leader was to set up the twining operations for the day and divides the payment received among the workers involved. According to Mr. Manzanas, as of July, there were around ten housing blocks involved in twining work. The ten twining machines donated by Coco Tech to the project have been distributed to these ten housing blocks. Each housing block usually works as a team in producing the twines.

*Female Workers doing Twining in front of their residence and Continuously supervised by Cocotech*
Evaluation of Production Process for Coco Twine

The process of producing coconet twines was broken down into four major steps and the average time it takes to perform each step was gathered through observation of workers during production. The major steps and the time can be seen in Figure 8 and Figure 9.
Process Time per Twine = 14.60 min/ twine

*Note: According to CocoTech Supervisors/Trainers, a skilled worker could produce a twine for 2 minutes on the average. Observed variance was high between the processing time of the workers and by the trainers.

**Recommendations**

Based on the assessment of the materials, methods, people, machines used in the training cum production of Coconet System the following are proposed:

- Since many additional household workers wants to participate in the twining job but is constrained by the number of machines available, a training on how to build the twining machines is suggested.
- Record system on raw material release and distributional and the twine production output should be implemented.
• Proper storage of finished goods and raw materials should be taught to the participants as the products are exposed to different weather conditions that weakens the quality of the product
• Coverings for the participants during work should be provided to protect them and their outputs from adverse weather conditions
• Proximity of the storage area of raw materials should be strategically located in a place nearer to work place
• Workers should be taught on the proper way to repair damaged twining machines to reduce production delays.
• Best practices as to how the 2 minute / twine output can be achieved can also be shared to the workers during training
• Workers should be provided with safety gloves to prevent blisters and the usage of these gloves should be strictly enforced early on in the training program

The details of the production analysis can be seen in APPENDIX E.

Application of Erosion Control CCS

Also during the same week as the group’s meeting, Coco Tech started training activities in net making. The initial sessions were held first in Kasiglaan Village and the weaving machine was later moved to an empty unit in Block 11, Lot 4 in Southville 8B where Coco Tech continued the training. Eight workers attended the training, most of them officers of the association. All are also actively doing twining work. Training lasted about a week. After the Coco Tech training, the workers led by Ms. Llaban continued the weaving operations. As of the third week of September 2012, they had already finished five 50 meter long coco nets

4.2. Application of Modified Concrete Hollow (mCHB) blocks in a Prototype Walling System of a House

The application of the mCHB on the walling systems of the housing unit took place on last week of August until the first week of September 2012. The application was conducted to construct the walling systems of a low cost house. The site is located in Kasiglahan Village, also a resettlement area of NHA. The site is an open lot surrounded with multiple finished low cost
houses developed by NHA and the site developer in the area, New San Jose Builders, unfinished house structure, and the main river bank in the Montalban area.

Application Site

4.2.1. Dimensions of mCHB vs. Regular Hollow Blocks

The comparison of the dimension of the mCHB and regular hollow blocks are presented in the table below. The dimensions include the exterior measurements of length, width, thickness, and the interior measurements of the length and width of the rectangular holes of the hollow blocks. The rectangular holes are the unfilled hollow space located at the center of the hollow block. Both the mCHB and regular hollow blocks have three rectangular holes. The mCHBs were produced using mechanized machine of MCM that was 15 years old. The mCHBs used in the application of the prototype walling system of the house were produced during the training cum production.
Table 5 Comparison of Sizes of mCHB and Regular Hollow Blocks

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>mCHB</th>
<th>Regular Hollow Blocks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width</td>
<td>40 cm</td>
<td>41 cm</td>
</tr>
<tr>
<td>Length/Depth</td>
<td>21 cm</td>
<td>18 and 19 cm</td>
</tr>
<tr>
<td>Thickness</td>
<td>9.8 cm</td>
<td>10 cm</td>
</tr>
<tr>
<td>Width (Rectangular hole)</td>
<td>8.5 cm</td>
<td>9.7 cm</td>
</tr>
<tr>
<td>Length (Rectangular hole)</td>
<td>4.5 cm</td>
<td>3 cm</td>
</tr>
<tr>
<td>Volume per hole</td>
<td>803.25 cm$^3$</td>
<td>582 cm$^3$</td>
</tr>
</tbody>
</table>

Source: Site observation and Interview from MCM on-site personnel

The mCHB was compared with two types of regular hollow block with different sizes. The two regular hollow blocks differed in terms of the length. The length difference between the two types of regular hollow blocks differed by only a small fraction of two centimeters. The size difference was due to the differences of regular hollow blocks suppliers. In comparing the dimensions of the mCHB and regular hollow blocks, it can be observed from the summarized table that the mCHB and regular hollow blocks differed in terms of the exterior measurements of length, width, and thickness; and interior measurements of length and width of the rectangular holes of the hollow blocks. However, the differences in the exterior measurements were minimal since the difference was only 1 cm which is considered to be relatively insignificant. Thus, it can be said that the mCHB and regular hollow blocks have almost similar sizes. The same size between the two distinct hollow blocks would mean the same number of hollow blocks were needed and used to construct one walling system. The workers would have to carry the same number of hollow blocks to finish the task of completing one wall. The mCHB did not pose any advantage in terms of the size.

Looking at the pictures below, the regular hollow blocks and mCHB have more or less similar structure and visual characteristics. It can be observed that some of the mCHB were...
broken (figure b). The blocks were intentionally cut into small parts to be used in the application of side areas of the house.

![Regular Hollow Blocks vs. mCHB](image_url)

Significant difference was observed in the volume of the hollow rectangular holes. The interior measurement of the rectangular holes was important during the application since it determined the amount of cement mixture to be used. The hollow holes were filled with cement mixture during the application. The volume of the hollow area of rectangular hole was computed by multiplying the length and width of the rectangular holes with the length/depth of the hollow blocks. The computed volume of each hollow area of rectangular hole is 803.25 cm³ and 582 cm³ for the mCHB and regular hollow blocks, respectively. Although the size of the mCHB and regular hollow block did not differ, the volume of the interior rectangular holes differed significantly. The mCHB has a larger volume than the regular hollow block. This indicates that the application of mCHB to complete a prototype walling systems required more amount of cement filling than the application of regular hollow blocks. The mCHB did not pose an advantage in terms of the saving of material requirements and usage, particularly cement. However, the mCHB has a lighter weight than the regular hollow blocks because the mCHB have a larger hollow volume than the regular hollow block. This posed an advantage to the workers since the lighter weight would be easier to carry and handle.
4.2.2. Process Flow of Application

Application was conducted by six workers under the employment of the site developer, New San Jose Builders. The six workers conducted the application of mCHB and regular hollow blocks simultaneously in different housing units. Two workers each were assigned to do the cement pouring and laying of blocks for each separate houses using mCHB and regular hollow blocks, while the two remaining workers accomplished the mixing of the cement mixture and the transport of the cement mixture from the mixing area to the housing site.

Based from site observation and interview of the workers that conducted the application, the processes of applying both types of concentrate blocks to the walling system of the house were similar. The process flow using mCHB did not change. The use of mCHB did not result to an easier and faster process flow since the application of concrete blocks follows the same methodology regardless of the type of concrete blocks. Thus, the mCHB did not pose an advantage in terms of methodology. However, the workers claimed that the first batch of mCHBs delivered and produced during the training cum production were stronger and light to carry than the regular hollow blocks. The claim the mCHB was lighter was supported in the comparison of the volume of the hollow area of the mCHB. In addition, the second batch of mCHBs using in the application had poorer quality than the first batch of mCHBs since it easily broke during the application. The quality of the mCHB was inconsistent. This was attributed to several possible causes. First, the MCM trainer claimed that some of the mCHBs brought in the second batch of deliver were not properly cured and met the required days of curing. This resulted to weaker mCHB and the subsequent breakage of blocks during the application by the workers. Second, the
variation of mCHB outputs can be attributed to the training cum production phase. During that period, the workers were still improving their skills in hollow block making. As a result, the sizes of the resulting mCHBs varied but the quality may still be acceptable. Lastly, the mechanized machine used in the molding process was very old and previously used; it was only repaired prior to the actual training cum production. Although the machine was repaired prior to the training, it still does not guarantee that the mCHBs produced would be of the same quality of the current hollow blocks in the market since regular hollow blocks are currently produced by new generations of molding machine. As evidence, the machine broke down multiple times during the training cum production period which contributed to the inconsistencies of the outputs. The inconsistencies of the quality showed one of the weaknesses of the mCHB over the regular hollow blocks. Quality control was poorer in the mCHB produced on site than the regular hollow blocks produced by other suppliers. The high level process of the application of concrete blocks in a prototype walling systems of a house can be seen in the following figure.

![Figure 10 Application of mCHB in a Prototype Walling System – High Level Process](image-url)
Cement Mixing

Cement Transport

mcHB Laying

Cement Pouring
4.2.3. Dimensions of Prototype Walling System

The dimensions of the prototype walling system using mCHB were 4.5 m (base) x 3.6 m (height). The shape of the wall was rectangular. The prototype wall was composed of 11 hollow blocks per row (base) and 8 hollow blocks per column (height).
4.2.4. Conclusions and Recommendations

The mCHB is lighter in terms of weights as compared to the regular hollow blocks since it has a larger volume in the hollow area. Other than this, there is no clear advantage posed by the mCHB over the regular hollow blocks in terms of its application to the prototype walling system of a house. This is due to the following reason:

- The mCHB and regular hollow blocks have the same sizes. Based on the comparison, the number of hollow blocks consumed and required for the completion of the walling system was also same in the application of the two different types of hollow blocks.
- The process flow in the application of the mCHB and the regular hollow blocks in the walling system of the house employed the same methodology. The workers conducted
the same process steps and used similar materials, other than the hollow blocks during the application. The methodology of concrete hollow block application in the walling system did not change when the type of hollow block varied.

- The mCHB and regular hollow blocks have different dimension in terms of the rectangular holes. The rectangular holes of the mCHB were larger in terms of volume. The application of mCHB required more amount of cement filling than the regular hollow blocks.

- There were inconsistencies in terms of the quality and size of the mCHB outputs. Again, the issue of inconsistency was attributed to (a) improper curing of mCHB, (b) undeveloped skills of workers during the training cum production, and (c) the 15 year old mechanized molding machine. This problem was non-existent for regular hollow blocks since it was produced by highly skilled and experienced producers of other suppliers and using the best available technology currently available in the market.

The cited disadvantage of inconsistencies of the mCHB over the regular hollow blocks may only be true for the prototype walling system developed and that was examined. This is the case because the issue on inconsistency was a result of several production system factors (e.g. equipment, worker skill, and improper methodology) in the mCHB production. Thus, this disadvantage can be eliminated when the worker skill becomes competent, old machinery is replaced with a good conditioned machine in the production, and the proper adherence of the methodology of hollow block making is followed. Future application of the mCHB in the construction of the house can eliminate this disadvantage when the cited improvements are made. Improvement is doable since MCM is very familiar with production management systems and measures given their experience in plant and manufacturing operations. They just need to institute the appropriate measures in the project site to sustain work and continuous improvement of workers’ skill in hollow block making beyond the training phase. Aside from this, the advantage of mCHB having lighter weight than the regular hollow blocks and the other cited reasons pointing that mCHB has no clear advantage still holds even though the inconsistency issue will be addressed.

Lastly, the mCHBs initially passed the load requirements when applied to a walling system of a house but further laboratory tests are ongoing in the formulation of the generic mix,
4.3. Development of Community-based enterprises (CBE)

4.3.1 Preparatory Activities Prior to Formation of Community-based enterprises (CBE)

After the training conducted by MCM and Cocotech, the next activity involved the formation of the Community-based enterprises (CBE). Mr. John Manzanas, the Enterprise Development Consultant of the ILO GJA Project, conducted various actions to develop the appropriate CBE fit for the workers of the mCHB and Coco Coir. The formation of the CBE of the mCHB did not push through since most of the workers involved in the training cum production did not return and were not willing to continue doing mCHB production. The few number of mCHB workers who were interested in creating were not enough to fill-up the minimum number of members of a CBE. Instead, Mr. Manzanas focused on forming the CBE of Coco Coir workers.

Prior to the formation of the CBE of Coco Coir workers, Mr. Manzanas prepared a draft set of elements for a strategy towards the development of a CBE in the pilot project site around the middle of April, 2012. As a consultant of enterprise development, he also gathered information and materials for use in a draft business plan for the Coco Coir workers. The business plan integrated environmental aspects, OSH and labour standards aspect for the specific enterprise. Mr. Manzanas then conducted a simple survey to gather information on the inclinations of the coco coir workers in establishing an association and to ask the workers their knowledge and level of understanding of an association. The survey was given to 30 Coco Coir female workers that were residents in Southville 8B area in the middle of August. This was with the help of Mr. Rui Ambrosio, the NHA Senior Field Facilitator. Only thirteen gave their response on the survey forms and all thirteen of which indicated their interest to join an association of coco coir workers.

During the training cum production phase in which the Coco Coir workers were already informally organized with Ms. Jocelyn Llaban as their de facto head and also had a loose hierarchy of leaders at the various housing blocks that performed twining work, Ms. Llaban had also been managing basic business transactions in twining work since June 2012. With this development, Mr. Manzanas recommended that the Coco Coir workers were ready to move their group further into a business. The formation of the CBE did not push through because of the
limited time period of the project. Instead, the Coco Coir workers will be organized in their own worker’s Association and registered as a business entity assisted by NHA project team.

4.3.2 Orientation Meeting of Worker’s Association

The first step of worker’s association formation was the organization by NHA of a meeting among the coco coir workers to discuss the establishment of an association in more detail. An orientation meeting regarding the formation of worker’s association of the Coco Coir workers was conducted on September 4, 2012 with ILO and NHA. The meeting was held in the Claret Mission in Southville 8B with 19 attendees that were previously trained in Coco Coir production. The meeting was together conducted by Mr. Manzanas in coordination with NHA and ILO.

Objective of the Meeting and Brief background on coco coir work

First, Mr. Manzanas started the meeting by laying out the objective of the meeting. The objectives were the following: a.) To provide the coco coir workers with the proper perspective and understanding on what an association is and how it functions and b.)To assist the workers initially organize and prepare themselves for an association. It was reiterated by Mr. Manzanas that the workers coco coir workers in Southville 8B were interested to establish an association among themselves for coco coir work. This information was based on a survey conducted by Mr. Manzanas on August of 2012. Then, Mr. Manzanas reviewed to the workers the brief background on coco coir work which include the following information:

a. Training on coco coir twining initially conducted last May 2012 by Cocotech.

b. There are presently about 40 residents in Southville 8B engaged in coco coir twining work.

c. Total production of coco coir twines exceeds 10,000 pieces as of end August 2012

d. The workers earn Php1.25 per finished twine rope.

e. Cocotech provides the raw materials for the coco coir twine.

f. Cocotech also buys all the coco coir twine produced.

g. The workers are informally organized, by housing blocks, in twine production.
Overview of a Workers’ Association

The meeting proceeded with Mr. Manzanas, the ILO consultant, giving a presentation on overview of a worker’s association. This was conducted to provide information to most of the workers whom did not have previous experience, knowledge, and background on an association. The speaker focused on discussing the rationale of a worker’s association and the features of a worker’s association. The presentation material was a power point presentation in Tagalog which was obtained by translating the original English power point version. The language used in the presentation was also Tagalog. From the presentation materials of Mr. Manzanas, the rationale for a workers’ association were as follows:

a. Easier to manage work and people under an organized structure
b. Allows members to pool resources (financial, skills, assets, etc.) and maximize use of pooled resources

c. Facilitates access to sources of assistance (donations, credit, etc.)
d. Easier to link up with other groups for mutual benefit
e. Provides formal structure for common business ventures of members
f. Sustains common projects and activities of members

Discussion by Mr. John Manzanas, the Enterprise Development Consultant

The next topic discussed was regarding the features of a workers’ association. The discussion was focused on the discussing the formation of an association as a formal organization of residents involved in coco coir twining and net production, organized for the purpose of managing the business of coco coir twine and net production, has the appropriate
facilities and management systems to sustain and expand the business, and supported by all members. From the presentation materials of Mr. Manzanas, the following information was discussed to the coco coir workers regarding the meeting of an association.

a. Formal organization of residents involved in coco coir twining and net production
   • Registered with the Securities and Exchange Commission (SEC) as a non-stock corporation
   • Has a board of directors and officers to manage the operations
   • Has its own office
   • Has its own funds
   • Recognized by others as a formal organization of coco coir workers

b. Organized for the purpose of managing the business of coco coir twine and net production
   • Focuses on the efficient and timely production of coco coir twine and nets
   • Provides the needed facilities, resources and support to maximize the production and income of the group from coco coir twine and nets
   • Provides a collective front in negotiating with buyers and suppliers

c. Has the appropriate facilities and management systems to sustain and expand the business
   • Has a systematic means of managing all production processes and workers
   • Provides for an efficient work flow in coco coir twine and net making
   • Ensures that all outputs meet desired quality and are delivered on time
   • Can increase production of the group while maintaining quality standards
   • Provides decent work environment for members
   • Provides for the efficient and secure management of members’ funds and income

d. Supported by all members
   • Remain committed to the association
   • Pay their regular dues on time
   • Actively participate in meetings and association activities
• Help manage the association by joining the board or as an officer
• Help expand membership by assisting qualified residents in the area to join the association
• Promote the association to others

Aside from the presentation on the overview of the worker’s association, Mr. Deo de la Vega, a guest speaker and President of the association of soap producers in Kasiglaan Village, gave a talk on his experiences in setting up and managing their own association. He also continued discussing their current activities and encouraged the Coco Coir group to proceed with their own organization. This was helpful in the point of view of the coco coir workers since they were made aware of the success of previously established association in their area.

Initial Set-up of Worker’s Association

After the lectures, the meeting then continued with the attendees all agreeing that they are going to set up their own association and proceeded to elect their officers for the association. The election included the selection of board members and officers of the association and set up various committees in the association such as on memberships and programs. The results of the election were as follows:

• Ms. Jocelyn Llaban – President
• Ms. Florida Martinez - Vice President
• Ms. Ma. Stella Fabilane – Secretary
• Ms. Joza Cervantes – Treasurer
• Ms. Babylyn Martinez - Auditor
Election Results of Worker’s Association

After the election, the workers together with ILO and NHA reviewed the SEC registration requirements. The newly formed association will be registered as a non-stock corporation. The basic requirements for SEC registration of Non-Stock Corporation as shown in the official SEC website were as follow:

- Name verification slip
- Articles of Incorporation and By-laws
- Affidavit of an incorporator or director undertaking to change corporate name
- List of members, certified by the Corporate Secretary
- List of contributors and amount contributed certified by the treasurer

A few days after the orientation meeting, the coco coir worker’s group decided to name their association the "Southville 8B Twining and Weaving Association". The group used the
residence of Ms. Florida Martinez, their Vice President, at Block 64, Lot 40, as their temporary office address. At the same time the worker’s formed their association, Mr. Manzanas completed a draft business plan for the group to help them in their start up activities as a business concern. The business plan laid out the basic facilities, processes and skills needed by the group in two key areas, namely, production management and financial management. A short section on membership development is also included to help the group manage their human resources. The plan also provides some estimates on market revenues and the various expenses and cost items for the association. According to Mr. Manzanas, the development of the business plan was based on the data and information from the NHA, Coco Tech, the internet, field research, from past experiences working with small businesses and by gathering primary data on the activities of the coco coir workers in twining and net weaving. The business plan was submitted to the ILO in the middle of September 2012.

Conclusion of the Orientation Meeting

The orientation meeting concluded with the workers agreeing to meet again to work on their Securities and Exchange Commission (SEC) registration. The worker’s group should coordinate with NHA on the registration of their newly formed worker’s association. According Mr. Manzanas, as of the third week of September 2012, the registration of the worker’s association was not yet accomplish by the group. The reason for this is that some of the group members did not have the funds to contribute as equity to their association. Mr. Manzanas and NHA provided assistance by helping the group reserve their name with the SEC to start the process of registration. However, as of September 17, 2012, the group has not provided any new action on the matter. The group was supposed to register as a non-stock corporation with the SEC. According to Mr. Manzanas, he sees uncertainty on when the group can register their worker’s association. The NHA is continuously checking the group on this matter. The reservation period will be for 60 days starting from the third week of September 2012. The registration process will continue once the association members have raised their equity contributions.

Gender Concern in the Formation of Worker’s Association

Lastly, 30 women twiners and weavers have participated on Gender Sensitivity Training last September 21, 2012 where division of work, role of men and women in work, and access and
control of resources for economic productivity were discussed to raise awareness of women that there is a need for both women and men to support each other so that women will be encouraged to aim for gainful employment.

Conclusion and Findings

- Newly trained female Coco Coir workers were assisted by Private and Public partners in initially organizing and preparing them in setting up their own association.
- The use of Tagalog language during the lectures and trainings ensured that the training message was conveyed and understood by the participants.
- Commitment to the work is important for the residents to transition from being trainees and workers to establishing their own business.
- As a recommendation of the enterprise development consultant, from the pool of workers, there may be a few individuals who have the drive to excel or exhibit leadership and entrepreneurial abilities. They should be the focal points for assistance in developing the CBE.
- The use of established methodology, products and technology of private partners in the formation of CBE is essential for the sustainability of the enterprise.

4.4. Green Masonry Skills Training (Greening the ‘Galing Mason) and Formation of Worker’s Guild

The Green Skills Masonry Training was conducted on August 28, 2012 to September 10, 2012. This was implemented in partnership with the Department of Labor and Employment (DOLE), the Technical Education and Skills Development Authority (TESDA), the National Housing Authority (NHA) with the guidance of the Philippine Green Building Council (PhilGBC) and is supported by Holcim, Ltd., the Philippine Constructors Association (PCA), Association of Construction Informal Workers (ACIW), and National Union of Building and Construction Workers (NUBCW). The site is located in Barangay Matictic in Bulacan in partnership with the local government of Bgy Matictic and the Municipal Social Welfare Development Office.
Site Location of Green Masonry Skills Training

The Green Masonry Skills training is an initial implementation of the Green Masonry curriculum in the Masonry-NCII Training. It builds upon an established training program by Holcim Philippines, the ‘Galing Mason Program, which was launched on September 8, 2004. The program consists of three components aimed at mason education, recognition and appropriate use of concrete products: a.) ‘Galing Mason Training, b.) ‘Galing Mason Olympics, and c.) ‘Galing Mason Award. The ‘Galing Mason training focuses on the enhancement of the skills of masons through a seven-day training cum production program. It provides basic and advanced masonry skills training for prospective and uncertified masons and the assessment and certification is provided by Holcim.
The standards for competency and the curriculum and assessment tool of masonry skill training program was duly accredited training regulation programme with TESDA in partnership with Holcim Philippines and ACIW. The training program is a seven-day training cum production program. The pool of trainers on masonry was composed of representatives from TESDA, PCA, ACIW, and NUBCW. Ms. Carmen Baugbog of ILO discussed the initiatives on green jobs and decent work. Lastly, the PhilGBC conducted the lectures on green jobs and greening the construction. There were forty-six Construction informal workers identified by TESDA who are undergoing their Masonry NCII training that participated in the Green Masonry Skills training.

4.4.1 Objectives of the Training Program

The training program aims to integrate “Green Masonry” concepts into the existing NCI and NCII Masonry Training. The Masonry training is an existing module already accredited by the Technical Skills Development Authority (TESDA). It consists of competencies that a person must achieve and that will enable him/her to lay bricks / blocks for structure, plaster concrete masonry / concrete surface, and install pre-cast baluster and handrail this is in addition to the competencies that a trainee must achieve through the NCI Masonry training- prepare masonry materials and perform basic masonry works. The objectives of integrating “Green Masonry” concepts are to enable participants to: (a) appreciate climate change as a personal, social and construction issue, (b) understand the possible effects as well as the direct and indirect impact of climate change, (c) identify the different concepts in Green Building, (d) recognize the importance of different practices towards Green Masonry, (e) understand the need for proper
identification of building materials to protect and conserve the environment, (f) differentiate between renewable and non-renewable resources, (g) to understand the concept of green and decent jobs (h) appreciate labour standards and basic occupational safety and health, (i) familiarize themselves with resource efficiency and waste management, (j) adopt practices that fosters “Greening” the workplace, and (k) identify various employment opportunities including work ethics.

The training consists of lecture-discussions, peer-learning and sharing, games, and hands-on exercises to achieve its objectives.

4.4.2 Training Program

The training program consists of two days to discuss concepts about “Green Masonry,” five days for the Masonry NCII Training, five days of actual application wherein the participants built a fence to apply the concepts that they’ve learned, and one day about Labour Standards and Occupational Safety and Health and Waste Management. The original ‘Galing Mason training program that is currently existing in TESDA was only for seven days, an additional six days were added for the Masonry Concepts and Fence building involving the concept of green. The contents of the training program are as follows:

Two-day introduction about Green Masonry
i. Introduction to Green Masonry
ii. Climate Change and the Philippine Weather
iii. Green Building and Masonry
iv. Green Jobs and Decent Work

Five-day NCII Masonry Training Lecture
i. Participating in Workplace Communication
ii. Preparing construction (heavy equipment) materials and tools
iii. Preparing Masonry Materials

One-day on Labour Standards and OSH and waste management
i. Waste Management
ii. Labour Standards and Occupational Safety and Health
After the training the participants were assessed through a written examination and an oral examination prepared by TESDA which was their basis in providing the NCII certification for the participants. The participants will be given the certification only if they pass both examinations. All of the 42 participants who took the NCI certification exam passed while only 25 out of the 42 who took the NCII exam passed.

4.4.3 Application of Fences

Part of the training of the participants is the actual application of what they have learned through putting up a fence to surround the day care center in Barangay Matictic, Bulacan. The total fence area was estimated to be 15.6 m for the front and 9m for the sides. The depth of the fence is 0.8m from the ground to the base of the fence, the width is 0.4m and the height from the base to the top of the fence is 0.7m for a total height of 1.5m from the ground to the top of the fence. The workers conducted the masonry works that were taught to them in the training with the continued guidance from TESDA and ACIW.
Groundbreaking of the fence (September 4, 2012)

Assessment during and after the training
Fencing Application (September 6 to 9, 2012)
4.4.4 Formation of Green Masonry Worker’s Guild

Last September 8, 2012, during the training period, the president of ACIW gave the workers an orientation about Workers’ Guild. During the session, all of the 42 male graduates agreed to form and take part in their own worker’s guild of masonry. ACIW facilitated an election of officers for the male groups the Masons Worker’s Guild. Eleven officers were elected. As of September 26, 2012, the formation of the Worker’s guild is still ongoing. The NUBCW continued to facilitate the process of the registering the guild with the Department of Labor and Employment, the next step in the formation of worker’s guild. Also, seventeen male graduates from Bgy. Matictic were given 15 days work after the training with HOLCIM to fill up their roster of Masons.

4.4.5 Findings and Conclusions

During the selection of trainees of the Greening the Galing Masonry Training, the Workers Guild Facilitator from the National Union Building Workers Construction (NUBCW) conducted an orientation regarding the training including the way forward after the training which is the formation of workers guild. In the middle of the training, three separate meetings were also conducted by the same facilitator to orient trainees on concepts of workers guild and its difference among other organization, election of officers, and initial planning especially for its registration to the Department of Labor and Employment as workers guild.
The ‘Galing Mason program has been established since 2004. It is a pilot training to integrate Green Masonry concepts in the existing NC I and NCII Masonry training program. This is an initial step to “Green” the ‘Galing Masons program and there is still room for improvement. The following are some of the findings that could be used to improve the Green Masonry Skills Training Program:

- Partnership with Holcim that has a tested masonry training program was very important in the success of the training in masonry skills.

- Aside from the topic of decent work, the benefits of greening explained in the training were towards environmental benefits but not the green aspect of construction.

- The training module of Masonry Skills Training is currently available in TESDA. The concept of green was merely added in the existing training module. The lecture materials on Green Masonry Skills Training has no synergy existing between the topic of green and masonry skills since the two topics was discussed separately and not dependent from each other.

- There is a need for integration of Green Masonry Concepts into the application portion of the training which was when the participants built the fence.

- The assessment conducted by TESDA after the training, which would lead to certification, was based only on the existing Masonry NCII certification examination and the Green Masonry Skills and Concepts were not assessed. It was uncertain if the participants were aware of the topic of greening during the training since there was no assessment on the participant’s knowledge on green construction. The assessment conducted was solely focused on the Green Masonry Skills of the workers. The certification by TESDA is as proof of their development in masonry skills.

- There is a language barrier since the language of instruction was English and participants were having a hard time understanding the training contents though this is needed to prepare them for work in the industry both local and abroad since the language of communication used in the industry is English. Though the lecturer presented the topic in Tagalog, but the presentation material is in English. There is currently no Tagalog presentation material on the Masonry Skills training.

- Workers were trained to use the proper tools and equipment as well as Personal Protective Equipment (PPEs) during the training cum production to prepare them for
work in the industry. Also, the male workers owned the Personal Protective Equipments (PPEs) after the training.

- The training standardized the masonry practices of the participants who could have learned masonry through other mediums.
- The participants were familiarized with the international names of tools and equipments to prepare them for work in the industry both local and abroad. Knowledge of trainees was upgraded to industry and international standards and practices.
- The set-up of the training cum production wherein the participants learn and apply what they have learned wherein they are given compensation and allowances is a good set-up to attract participants and retain them during the course of the training cum production.
- The evaluation of the Green Masonry training was conducted by the partners and trainers involved in the training. Each entity gave their insights regarding the improvement of the program for future application.
- Transition from workers into a member the worker’s guild enabled most of the male participants to improve their overall behaviour and perspective (mindset) towards life. This include the development of Skills, teamwork, discipline, and well-being evidently improved.

4.5. Green Elements Promoted in Socialized Housing

Promotion of green elements in the socialized housing demonstration project is handled by National Housing Authority (NHA) in coordination with the Philippine Green Building Council (PHILGBC). Activities for the green elements promoted in the socialized housing include the production of green guide draft, awareness meeting and policy brief on the green guide draft, pilot training on the green guide in socialized housing, orientation and validation on implementation plan, initial assessment of the green jobs demonstration project with social partners, and gender sensitivity and awareness training for social partners.
4.5.1. Draft Green Guide in Socialized Housing

The production of green guide is handled by the ILO GJA Consultant PHILGBC in coordination with NHA and ILO. A draft of this guide has already been crafted for further review and approval of the ILO since December of 2011 through series of six stakeholders consultation from developers/investors; decision makers/government agencies, workers’ organizations, housing associations and people’s organization and technical experts on greening. The draft of the green guide reflects the inputs from the stakeholders constitution. It also starts with an introduction and instruction on how to use the green guide and is divided into 16 sections relaying the following:

a) Purpose, scope, and target audience of the green guide
b) Special considerations for the implementation of the green guide
c) Integrated design process, laws, regulations, standards and current best practice for green building
d) Recommendations for site assessment, design planning and management, water, energy, transportation, indoor environment quality, green materials and technologies, emissions, ecological solid waste management, heritage conservation, and innovation.
e) Existing economic models for housing currently used by the NHA
f) Recommendations by the ILO on labour considerations for housing projects and current policies of the Philippine Government.

The Green Guide aims to help users in integrating sustainable practices and strategies in socialized housing communities. This can be achieved by assisting them through the following, stakeholders orientation on important environmental issues, identification of existing government-initiated policies, identification of opportunities for green job creation, identification of current best practice on green building, letting users set project-specific goals and objectives at an appropriate level, establishment of policies and procedures that facilitates holistic decision making in creating sustainable communities. The purpose of the guide is to establish guidelines for decision makers in the public and private sector, promote a sustainable socialized housing sector, and encourage the creation of decent and safe green jobs.
4.5.2. Green Guide for Socialized Housing Pilot Seminar

An orientation seminar on the green guide also commenced on August 28-29, 2012 to educate socialized housing stakeholders on the proper use of the Green Guide. 20 agencies participated in the seminar coming from 5 local government units, 4 private companies, 3 shelter agencies, and 8 other key agencies. The seminar started with an introduction of the Green Jobs in socialized housing demonstration project, the presentation of the Green jobs promotion in the socialized housing sector, and the current initiatives of the National Housing Authority (NHA). Afterwards, the current work of PHILGBC and the BERDE program were outlined together with the presentation of labour standards. Subsequently, the Green Guide presentation proper was discussed. The introductions, presentations, training objectives, and sharing of expectations from the participants were led by representatives from NHA, ILO, and PHILGBC. The seminar continued on following a training module comprised of topics on what is green Jobs, what is green building, how to use the green guide, special consideration, integrated practice delivery, site assessment, design planning and management, water, energy, transportation, indoor environment quality, green materials and technologies, emissions, ecological solid waste management act, heritage conservation, innovation, economic models for housing, and labour considerations. In the end, purpose of the Green Guide was laid out to be as follows: (a) Guidelines for decision makers in the public and private sector, (b) Promoting and incorporating sustainability in the socialized housing sector, and (c) encourage the creation of green jobs that is decent and safe.

*Presentation of the Green Guide*
4.5.3. Awareness Meeting and Policy Brief on the Green Guide for Socialized Housing Projects in the Philippines

The development of a Green Guide for Socialized Housing in the Philippines is part of the advocacy efforts of the Green Jobs Promotion in Socialized Housing Sector Project of the International Labour Organization (ILO) under the Green Jobs in Asia Project. A Policy Brief meeting for the Green Guide for Socialized Housing Projects in the Philippines took place on September 19, 2012. Apart from Ms. Carmen Baugbog, the National Programme Coordinator of the Green Jobs in Asia Philippines of ILO, the attendees of the meeting include the various representatives from the Housing and Land Use Regulatory Board (HULRB), Housing and Urban Development Coordinating Council (HUDCC), National Housing Authority (NHA), and, Philippine Green Building Council (PHILGB). The Policy Brief meeting tackled the policy recommendations to support the adoption of greening of communities built by the NHA and sustainability practices in the socialized housing sectors. According to the Policy Brief developed by Arch. Christopher Cruz de la Cruz, Chairman and President at PHILGB, it strongly recommended the Green Guide be used as an instrument of government in promoting safe and decent green jobs, green building, and the greening of the supply chain of the socialized housing sector. The Green Guide for Socialized Housing Sector aims to (a) Stimulate creation of green enterprises; (b) Promote green jobs creation with decent work through decent and safe work practices in the housing sector; and shift of existing jobs to green collar work; and (c) Facilitate overall transformation of socialized housing sector towards sustainability.

The meeting started with the opening remarks of Ms. Baugbog of ILO followed by the discussion of the background on the green jobs in Asia Project. This was immediately followed by Ms. Evangelina I. Equipaje, Department Manager of the Livelihood Development Department of the NHA, talking about the current initiatives on green jobs demonstration project in Socialized Housing. Arch. de la Cruz of PHILGB then discussed the Purpose of the Policy Brief, Overview of the Green Guide for Socialized Housing Projects in the Philippines, and he concluded his speech with the Presentation of the Policy Brief.
In the presentation of the Policy Brief, Arch. de la Cruz of PHILGB cited that the purpose of the Policy Brief was to (a) provide recommendations for greening socialized housing, (b) promote safe and decent green jobs, (c) Promotion of green building, (d) Greening of supply chain of socialized housing sector, and (e) Creation of a green guide that is complimentary to existing public policy on socialized housing projects. The Policy Brief seeks to support the change to a Greener economy, and it was identified that the creation of green jobs is essential to support this shift and towards sustainability. The use of the Green Guide is needed to complement existing public policy on the creation of socialized housing projects. The presentation followed with the review of the Green Guide for Socialized Housing Projects. The key point of this discussion is on how to use the Green Guide, the presentation of the purpose of the green guide, and scope and special consideration of the green guide. How to use the Green Guide can be as follow: (a) Orienting stakeholders on environmental issues that need to be prioritized and addressed; (b) Identifying existing policies set by government; (c) Identify opportunities for green job creation; (d) Identifying current best practice on green building; (e) Allowing them to set project-specific goals and objectives at an appropriate level; and (f) Establishing policies and procedures that may facilitate holistic decision making in creating sustainable communities. On the other hand, the score of the green guide were as follows: (a) Batas Pambansa Bilang 220, Socialized Housing Act, (b) Maybe used by both public and private stakeholders, and (c) Voluntary until and unless compliance to the guide is made mandatory by a legal jurisdiction.
The Policy Brief was said to be an appropriate tool to support development in the socialized housing sectors. The presentation of the Policy Brief covered the Environmental Challenges, Socialized Housing Demand Scenario, Pursuing and Promoting Green Jobs Creation, Encouraging Green Building as a holistic strategy for Socialized Housing, and the Policy Recommendations. The initiative of green building will push an (a) environmentally preferable and responsible system which reduces the amount of resources extracted from the natural environment during design, construction and operation of buildings, and safeguards occupant health and safety throughout building lifecycle; (b) Green building opens opportunities for greening the supply chain for the sector; (c) Transition of enterprises to green will make way for creation of green jobs; and (d) Green building education and promotion programs to address climate change and environmental protection.

The last part of the presentation of Arch. de la Cruz discussed in detail the policy recommendations in advancing sustainability in the socialized housing scenario. He pointed out that existing government promulgated policies on environmental sustainability have yet to neither incorporate strategies for stimulation of creation of green jobs nor facilitate in greening of building industry. Thus, the development of the green guide, led by the ILO, was conducted. The development of the Green Guide considered a holistic framework that will transition socialized housing sector towards sustainability and was developed by multi-stakeholder group to ensure fair, balanced and robust framework. The policy recommendations as discussed should discuss the current and upcoming issues in the sector of: (a) Growing interest in green building in the Philippines will stimulate needs for new skills and may create new jobs (by utilization of green building technologies), (b) Current approach to addressing environmental issues in the socialized housing sector in the Philippines is largely tangential (use of BERGE Green Building Rating System), and (c) Opportunities exist to overcome social and economic challenges associated with climate change (by Adopting green measures and the Green Guide in the socialized housing sector).
Open Forum

The program continued with an open forum, a discussion of the synthesis and policy direction by Asec Felix William B. Fuentebella, Deputy Secretary-General of HUDCC, and closing remarks given by Arch. Ma. Benita O. Regala, Department Manager of the Housing Technology Development Office of NHA. The Policy Brief meeting concluded with the summarization of issues that were brought up during the open forum and synthesis. These include the following: (a) Operationalization of the Green Guide to implement it in the local government units, (b) Entry point of the Green Guide in existing government rules and regulation, and (c) the actual implementation of the Green Guide in the socialized housing sector.

Participants of the Policy Brief for Green Guide for Socialized Housing Projects in the Philippines
Conclusion

It was observed that the partners and stakeholders in the Policy Brief meeting were already aware of the benefits of greener communities and were making a strong case on the greening of socialized housing projects. However, the group were faced a road block on how the Green Guide should be implemented and operationalized at the local level. As a conclusion, there is a constant effort by entities coming from the government agencies and private sector in pushing the concept of green and sustainability in promoting safe and decent green jobs, green building, and the greening of the supply chain in the Philippine property sector, particularly in socialized housing sector, by pushing the initiative of the Green Guide. But, these entities have yet to come up the strategies to operationalized and implement the policies in the socialized housing sector.

4.5.4. Gender Sensitivity Training for Social Partners in Socialized Housing Demonstration Project

The gender sensitivity training for social partners in socialized housing demonstration project is a whole day session conducted on September 20, 2012 at LETO Christian Center Rodriguez, Rizal. About 38 participants attended the training coming from those trained for green materials (mchb and coconet). Six male mCHB workers and 32 female Coco Coir workers attended the Gender Sensitivity Session to raise awareness on the equal opportunities of men and women in the world of productive work and to discuss stereotype roles assigned to men and women. Two speakers facilitated the training namely Delia Bendanillo and Sonia Rapisura.
The training started with an introduction on sex and gender, getting to know the participants, and confidence building. The subsequent sessions dealt with a series of discussions and workshops with topics on reflection of participants, access and control of resources and benefits, and analysis of factors. At some point in these sessions, the participants were divided into groups (mixture of men and women). Each of these groups performed a role-playing act on how women should be treated in society wherein the group were seen to be highly participative.

*Participants’ Role Play their Interpretation of Gender Sensitivity*

*Ms. Carmen Baugbog of ILO Talking about the Importance of Gender Sensitivity*

The training concluded with a message from project stakeholders and a graduation ceremony for participants. Carmen Baugbog from the ILO, briefed the participants on the role of ILO in the green jobs in socialized housing demonstration project where the gender sensitivity training program belongs. Towards the end of the program, each participant were called on stage to receive a certificate of participation in the gender sensitivity training program.
4.5.5. Good Practices and Lessons Learned

The following are the good practices and lessons learned that could help in the improvement, enhancement, and assessment of green element promotion initiatives in the future.

**Good Practices:**

- Exchange of ideas between partners to promote better understanding of the green guide and policy brief and brainstorming on strategies for promotion of green jobs in socialized housing projects from different partners
- The use of Tagalog language during the training ensured that the message was conveyed and understood by the participant
- Participants were given recognition and acknowledgement of their attendance in gender sensitivity training. Constant effort is also done to create awareness on gender sensitivity

**Lesson Learned:**

- Operationalization of the green guide and policy brief manual is vital for the implementation in local government levels
- Current government regulations should be aligned with the green guide and policy brief for effective implementation
- Future trainings should be more activity based (e.g. workshops) than lecture-based to engage participants
APPENDIX A: Process Documentation Video Outline

I. Background on Green Jobs
   a) Statements from stakeholders regarding green jobs
   b) Green jobs in Asia and in the Philippines

II. Green Jobs and socialized housing
   a) Progression of Socialized housing
   b) Linkage between green jobs and socialized housing

III. Framework for the creation of green jobs
   a) Sustainable Construction Employment Model
   b) Statements from stakeholders regarding such approach
   c) Structure, Roles and Responsibilities → interviews and statements from stakeholders
   d) mCHB
      i. Statements as to why mCHB production could generate green jobs
      ii. Pictures/Video of activities
   e) CoCo Net
      i. Statements as to why CoCo net production could generate green jobs
      ii. Pictures/Video of activities
         1. OSH
         2. Training
         3. Production
   f) Green Based Community Enterprise Development → Pictures and Video
   g) Formation of worker’s guild → Pictures/video and legal document
APPENDIX B: Advocacy Video Outline

Advocacy Video Outline

Focus on a storyline of a person on how his/her life has changed

1. Life before the green jobs project (Video of life before green jobs → Introduction of the person and a short video of daily routine)
   a. Background of focus person
   b. Feedback when invited for the green jobs project implementation

2. Implementation of green jobs project
   a. Role in the project
   b. Opinion/Feedback regarding the project
   c. Pictures and video during the implementation
      i. Training (comments)
      ii. OSH (comments)
      iii. Production (comments)

3. Life after green jobs project
   a. Learning about green jobs
   b. Did it improve your life? How?
      i. Work?
      ii. Increase in salary?
      iii. Increase in quality of life for self and possibly children/family
   c. Comparison of life before and after green jobs?
   d. New routine after green jobs project
APPENDIX C: Evaluation of production process of Modified Concrete hollow blocks (mCHB) using manual approach

Evaluation of Inputs

*Man*

- No record to tracked raw material releases. Raw materials were immediately released when needed.
- At the time of evaluation, only 2 workers showed up at the production site and collaborated with MCM to produce mCHB.
- According to the in-charge personnel of MCM who is responsible in training the workers, recruitment of workers was weak since recruits were unwilling to go through the nature of the hollow block production. Here were some of the specific reasons cited by the workers:
  1. Hollow block production is a dirty job.
  2. Workers do not want to undertake heavy lifting.
  3. Workers became unmotivated when the subsidiary food allowances were no longer included in the remuneration package.
- Total working hours were not enough to achieve daily targets.
  - Current output is 100 hollow blocks per 5 hours of work for 2 persons.
    - Workers can work up to 8 hours only per day.
  - Daily Target output increases over time to accommodate learning period and learning curve during the training period.
    a. Output of 300 mCHB (for 2 to 3days)
    b. 500-600 mCHB (for 4th-7th day)
    c. 600-1000 mCHB (for 8th day - 15th day)

*Machine*

- Mold equipment was hard to handle and use causing some formed blocks to break as worker carefully use it.
Handling of Manual Loading

- No standard placement of tools as worker does one activity to another. The figure below shows several workers waiting for instructions from the trainers on what process/task to do. Task allocations were not performed by the trainers.

Workers at Production

Materials

- No standard amount of water to be used in the production process. Workers only estimated the water to be used depending on the aesthetic indicators of the mixture output. This caused variability of the production process.
Estimation of Water Pouring during Mixing Process

- White sand and black sand were exposed to unwanted elements (e.g. rain, dirt particles) since it stored outside, open area.

Methods

- Raw material preparation is only upon request of workers. Workers cannot start the production unless MCM personnel were present.
- Workers had no knowledge on the production mix. Workers were only taught with the production process, but were not familiarized with the science of the production
mix. These include the purpose of each of the inputs included in the mix. This hindered their learning on all aspect of the production process.

Evaluation of Process

*Man*

- Workers have little or no knowledge on the rationale behind the production process since it was not initially taught to them.
- Workers have no knowledge on the composition of the generic mix.

*Machine*

- Molds were difficult to handle making work inefficient and uneasy.
- Defective molds and mHB mixture tends to get stuck in the mold.
Mixture during the mixing process is exposed to elements that could lead to contamination of cement mixture. The contamination of standard mixture of mCHB could lead to unexpected and unwanted outputs which were considered as rejects.
• Materials in the working area were exposed to different weather conditions causing weaknesses in work-in-process mCHB.

Methods
• No quantitative or objective way of mixing the mCHB mixture. It is dependent on the subjective evaluation of the workers. The figure below shows the variability of the water content of the mixture.

![Too Much Water] (Too Dry)

Different Water Content in the Mixture

• Release of mixture from the mold leads to possible material wastage. The consequence of rework from collapsing hollow blocks (after release from mold) leads to unmonitored wastage of materials.
(Wastage during Pouring Mixture to Mold) (Wastage during Release of Mixture from Mold)

Mixture Wastage during Molding Process

- No standard for ensuring cement compression in mold. As can be seen in the figure below, the workers only used a stick to compress the mixture and also to remove excess and uneven mixture in the mold frame. This varied depending on the worker’s application of strength in the compression process. Compression was applied by smashing the stick on the mold.
There was no standard assessment tool to evaluate the progress of the training. The need of monitoring, evaluation and assessment of training output and performance was not conducted.

**Occupational Safety and Health**

- There was no first aid kits provided in the training site.
- Workers were not equipped with Personal Protective Equipments (PPE’s) such as gloves or masks. Orientation on Occupational and Health Hazard in construction was conducted by a representative in the labour group; however, it was not practiced in the production site.
Workers with PPEs

- Workers could experience back pain due to bad positioning and posture.
- Process was labour intensive and decreases productivity due to fatigue.

Evaluation of Output

Issues on output quality
• Quality characteristic were only available based on knowledge of supervisor, workers were not knowledgeable in quality control specifically in determining how to assess which outputs were acceptable or not. This is a weakness since the quality of the output is dependent on the supervisor from MCM and not from the worker conducting the production process.

• No machine (e.g. compression tester) was used to measure the quality of finished goods (FG). Again, quality is dependent on the skills of the workers.

• 5% reject rate of finished hollow block that were stacked according to supervisor.

\[ \text{Sample mCHB Rejects} \]

• Rework of 3 to 4 hollow blocks during the mixture release in molding process per batch were observed. These were a result of very wet mixture causing the collapse of the molded mixture or due to human error of the worker upon the release of mixture from the manual mold.

\[ \text{1 batch of mixture = 12 hollow blocks} \]

**Issues on storage of finished goods**

• Wet hollow blocks were exposed to unwanted elements. Due to exposure to unwanted elements, in particular rain, wet mCHB outputs easily breaks. Also, poor storage also caused damages of hollow blocks that were undergoing the curing process. Curing process of mCHB takes 7 days, at the minimum. Unsheltered mCHB that were in the curing stage were easily damaged by the bad weather condition. Poor storage is attributed to uncovered (roof) work area and storage, and unenclosed area which lead to security issues (e.g. theft). Exposure is inevitable since the storage area is an open area.
• It was observed that the roofing structure was used for the purpose of providing shelter to the workers, not for safety of the work-in-process and finished goods.

Storage of Finished Goods

• Stacking system of hollow blocks can result to damaged finished goods. This is because FGs were stacked on top of each other. Unobserved wet FGs might collapse.

Cause and Effect Diagram

The figure below summarizes several root causes that resulted to the inability of the production process to achieve the lowest output target of 300 mCHB per day. The Ishikawa Fishbone diagram was used to determine the cause of the problem and then the causes of the cause. This can be seen in Figure 11.
**Figure 11 Cause and Effect Diagram of mCHB Production**

**Table 6 Prospective of mCHB Production Output**

<table>
<thead>
<tr>
<th>mCHB Inputs</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Man</td>
<td>2 workers</td>
</tr>
<tr>
<td>Observed Working hours</td>
<td>5 hours of work</td>
</tr>
<tr>
<td>Actual Output</td>
<td>100 hollow blocks / 5 hours of work for 2 person</td>
</tr>
<tr>
<td>Output per hour</td>
<td>20 hollow block / hour for 2 workers</td>
</tr>
<tr>
<td>Estimated Income</td>
<td>P 10/ per person per hour</td>
</tr>
<tr>
<td>( @ 1 peso/mCHB for manual approach)</td>
<td></td>
</tr>
<tr>
<td>Targeted output</td>
<td>300 hollow blocks/day per person</td>
</tr>
<tr>
<td>Conclusion</td>
<td>The current set-up of the manual approach of the mCHB could not achieve the minimum daily targets of 300 mCHB per worker. This conclusion was strongly based on the actual output of 2 workers of 100 mCHB. A single worker could only produce 50 mCHB. It is</td>
</tr>
</tbody>
</table>
unlikely that a single person can produce 300 mCHB after acquiring the required skills over time. This is because the production set-up is too labour intensive, the productivity of the workers will decrease over time due to fatigue.
APPENDIX D: Evaluation of production process of Modified Concrete hollow blocks (mCHB) using mechanized approach

**Man**
- There were only four workers who reported to the relocated mechanized mCHB production site.
- The number of workers was reduced to four workers because only required the said number of workers since there were only two mechanized molding machine available. Each machine can be operated by only two workers.

**Machine**
- The mechanized hollow block machine broke down twice in last week’s training cum production (July 2 to 6, 2012). This caused the long halt/delay of the production since the MCM personnel were awaiting for the arrival of replacement for the machine to operate again. The replacement part was said to be delivered by another personnel of MCM not assigned in the training site.
- The mechanized machine of MCM is 15 years old, but was repaired and tuned up prior to the training cum production.
- The shed covering the molding machine was small. Machine could still be exposed to environmental hazards (e.g. rain). Also, holes were present in the shed which posed a risk of water leaking the machine.
- The machine is not exclusive to the formula since the machine is old. This means that the machine can produce the same size with regular mix of hollow block. The machine does not post an advantage for the mCHB over other hollow block since it is not dependent on the mix.
Methods

- The relocated production area also was not secured from natural and manmade elements that will affect the output. This can be seen in the figure below showing that the production site was not entirely covered with roofing structures.
Mechanized Hollow Block Production Site

- The consequence of poor storage allowed the first 72 mCHB produced using the mechanized approach during the first 2 days of training cum production to be damaged and washed away by the successive rains in the area.

- A common practice of workers was that they usually apply more amounts of raw materials than the standard measurement of the mixture taught by the trainers and set by MCM. Workers made it a habit to provide more than “what is needed?” even though they were aware that they used more than the standard measurements. The MCM trainers only occasionally observed this occurrence and then immediately provide corrections and interventions. However, MCM do not have control on mixture done by workers when MCM trainers were not around to observe the workers in production. Material wastage was evident during this practice by the workers.

*Damaged Finished Products (From left to right: breakage, cracks and sliced)*
• Storage of the raw material of sand and gravel was also located outside the enclosed area of the production site. The risk of pilferages and wastage of sands through the means of wind transport existed.

![Sand and Gravel Storage](image)

• The molding process became easier for the workers and more consistent blocks were produced due to the presence of the mechanized molding machine. Also lesser rework of hollow block outputs took place since the mixtures inside the mold were more intact and well compressed by the machine. It did not easily break when the molded mixture was removed from the mold.

*Material*

• The quality of the hollow block outputs using the manual and mechanized approach differed. The quality of the hollow block outputs using the mechanized approach was more consistent across hollow blocks and the texture was finer than the outputs using the manual approach (see figure below).
mCHB output using Manual approach        mCHB output using Mechanized approach

Manual (left, light color) vs Mechanized (right, dark color) outputs

Comparison of Outputs
APPENDIX E: Evaluation of production process of coco twine

Evaluation of Inputs

*Man*

- Releasing of raw materials was dependent on person in-charge of CocoTech to the community. Workers cannot start production when they do not have access to raw materials.
- Workers had limited knowledge in recording the material released.

*Machine*

- Some of the twinning machines were defective. Workers had a hard time in repairing the machines. These lead to production delays and halts.

*Materials*

- Raw materials storage area was far from work area. The distance of the storage area to the houses of the workers, the work area, was approximately 800 meters.
- Raw materials were exposed to unwanted elements since it was stored outside the household of workers. Some of the unused raw materials eventually became wasted.
Division of raw materials of coco fiber was not measured as it is distributed to different groups. This is an issue in material release.

Methods

- There was no record system in the procurement and distribution of raw materials.
- Best practices on keeping the right thickness of twines were not taught to workers. The workers were only given a sample finished product and then used it as a sample to be replicated during production. Thus, the workers were having difficulty in judging the acceptable thickness of the twines.
• The work area was small. The workers only allotted a small area of their household as the production site. Looking at the picture below, this area covers the area where the woman (in pink) is operating the machine up to where the two women in the other side were standing; and also above the platform. Small and uneven work area increased unnecessary movement of workers.

![Work Area in Household](image.png)

**Evaluation of Process**

*Man*

• There was no clear job allocation. Each worker in a group could rotate from twining to operating the twining machine. These hinders skill development in the twining process, particularly in getting hold of the correct thickness of the twine and avoiding of twine breaking during production.

*Machine*

• Twinning machines could easily be broken during use. This lead to a continuous delay in production.

*Materials*

• Material wastage of coco fibers was evident. Wasted raw materials were scattered in the work area. Upon observation, the workers were not aware that raw materials were wasted. Accumulation of this wastage will lead to a bulk of unused raw materials that are unmonitored. This is illustrated in the succeeding figure.
Unmonitored Wastage of Raw Materials

Methods

- Twines easily broke during twining process causing temporary halt/delay in production, halt occurs in certain intervals.
Thickness of twines was estimated. The thickness of the twine outputs were not standardized and non-uniform.

Length was designated by Cocotech supervisor. Although the target length per twine was 11 meters, there were some instances where the twine length varied.
• Folding the rope were not exact

**Occupational Safety and Health**

• Workers were exposed to environmental hazards (sun and rain). This was because there was only a few portion of the work area that was covered with roofing structures. Workers were sometimes forced to exceed the covered work area in order to accommodate production constraints.

• Same as the issue in the mCHB production, workers in Coconet production did not have PPEs.

![Workers at Production](image)

**Workers at Production**

• Workers could be wounded by the fiber.

**Issues on Quality**

• No machine was used to measure the quality of finished goods (FG). These include the quality control of thickness, length, and compression strength of the coco twines.

• Thickness and length were just estimated

• Cannot undo or rework unacceptable finished goods.
Cause and Effect Diagram

The Ishikawa Fishbone diagram was used to determine the cause of the problem and then the causes of the cause. This can be seen in Figure 12 Cause and Effect Diagram of CocoTwine Production.

![Figure 12 Cause and Effect Diagram of CocoTwine Production](image)
### Table 7 Prospective of Coco Twine Production Output

<table>
<thead>
<tr>
<th>Coconet Inputs</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Man</td>
<td>4</td>
</tr>
<tr>
<td>Machine</td>
<td>1</td>
</tr>
<tr>
<td>Observed Working hours</td>
<td>5 hours of work</td>
</tr>
<tr>
<td>Actual Output</td>
<td>20 twines / 5 hours of work for 2 person</td>
</tr>
<tr>
<td>Output per hour</td>
<td>4 twines/ hour for 2 workers</td>
</tr>
<tr>
<td>Estimated Income</td>
<td>P 25/ per 2 person per hour</td>
</tr>
<tr>
<td>( @ 1.25 peso/twine)</td>
<td></td>
</tr>
<tr>
<td>Conclusion</td>
<td>At the time of assessment, there were 5 rolls of Coco coir system (CCS) twines produced. The requirements for weaving activity are 30 rolls.</td>
</tr>
</tbody>
</table>

### Table 8 Actual Production Output as of August 14, 2012

<table>
<thead>
<tr>
<th>Coconet Inputs</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Man</td>
<td>45 workers</td>
</tr>
<tr>
<td>Machine</td>
<td>12</td>
</tr>
<tr>
<td>Observed Average Working hours</td>
<td>5-8 hours of work</td>
</tr>
<tr>
<td>Actual Total Output</td>
<td>9500 twines</td>
</tr>
<tr>
<td>Estimated Income (@ 1.25 peso/twine)</td>
<td>P11,875</td>
</tr>
<tr>
<td>Targeted output</td>
<td>13500 twines</td>
</tr>
<tr>
<td>Conclusion</td>
<td>The requirements for weaving activity are 30 rolls or 13500 twines. The production phase of Coconet cannot still proceed to the weaving phase because it is still short by 4000 twines.</td>
</tr>
</tbody>
</table>