



**CLIMATE &
CLEAN AIR
COALITION**
TO REDUCE SHORT-LIVED
CLIMATE POLLUTANTS

Climate & Clean Air Coalition (CCAC)

Brick Initiative

Global & Asia Workshop of

“Brick Kilns Policy and Advocacy Network”

18 - 20 February 2015,

Godavari Village Resort, Kathmandu, Nepal



Organized by

***ICIMOD with the support of the Climate and Clean Air Coalition to
Reduce Short-Lived Climate Pollutants (CCAC)***

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1 Background

Brick production is an important area where the emission of black carbon and other short-lived climate pollutants (SLCPs) can be substantially reduced. Studies show that using more efficient technologies, mainly during the firing of bricks, can reduce pollutant emissions by 10–50%, depending on the process, scale and fuel used. The Brick Production Initiative (BPI) of the Climate and Clean Air Coalition (CCAC) aims to catalyse political engagement by placing the goal of reducing SLCPs from inefficient brick production on the national agenda.

To improve regional brick kiln policy by taking into account the economic, technological, environmental, and social context of each country, a Brick Kilns Policy Advocacy Network (PAN) has been launched both at the global level as well as the regional level through two networks in South Asia and Latin America.

The objective of the Policy and Advocacy Network (PAN) is to provide decision makers, national governments, and subnational entities with tools, information, and programmatic support to develop comprehensive policy frameworks to improve brick kiln conditions and operations.

The global and regional policy and advocacy networks will help build decision-maker capacity to pursue policy and budgetary/financing actions and advance meaningful development, implementation and enforcement of regulations to reduce emissions related to brick production. The PAN will address policy and advocacy needs by:

- Evaluating and assessing current policies in countries with brick production (both developed and developing) in order to leapfrog learning from other experiences
- Developing a portfolio of policies that could be implemented at the different countries

2 Objective

The first workshop of Global & Asia Policy and Advocacy Network (PAN) was held on 18 – 20 February 2015 at Kathmandu, Nepal. The main objectives of the workshop were to

1. Identify main development concerns posed by brick production
2. Articulate a common vision for the brick sector
3. Develop an understanding of policy approaches/ specific policies adopted by various countries

4. Prioritize regional actions and prepare an action plan of work to be undertaken by PAN.

3 Agenda of the Workshop

Day 1 (February 18, 2015)	
9:00 - 9:45	Registration
09:45 -10:30	<p>Welcome remarks</p> <ul style="list-style-type: none"> • Dr Eklabya Sharma, Director, Programme Operations, ICIMOD <p>Remarks</p> <ul style="list-style-type: none"> • Hon'ble Chandra Maharjan, CA member and Brick kiln entrepreneur <p>Introduction to the CCAC Brick Initiative</p> <ul style="list-style-type: none"> • Catalina Etcheverry, Coordinator, CCAC secretariat <p>Introduction to the workshop</p> <ul style="list-style-type: none"> • Bidya Banmali Pradhan, ICIMOD <p>Round of introductions by the participants</p>
10:30 -12:30	<p>Session I: Setting the context</p> <p>The session consisted of 3 regional presentations from Latin America, Africa and Asia. The presentations cover:</p> <ul style="list-style-type: none"> • Status and characteristics of brick making (production, technologies, enterprises, future demand trends, etc) • Environmental, economic, social and other impacts of brick making (air pollution, fuel and clay resources, employment, working conditions, etc) • Policy approaches used <p><i>Chairperson: Arun Shrestha, Regional Programme Manager, ICIMOD</i></p> <p><i>Presenter:</i></p> <ul style="list-style-type: none"> • <i>Asia: Sameer Maithel, Greentech Knowledge Solutions, India</i> • <i>Africa: Daniel Wyss, PROECCO, Rwanda & Burundi</i> • <i>Latin America: Jorge Daniel Taillant, Executive Director, Centre for Human Rights and Environment – CEDHA,</i>
12:30 -13:30	Lunch
13:50 -16:15	<p>Session II: Environmental policies & regulations in promoting cleaner brick production</p> <p>Various countries have used environmental policies/ regulations (e.g air emission norms, banning of certain technologies and fuels, kiln siting rules, mandating use of waste materials, regulating the mining of raw materials, etc) to reduce negative environmental impacts of brick making.</p>

	<p>The session would have four presentations, the presentations will cover:</p> <ul style="list-style-type: none"> • Description of the policies/regulations • Rationale and process of formulation • Implementation process and challenges • Overall impact and experiences <p><i>Chairperson: Daniel Wyss, PROECCO, Africa</i> <i>Presenter*:</i></p> <ul style="list-style-type: none"> • <i>Chile: Maria Eliana Vega Fernandez, Regional Ministerial Secretary of Environment-Maul, Chile</i> • <i>Africa: Luca De Giovanetti, Swiss Contact, South Africa</i> • <i>Bangladesh: Mominur Rahman, Bangladesh University of Engineering & Technology</i> • <i>Colombia: Jose Ricardo Lopez, Local Authorities (Director), Corpoboyaca, Colombia</i> • <i>Nepal: Devi Bhandari, Department of Environment, Nepal</i> • <i>Pakistan: Tahir Pervaiz Dar, TechnoGreen Associates, Pakistan</i>
<p>16:15 -17:15</p>	<p>Session III: Building construction regulations, green labels & market mechanisms to promote the demand/market for cleaner bricks</p> <p>Building construction regulations, green labels and market mechanisms helps in creating demand for cleaner bricks.</p> <p>The presentations will cover:</p> <ul style="list-style-type: none"> • Description of the regulation/ label/ mechanism • Rationale and process of formulation • Implementation process and challenges • Overall impact and experiences <p><i>Chairperson: Arnico Panday, Programme Cordinator, ICIMOD</i> <i>Presenter:</i></p> <ul style="list-style-type: none"> • <i>Vietnam: Vu Thi Kim Thoa, Entec AG, Vietnam</i> • <i>Nepal: Usha Manandhar, MinErgy, Nepal</i>
<p>Day 2 (February 19, 2015)</p>	
<p>9:00 -9:10</p>	<p>Recap of Day 1</p>
<p>9:10 -10:45</p>	<p>Session V: Industrial policies for the promotion of cleaner brick production</p> <p>Pro-active industrial sector policies in the form of incentives, tax benefits, access to finance, training, technology delivery etc. can be used to promote cleaner brick production.</p>

	<p>The presentations will cover:</p> <ul style="list-style-type: none"> • Description of policies • Rationale and process of formulation • Implementation process and challenges • Overall impact and experiences <p><i>Presenter:</i></p> <ul style="list-style-type: none"> • <i>Colombia: Aura Luisa Rodriguez, Coordinador Sectorial, CAEM</i> • <i>Africa: Jamal Abboud, Manager, Industrial Depollution Fund of the Ministry</i> • <i>China: Ashish Shrestha, World Bank</i> • <i>Vietnam: Vu Thi Kim Thoa, Entec AG, Vietnam</i> • <i>Nepal: Amit Acharya, Department of Industries, Nepal</i>
10:45 -11:00	<i>Tea</i>
11:00 -12:00	<p>Session IV: Cross-Cutting Issues in the transformation of brick industry</p> <p><i>Chairperson: Maria Eliana Vega Fernandez, Regional Ministerial Secretary of Environment (SEREMI), Maul Region</i></p> <p><i>Presenter:</i></p> <p><i>Labour policies/programmes in promoting decent working conditions :</i></p> <ul style="list-style-type: none"> • <i>J John, Centre for Education & Communication, India</i> <p><i>Development of Market for cleaner bricks</i></p> <ul style="list-style-type: none"> • <i>O P Badlani, India</i> <p><i>Role of regional partnership networks in promotion of cleaner brick production</i></p> <ul style="list-style-type: none"> • <i>Suresh Shrestha, SAARC Energy Centre, Pakistan</i> <p><i>Occupational health and safety concerns of brick kiln workers</i></p> <ul style="list-style-type: none"> • <i>Bhisma Pandit, Nepal</i>
12:00 – 12:45	<p>Session VI: Policy Advocacy Approaches</p> <p>Sustained and effective policy advocacy is required to establish a comprehensive policy framework for cleaner brick production. What can we learn from experiences of policy advocacy in brick or similar sectors.</p> <p>The presentations will cover:</p> <ul style="list-style-type: none"> • Description of the problem • Policy advocacy approach/ campaign • Implementation and challenges • Overall impact and experiences

	<p><i>Chairperson: Reto Thoenen, Swiss Agency for Development and Cooperation</i></p> <p><i>Presenter*:</i></p> <ul style="list-style-type: none"> • <i>Nepal: Nawa Raj Dhakal, AEPC, Nepal</i> • <i>India: Nivit Kumar Yadav, Centre for Science & Environment, India</i>
12:45 -13:30	Lunch
13:30 -17:30	<p>Session VII: Group Work: Formulation of Vision and Policy Approaches</p> <p>Participants will be divided into 3 thematic groups</p> <ol style="list-style-type: none"> 1. Environment and Industrial Policies, 2. Development of market for cleaner bricks, 3. Reducing the negative social impact of brick industry <p><i>Moderator team: Sameer Maithel, Catalina Etcheverry and Bidya Banmali Pradhan</i></p>
18:30 – 21:00	Dinner
Day 3 (February 20, 2015)	
09:30 -12:15	<p>Session VII (Contd)</p> <p>The three groups presented the outcomes of the group work. This was followed by discussion.</p>
12:15 -12:30	Valedictory Session
12:30 -13:30	Lunch
13:30 -18:00	Field visit to brick kilns

4 Proceedings

4.1 Day 1: 18 February 2015

4.1.1 Inauguration Session

4.1.1.1 Welcome Remarks: Dr Eklabya Sharma, Director Operations, ICIMOD

Dr Eklabya Sharma inaugurated the workshop by welcoming all the participants to the workshop. In his welcome remarks, he provided an overview of ICIMOD activities towards mitigating Black Carbon emissions, including activities in Brick Kilns, Agriculture burning, and household cookstoves. He mentioned that brick kilns are significant contributor of Black Carbon emissions in the Kathmandu valley. He also emphasized the role of media in disseminating the knowledge to stakeholders particularly policy formulators. He said that the topic of mitigating Black Carbon is related to Science, Policy, Practice and People with the most important co-benefits of betterment of health of human being and livestock. In the end, he once again welcomed all the participants and wishes them luck for the meeting the objective of the workshop.

4.1.1.2 Remarks: Hon'ble Chandra Maharjan, CA member and Brick kiln entrepreneur

Hon'ble Mahajan extended his warm welcome to all the participants, experts and representatives of government of Nepal and other countries. Hon'ble Mahajan, who is also a brick kiln entrepreneur in Nepal shared his experience of switching to cleaner firing technology. While sharing his experience, he mentioned that in choosing the firing technology careful due diligence is required. Presently, he is operating a 6 shaft VSBK which was constructed with the support from SDC programme. The cost of construction of VSBK was high but he has realized the environmental benefits of the cleaner technology.

He suggested that providing financial incentives like house tax rebate etc to the users for bricks produced from cleaner technologies may help in developing market for cleaner brick firing technologies and thereby can overcome the barrier of high capital cost. He has been raising the issues pertaining to brick kilns with the government of Nepal and will ensure that the issues are registered at the highest level of the government. Finally he wished good luck to all the participants for the workshop.

4.1.1.3 Introduction to the CCAC Brick Initiative: Catalina Etcheverry, CCAC Secretariat

Ms Catalina Etcheverry, started with providing a background on Short Lived Climate Pollutants (SLCP's) and its impacts. She also explained that SLCP's are responsible for 20% of the historical global warming and 40% of current warming influence. She emphasized that mitigation of SLCP's could not only avoid 0.6°C by 2050 but also help in avoiding 2 million premature deaths per year and 32 – 50 million ton/year crop losses by 2030.

Further, she introduced the CCAC objective, approach and structure to the participants. While explaining the initiatives under CCAC initiatives, she explained that the CCAC initiatives consist of collectively agreed strategic streams of work providing directions for the collaborative and individual action of the CCAC Partners, through and beyond activities financed by the CCAC Trust Fund. She also highlighted key characteristics of the CCAC initiative:

- i. Structured around a sector or a cross-sectoral issue (Cover reductions of all three core pollutants: methane, black carbon (BC), & HFCs)
- ii. Coherent, integrated, and well-coordinated efforts that can encompass a number of activity streams
- iii. Built upon scientific evidence, and building on existing efforts
- iv. Associated with measurable long term goals (vision, timeline and magnitude of SLCP reductions) to be achieved through theory of change (rationale for action, strategy to deliver, and comparative advantage of the CCAC)
- v. Focus on quick, low-cost impacts, leveraging other efforts & scalability

In the end, she emphasized that all the CCAC members are looking forward to see the impact of the CCAC initiatives.

4.1.1.4 Introduction to the Workshop: Bidya Banmali Pradhan, ICIMOD

Ms Pradhan started with providing brief description of the four components of the CCAC brick production initiative; (i) CCAC Policy and Advocacy Network (PAN Global) , (ii) Climate Accounting Measurement and Analysis (CLIAMA), (iii) Technology Training Nodes and (iv) Regional Policy and Advocacy Network (South Asia PAN) . She also explained the main tasks involved in each of the four components of the brick initiative. At the end she laid down the objective of the workshop to the participants.

4.1.2 Session I: Setting the Context

Chairperson: Arun Shrestha, Regional Programme Manager, ICIMOD

4.1.2.1 Brick Industry in Asia: Dr Sameer Maithel, Greentech Knowledge Solutions

The presentation by Dr Sameer Maithel was focused upon providing an overview of the status and characteristics of brick industry in Asia. The main points emerging from the presentation are provided below

- Asia is the most populous continent. It is estimated that 80% of the global brick production takes place in Asia. Highly populated regions - China & South Asian countries are some of the major producers of bricks
- South Asia countries are predominantly using solid clay fired bricks, while China and Vietnam has already made a shift to variety of walling products including Solid clay fired bricks, hollow blocks and various non-fired products. Several other countries like Philippines are predominantly based on non-fired products.
- There are significant differences in brick industry and production processes production process between south Asian brick industry and Chinese and Vietnamese brick industry
 - South Asian brick industry consists of relatively small-scale, traditional, informal, un-organised, seasonal production system (max. production 10 million bricks/year). It relies heavily on migratory workforce as majority of processes are manual.
 - Chinese and Vietnamese brick industry is moving towards large-scale, industrial, organised, year-round production system (max. production 120 million bricks/year). Most of the processes are mechanized. Also there is a national policy framework to transform the brick industry towards cleaner and efficient brick production
- Environment, economic and social impact of brick industry is high. Loss of agricultural top soil, land degradation, Air pollution and wastage of fuel are some of the most pressing issues that require immediate attention.

- A comprehensive policy framework for cleaner brick production is required that also takes in to account the emerging context of the brick industry in south Asia.

4.1.2.2 *Brick Making in East Africa: Daniel Wyss, Promoting Off-farm Employment in the Great Lakes Region through Climate Responsive Construction Material Production (PROECCO)*

Mr Daniel Wyss started with providing a brief background of the Great Lakes Region in the Eastern Africa. Brick making in Great Lakes region consist of few industrial kilns but majority of brick production is artisanal. Artisanal brick production is a seasonal activity during the dry season. Wood fired clamps are the main firing technology used in artisanal brick production. However, government as well as private entrepreneurs have tried a variety of other brick kiln technologies but have gained limited success. Deforestation due to wood consumption and land degradation has been identified as important impacts of brick making by the government of the region. Government has banned the use of firewood for brick making purposes.

The PROECCO project supporting the brick makers by

- Providing clay quality testing services for new brick makers
- Building model houses that can help the authorities develop specific regulations for climate responsive construction and thereafter providing vocational training to the skill force for effective implementation of the regulations
- Developing web maps and online knowledge base for technical information.
- Developing manual/motorized extrusion machines for production of bricks of standard size and quality.
- Reactivation of abandoned kilns and demonstration of new and appropriate brick firing technology like downdraught kiln, VSBK and semi industrial Zigzag kilns using alternate fuels like Sawdust and Rice husk.
- Providing business planning and management training to brick makers so that they can access the credit collateral fund by the government

4.1.2.3 Impact of Brick Making in Latin America: Jorge Daniel Taillant, Executive Director, Centre for Human Rights and Environment – CEDHA

Mr Jorge joined the meeting through skype and said that to initiate a public policy response it is important that the policy makers recognize the negative impacts of brick making. One of the important roles of PAN should be to bring this recognition, which will then put pressure on the policy makers to address the issues.

He emphasized on the need of comprehensive policy measures including various aspects such as land planning, health, climate, etc. through collaboration among different agencies/departments at national as well as local level. He also suggested that there are big differences and diversity in local developmental issues even within a particular region and this should be taken into consideration while developing policy measures.

4.1.2.4 Question and Answer on Session – I

Q: What is the status of brick making in other countries of Africa

Daniel Wyss: As far as I know, the brick sector in Africa varies a lot. In several countries of Central Africa, it is more artisanal. On the other hand in countries such as South Africa, Morocco it is more industrial and in countries like Egypt they use brick kilns which are similar to Bull’s Trench Kilns used in South Asia. .

Q: What are other environment regulations on brick industry in Rwanda apart from ban on using firewood for brick making?

Daniel Wyss: There are regulations on rehabilitation of the clay quarrying sites but there are no specific guidelines to that regulation

Q: What are alternate building material options other than fired clay bricks that are being used in South Asian countries?

Sameer Maithel: A variety of other alternate building materials are being used in India. For eg Aerated Concrete Blocks are finding their market in parts of the country and prefabricated concrete panels are being used in big cities like Chennai, fly ash based products are being used in central India but overall the contribution of alternate building materials is very less as compared to fired clay bricks.

Q: What could be the social implication of transforming clay fired brick making enterprises to production of non-fired material as presently majority of the brick industry consist of small family owned enterprises

Sameer Maithel: Most of the enterprises in non-fired building material production are new enterprises. It would be very difficult for traditional family owned brick production enterprises to shift to non-fired material production enterprises because it will require changes in managerial processes as well as the type of labor employed. The social impact of shifting the building material to non-fired material are expected to be high.

Jorge Daniel Taillant: There are social implications of transformation particularly for small scale owners, because it would be most difficult for them

Q: Dr Sameer, Can you please share some of your experiences of using internal fuel in India

Ans: Mixing internal fuel with the raw mix has been used in various places in India. However, care must be taken before mixing fuel with clay as clay at some places is not suitable to have internal fuel mixed. The clay sample must be tested to check its appropriateness for mixing of internal fuel. Another issue is uniform mixing of clay with fuel, which will require use of machines for raw mix preparation and moulding.

Q: What have been the experiences of providing finance to brick kiln owners?

Daniel Wyss: Govt. of Rwanda has established a collateral fund to provide finance to small scale enterprises. The fund is also being used for brick making activities. But most of the brick makers do not have bank accounts and it takes more than 5 yrs for them to open account and get credit. The trust level of banks on brick makers is very low. PROEECO is working on micro leasing of equipment's, as banks are willing to provide credit for equipment purchase.

Sameer: In South Asia, banks generally provide working capital credit to the brick kiln owners but banks are generally reluctant to provide term loans for capital expenditure purposes to brick makers. Therefore, capital flow from financing institutions to the brick sector is quite small. Several of the banks have black listed the brick sector for providing finance. However, the capital requirement for transformation of the brick sector is very large.

4.1.3 Session II: Environment policies and regulations in promoting cleaner production

Chairperson: Daniel Wyss, PROECCO, Africa

4.1.3.1 Brick Production in Maule region, Chile: María Eliana Vega Fernández, Regional Ministerial Secretary of the Environment, Maule region, Chile

Ms Maria started with a brief introduction of Chile and its main brick producing provinces in Maule region of Chile. Highlights of the presentation are summarized below

- Maule region contributes to 30 – 50% of the total brick production of Chile
- The brick making process is artisanal, with manual preparation of raw mix, manual moulding, open sun drying and firing in clamps using wood and biomass as fuel.
- At present, there are around 1200 brick producing units operating in Maule region, producing ~ 345 million bricks/year.
- Around 94.5% of the bricks kilns in Chile are artisanal in nature, whereas industrial kilns contribute to only 5.5% of brick kilns.
- There are no national estimates for air pollution or black carbon emissions tied to the brickmaking sector.
- No regulation or standards for artisanal brick production, only for industrial brick making.
- Till now, no efforts have been made to monitor black carbon emissions from brick kilns due to lack of resources to monitoring a sufficient number of representatives kilns; lack of standardization for black carbon monitoring methods; lack of local technicians to monitor and collect data.
- The government of Chile needs information related to the size and status of brickmaking sector.
- Government is also keen to do a project to generate a diagnosis and clean production agreement for artisanal bricks producers.

4.1.3.2 South Africa Clay Brick Sector – Environment Policies and Regulations: Luca De Giovanetti, Swiss Contact, South Africa

Mr Luca introduced the clay brick sector in South Africa, which was followed by a summary of existing and planned environment policies and regulations by South African government on the brick sector. The highlights of the presentation is given below

- 97% of the brick production in South Africa is through formal brick industry. The formal brick industry is evenly spread across the country. 68% of the brick producers in formal set – up are using clamps for firing, whereas only 24% of brick producers are using tunnel kilns. Rest of the brick producers use Hoffman or VSBK technology for firing. Coal is the primary fuel used for firing.
- Artisanal brick production contributes to only 3% of the production and is restricted to only 1 province of the country. There are ~ 1000 artisanal brick producers in the province using hand moulding and clamp based firing for production. Coal is the primary fuel used by artisanal brick producers
- Environment or any other legal compliance is applicable only on the formal brick industry.
- There are several policies and regulation ranging from occupational health and safety, mining, air pollution, environment management, labour, standards for products etc that are applicable to the brick sector.
- Clay brick production is a significant contributors to PM and SO₂ emissions and has been listed as an activity that requires Air emission license and has to adhere to emission standards (for clamps emission standards are based on ambient air quality, whereas for kilns with stack the standards are for stack emissions)
- The government is in process of drafting a strategy to replace clamps with modern firing technologies for the formal brick sector. The strategy for informal sector may be based on enhancing the local economic conditions of the brick producers instead of adhering to environment/legal compliance
- There are other planned regulations like Carbon Budgeting, Carbon Tax and Environment Management planning, that are also likely to effect the formal brick industry of South Africa

- Swiss Contact is implementing *Energy Efficient Clay Brick (EECB)* programme with an objective of increasing energy efficiency and reducing CO₂ emissions from the brick sector. Some of the important learning from the programme are
 - Clear Rules and Regulation are very important to set and level the playing field.
 - Setting high targets without proper enforcement is not effective
 - Regulations have to be supported by financial incentives to facilitate transition.
 - It is important to consider all relevant aspects and impacts of a decision (life cycle)
 - There is an increased interest and sensitivity toward Energy Efficiency. Energy Efficiency is more interesting for the private sector than air quality/ climate change.

4.1.3.3 Brick making sector – Current Status in Bangladesh: Md Mominur Rahman, Chemical Engg Department, Bangladesh University of Engineering and Technology

Mr Rahman started with providing the status of the Bangladesh brick industry – total brick production, types of brick kilns operational, green brick making process and monitored fuel consumption and particulate emissions from various brick kiln technologies in Bangladesh. Recent studies indicate that brick kilns contribute 30 – 40% of the PM_{2.5} in ambient air and hence the health damage cost of human beings and livestock due to the brick kilns is significant. Some of the main points of environment regulations on brick kilns in Bangladesh are summarized below

- The brick burning control act in Bangladesh was introduced in 1989, with an objective to eliminate use of firewood in brick industry. In 2002, the act was amended to ban moving chimney Bulls Trench Kiln and switch to fixed chimney kilns.
- Recent amendment in 2013 bans use of fixed chimney kilns and talks about switching to other cleaner technologies like Zigzag, Hoffman, Hybrid Hoffman, VSBK or tunnel kilns.
- Apart from the firing technology the amendment also makes strict regulations on not using soil from agricultural land, hill-mountain, river bed, fellow land and low land for making bricks without prior permission of regulatory authorities.

- The amendment also puts a binding regulations on brick producers to manufacture hollow blocks (at least 50% of total brick production)
- Some of the regulations in the amendments are non-feasible and seems impractical for eg. Brick producers cannot use the road infrastructure developed by local government to transport raw material or products.
- The brick siting rules are very stringent and does not seem feasible.

4.1.3.4 Talk on Project on brick sector transformation in Corpoboyaco, Colombia – Mr Jose Ricardo Lopez, Environment Authority, Corpoboyaco

Mr Ricardo presented a case study of a project intervention in Corpoboyaco province of Columbia. Earlier, Corpoboyaco has 600 clamp type brick kilns operating in the region. The ambient air quality was very poor in the province. Ambient air monitoring recognized that there is huge contamination in the ambient air. It was estimated that 56% of emissions (Particulate Matter) was coming from artisanal brick production.

The project started with a dialogue between the government and the brick industry where the government discussed the health impact of emissions on the community. The government also emphasized on the benefits of the project interventions like improved brick quality and better income. The authorities thereafter developed a programme for replacing the fuel as well as the firing technology and the brick makers were requested to shift to better technology and replace fuel. Around 150 brick makers participated in the project out of which 70 brick makers shifted to improved brick firing technology. During 4 years, brick making families received 220 USD/per month for shifting to environment friendly technologies. The authorities has so far demolished 46 kilns and started forestation. The authorities has also partnered with norms and standards department who will help them in quantifying the emissions. The program also created a voluntary market place for emission trading. The government purchased the emissions for the lower income brick makers, who were unable to switch to cleaner technologies. In 3 years, there were significant improvement in air quality PM concentration in ambient air was reduced by half.

4.1.3.5 Environmental policies and regulations on brick kilns in Nepal – Mr Devi Prasad Bhandari, Department of Environment, Nepal

Mr Devi Prasad gave an overview of the Environment Protection Regulation – 1997, which is an umbrella act under which environment regulations have been drafted for brick kilns in Nepal. He explained the list of rules and regulations applicable for brick industry in Nepal. Similar to other South Asian countries, Nepal has also imposed ban on moving chimney Bulls trench kiln. Department of Environment has issued stack emission standards for particulate matter emissions. Department has monitored several kilns for concentration of particulate emissions and has found that SPM emissions from majority of the kilns are below the notified standards. However, the standard seems to be quite relaxed and has not been modified during the last decade.

Department of Environment has identified the air pollution due to brick kilns as a major challenge for improving the ambient air quality in Kathmandu Valley.

4.1.3.6 Status of Brick Industry in Pakistan – Mr Tahir Pervaiz Dar, TechnoGreen Associates, Pakistan

Mr Tahir provided a broad overview of the brick industry in Pakistan. There are around 10,000 brick kilns operating in Pakistan. 95% of the brick kilns are located in three provinces, KPK, Punjab and Sind. Majority of the brick kilns are either fixed chimney or moveable chimney Bulls Trench Kilns. All the processes ranging from raw mix preparation to firing are performed manually. There is no environment regulation in place for brick making. The demand of brick is increasing and therefore the production is expected to increase. Due to non-regularization of the brick sector, the environmental, economic and social impacts are high. Indicative studies shows that brick kilns are responsible for 30% of the air pollution.

4.1.3.7 Question and Answer on Session – II

Q: Is there any medium scale brick making enterprises, similar to South Asia in South Africa?

Luca: There are no medium scale brick making industries in South Africa. There is either large scale or organized sector production or very small artisanal production.

Q Are the emission standards based on firing technology in South Africa?

Luca: For all brick manufacturers not using clamp kiln and producing 100ton product per annum or more, the environment standards are fixed irrespective of technology of firing

Q: Is hand moulding of bricks is practiced in formal brick industry of South Africa? What is the strength of the bricks and how much is the energy consumption in different firing technologies in South Africa?

Luca: All the bricks produced by formal brick enterprises moulded using extrusion technology. Traditionally the market favoured solid bricks, there is now emerging interest from the customers in hollow and perforated bricks. In general, strength of an extruded brick fired in a clamp is in order of 25MPA. Energy consumption in clamp varies from 2MJ/kg to 4 MJ/kg fired. Energy consumption of VSBK has been measured to be 0.8 MJ/kg fired brick

Q: Is there is any market segmentation between the bricks produced from formal and informal brick sector in South Africa?

Luca: The markets are segmented as formal sector produces better quality bricks.

Q: Could you please elaborate more on the point that policy is more focused towards local development than adhering to stringent environment regulations for the informal brick industry in South Africa?

Luca: The government is in the process of developing its policy for the informal brick sector. The approach is likely to focus on enhancing business development skills, marketing skills etc for small scale artisanal production sector. The first technical intervention is expected to be extrusion based moulding followed by community based brick kiln for firing.

Q: What is method of preparation of hollow blocks and what is drying process in Colombia?

Ricardo: Vacuum extruders are used to prepare hollow blocks. Large producers use mechanical drier using heat extracted from kiln and for small scale producers, they dry the bricks in shade.

4.1.4 Session III: Building construction regulations, green labels & market mechanisms to promote the demand/market for cleaner bricks

Chairperson: Arnico Panday, Programme Coordinator, ICIMOD

4.1.4.1 Sustainable Brick Industry Development in Vietnam –Ms Vu Thi Kim Thoa, Entec ESCO, Vietnam

Ms Thoa started with a brief history of brick making in Vietnam. She explained that in Vietnam, brick makers pay special attention to clay preparation and its ageing process. The first tunnel kiln was established in 1970's. The technology was received from Eastern Europe. The technology was adapted to Vietnamese context to gain energy efficient drying and make suitable mechanization of the artisanal brick making units

Even though the tunnel kilns have been introduced since 1980's, almost 50% of the national brick production is still through artisanal brick makers located in rural and hilly regions of Vietnam. The artisanal production still causes air pollution, top soil losses and crop damages. The main points of the building construction regulations in Vietnam are summarized below

- In 2000, Government of Vietnam issued a decision to ban all traditional brick making units within urban perimeter in the next 5 years. The ban is will be imposed across the country by 2017.
- The government also approved Building Material Industry Development Plan for 2020 with a vision to 2030. The plan includes development of non-fired brick making production and its use.
- The market of non-fired building materials have picked up significantly, however fired clay bricks (almost 80% of the market) and clay roofing tiles are still the predominant building materials used in Vietnam
- At Provincial government in Nam-Dinh issued decision in 2002 for approving the development plan for building material sector till 2005 with orientation till 2010. The development plan includes
 - Management of natural mineral resources to limit the use of top soil in fired brick production
 - Gradually erase traditional mining and production operations that affects the health of workers
 - Elimination of the artisanal brick making through intermittent kilns, replacing it with VSBK as intermediate technology and finally transforming it to tunnel kiln technology with capacity of 10 – 15 million bricks/year

- Various developments and technical improvement have been performed in VSBK technology so as to make it apt for hilly regions of Vietnam. The development includes creating market acceptance for thinner products, and making technical improvements in offloading mechanisms, efficient flue gas channel design so as to improve working conditions of the workers, improving the insulation of the structure and mastering the firing process etc
- Overall impact of the decision of Nam Dinh Province has been limited so far. In 2006, there were still around 400 artisanal brick making units operational in the province. However, the province has witnessed growth in Tunnel kilns and VSBK.
- The concept of embodied energy of the bricks introduced in the Energy Efficient Building Material and Green Building Rating Tools. Further, the thermal properties (U-Value) of the building material and building components have been included in the Vietnamese National Standard

4.1.4.2 Better Brick Nepal Program: Usha Manandhar, MinErgy, Nepal

Ms Usha, gave an interesting presentation on “Better Bricks Nepal Program”. The program aims at incentivizing brick kilns that produce “Better Bricks” by a voluntary certification method to create a market segment for Better Bricks. The program also aims to create regulatory environment and procurement systems to promote the market for Better Bricks. Giving a brief context of the brick industry in Nepal, Usha explained that there are multiple social issues like child labour, bonded labour, poor working conditions, environmental pollution, inhumane conditions of animal labour that are prevalent in the present brick industry in Nepal and at present there exist no incentives for the brick makers for improving the conditions.

The main points from the presentation is given below

- The first step in the process of development of certificate was to develop standards on which the assessment of kilns can be conducted. The criteria for standards were based on child labour, forced/bonded labour and decent working conditions. ISEAL process supported by GoodWeave organization (working on ending child labour in carpet industry) was followed. The process is internationally credible. Standards also take in to account the national level laws and regulation in context to the brick industry.

Environmental pollution and animal welfare criteria are also expected to be included in the standards.

- The kiln is audited based on the standards and thereafter a Compliance Action Plan (CAP) is developed in close consultation with kiln management and experts. Technical assistance is provided for implementing the action plan. Assistance also include measures for offsetting the extra cost incurred in complying to the standards
- Implementation of the CAP is verified by auditing through independent auditing team. Clear guidelines have been developed for verification of the CAP.
- Upon successful verification, the kiln is granted a certificate. A legitimate and authorized entity for certification is in development phase.
- They expect that developing markets for certified bricks will be the main challenge. Public procurement and procurement by international agencies can become a major market for certified products. Other challenges include limited capacity of brick kiln owners to invest for complying with the standards.

4.2 Day 2: 19 February 2015

4.2.1 Session V: Industrial policies for the promotion of cleaner brick production

Chairperson: Maheshwor Rupakheti, Institute of Advance Sustainable Studies, Germany

4.2.1.1 Corporate Environmental Corporation (CAEM): Ms Aura Luisa Rodriguez, Coordinator Sectorial, CAEM

CAEM is a non-profit organization, affiliated with chamber of commerce of Bogota. Ms Luisa is the coordinator of the brick initiative in CAEM. She started with providing a brief overview of the activities of CAEM in the brick sector. Presently four projects are being implemented by CAEM in the brick sector of Bogota.

1. Energy efficiency in Bricks (EELA), supported by Swiss Development Cooperation (SDC)
2. Implementation of adequate air fuel systems in kiln, supported by USAID
3. National brick inventory and protocol to measure black carbon emissions in Colombia

4. NAMA pilot for the industrial sector of Bogota with Government of Colombia

The main outputs and learnings from the four projects are summarized below

- There are around 1160 brick kilns in Colombia, out of which technical assistance has been provided to 166 brick kilns.
- A top – down approach was followed, where an institutional framework for climate change mitigation options was established at the highest level of Colombian government. Establishing a framework shows commitment of the top most level of government.
- The national strategy of climate change has a component that focuses on low carbon development. Under the component, sectorial action plans for reducing emissions of greenhouse gases have been prepared.
- A legal framework for the brick sector has been introduced for it to comply with Mining code and grant air emission permit and environment license from the ministry of environment.
- The regulations are implemented by an autonomous institution at the ground level.
- The national cleaner production policy is promoting self-management and self-regulation practices. It is also providing assistance to support entrepreneurs in improving their environmental and business performance.
- Technical interventions in the brick sector have been introduced in steps, the first step was to engage with the brick sector persons through small interventions like drying shade and mining. In the second step, technological transformations like upgradation of firing technology, technical improvements, mechanization of the process etc were undertaken
- The interventions have resulted in abating 52,000 tons of CO₂ since 2010, improving revenue in the order of USD 1 million to the brick producers and strengthening of the public policy for the brick sector.

4.2.1.2 Morocco's experience in the Brick sector: Legislative and regulatory framework – M Abboud Jamal, Manager, Industrial Depollution Fund of the Ministry

Mr Jamal provided an overview of environmental and air pollution regulations that cover the brick sector as well. Brick making is covered in the reducing air pollution law. The government has specified norms of air quality; regular monitoring of ambient air is conducted at 29 fixed

monitoring station as well as mobile monitoring stations. Morocco also has an environment police to enforce regulations.

Air pollution regulations are based on prevention of release of pollutants in atmosphere, regular monitoring of air pollution and methods of reduction. Emission norms are classified according to the substances. Air pollution limits are for particulate matter, inorganic substances in form of gas and vapor. To establish the limit values of brick sector a benchmark study was performed which has looked at emission norms notified by other brick making countries.

Clay -based bricks are widely used in Morocco. According to a recent study there are 86 brick making units in Morocco. 28 among 86 brick kilns could be considered as real industrial units with multiple kilns and using automated drying processes. Their annual production capacity was estimated between 50,000 and 100.000 tonnes. 46 units can be considered as semi- industrial, using Hoffmann kilns and open or shaded drying .Remaining 12 units can be considered as artisanal with small furnaces typically highly polluting and producing less than 10,000 tons per year.

The Ministry of Environment, Morocco has established a financial instrument called Industrial Pollution Control Fund (FODEP) to support the industrial sector in reducing negative impacts on the environment:

FODEP was set up in the framework of German cooperation with Morocco since 1998, supported by financial assistance of Euro 24 million provided by the German Development Bank (KfW). FODEP is involved in funding remediation projects through grants from 20% to 40% for projects that reduce pollution through the establishment of processing facilities or disposal of liquid or gaseous discharges or solid waste.

15 companies have benefited from this financial assistance for the implementation of the air pollution treatment technologies.

4.2.1.3 Policies for the Promotion of Cleaner Brick Production in China – Ashish

Shrestha, World Bank

Mr Ashish Shrestha, made a presentation on the Chinese policies for promoting cleaner brick production. China is the world largest brick producing country with the production capacity

of ~ 900 billion bricks/year. There are around 80,000 brick making enterprises in china. The main points of the presentation are summarized below

- China’s brick production increased fivefold during 1982–2008. The production grew at 10.6%/year in the 1980s and at 9.2%/year in 1990s.
- In the 1990s, the Hoffmann annular kiln with natural drying dominated China’s kiln technologies - 90.8 percent of the total. The Intermittent (primitive) “horse-foot” kiln comprised another 7.5 percent. Small-sized enterprises dominated the entire industry, representing 99 percent of total enterprises and 90 percent of production.
- Presently, the Hoffmann kilns continue to dominate the production of clay fired bricks, representing 90 percent of total kilns, while Tunnel kilns account for less than 5 percent.
- In the early 1990’s, Chinese government started to control solid clay bricks. In 1999 the Government banned the use of solid clay bricks in coastal cities and cities where land was scarce. In the same year, the State Office of Wall Material Renovation of the National Development and Reform Commission identified the first 170 cities expected to limit the use of solid clay bricks to certain targets by 2003.
- In 2005, the Government banned all clay-building products in the 170 cities and extended the regulation to suburban areas. It also banned the use of solid clay bricks in other 256 cities by 2008.
- In 2004, the Government mentioned for the first time the controlled use of solid clay bricks in small towns and rural areas. It established national targets to reduce their production by 80 billion bricks by 2006 and prohibit their use in all cities by 2010.
- In 2007, the 11th Five-Year Plan established targets for China’s brick and tile industry, centred on (i) developing new wall materials, (ii) conserving land resources, (iii) saving energy and other resources, and (iv) phasing out outdated technologies (including Hoffman kiln with less than 18 doors).
- Command-and-control was the major regulating measure for phasing out solid clay bricks and polluting technologies; this was facilitated via such economic instruments as specific funds and preferential tax policies on promoting new wall materials. The economic instruments have been essential to adjusting the cost and price gaps between traditional solid clay bricks and new wall materials.

- At the outset, national laws set up strategies and macroeconomic development plans that were then detailed with specified regulations and policies.
- The theme was changing the market environment, with intervention focused at the enterprise level.
- Comprehensive policies and regulations were designed and issued, along the whole value chain of brick production and usage: from raw materials, production processes and equipment, to final products, building designs, and construction processes. Upstream and downstream regulations worked together to help guide brick-sector development in the preferred direction.
- Close inter-institutional collaboration was essential for making policies, laws, and regulations work compatibly within the extended value chain of bricks.
- Regulations started from locations with the highest implementation capacity (e.g., municipalities, large cities, and coastal cities with relatively low targets) and then expanded into suburban and even rural areas.
- Policies, laws, and regulations have been consistently monitored, reviewed, and evaluated to identify problems that emerged from implementing earlier regulations; thereafter, they were updated by setting up higher targets through more stringent regulations that provided continuous stimulus for consolidating achievements.

4.2.1.4 Sustainable Brick Industry Development in Vietnam – Vu Thi Kim Thoa, Entec ESCO, Vietnam

Ms Thoa presented the industrial policies in Vietnam for cleaner brick production. The main theme of the industrial policies was to develop institutional capacity for R&D, training and capacity development of brick industry. The main points of the presentation are summarized below

- Industrial policies for cleaner brick production focused on developing institutional capacities for R&D, training, standards, testing procedures and facilities and certification. Government institutions also tried to register small scale producers with department of building material and department of environment and technology so that they can receive the benefits of institutional development.
- Capacities have been developed in various technical institutions including institutes related to building science and building material technology, architecture, thermal

heat transfer etc for providing technical support for brick kiln design and construction.

- Training courses have been developed as vocational courses for building material production systems and brick firing process, engineering level courses at national level university for air supply and ventilation system design and green architectural design at architectural universities.
- Policies also aimed at developing industrial networks for knowledge sharing and business opportunities.
 - Vietnam association of building materials
 - International knowledge sharing on Green buildings
 - Networking with brick making research and testing facilities at international level
 - Networking with international brick making equipment supplier
- Another important measure was to introduce Integrated Resource Management and Environment Management in brick making sector.
 - Clay resource mapping was conducted for Nam-Dinh province of Vietnam with support from SDC.
 - Ambient air monitoring performed at brick kiln sites and brick kiln clusters to monitor ambient air quality to ensure OHS regulations issued by Ministry of Health
- Other measures include
 - Introduction of embodied energy of brick in Green Building rating systems
 - Training of brick kiln staff for energy auditing to calculate kiln energy performance
 - Introduction of requirement of building material and building component thermal properties in national standard for Building components and parts
 - Introduction of Economic performance analysis of brick making business

4.2.1.5 Policies, legislations and initiatives related to promotion of cleaner brick production in Nepal –Amit Acharya, Ministry of Industries, Nepal

Mr Acharya started with providing a brief introduction of the brick industry in Nepal. He also stated that the general industrial policy – 2010 is applicable to brick sector as well. The industrial policy talks about promoting environment friendly and energy efficient technologies through technical and financial assistance. Industrial enterprise act and

environment protection act covers various kinds of incentives and appreciation for promoting cleaner and environment friendly production. Some of the main points of the presentation are given below

- Cleaner Production (CP) was introduced in Nepal for the first time with the implementation of a Demonstration Programme in 1997. The activity was initiated as one of the output under the Industrial Pollution Control Management (IPCM) Project implemented by Ministry of Industry (MOI) with the assistance of UNIDO and UNDP in 1997.
- Industrial Energy efficiency improvement activities were started first time by the Ministry of Industry in early of 1995 under the World Bank financial assistance. The project called Office of Energy Efficiency Services (OEES), provided consultancy services with the help of expatriate energy experts.
- Under another programme of ESPS-DANIDA, remarkable achievements have been gained on Energy Efficiency (EE) in industries.
- NEEP, implemented by GIZ and Government of Nepal, has helped in awareness raising, facilitating services and training for energy efficiency, auditing, management.
- Ministry of Industries in past year conducted feasibility study on HHK technology, and training on energy efficiency, specific to brick kilns.

4.2.1.6 Question and Answer on Session – V

Q- The limit of SPM of 50mg/Nm³ set by Morocco environment authority from the brick kiln appears on a much lower side as compared to 750 mg/Nm³ in South Asian countries, Do the brick kilns in Morocco use natural gas for firing or use some pollution control devices to limit the SPM?

Ans – The limit of 50mg/Nm³ is a bench mark. Generally brick manufacturers use Diesel, Furnace Oil/Heavy Oil (petroleum products) for firing of bricks. Emission norm worldwide for new brick making unit is 50 mg/Nm³.

4.2.2 Session IV: Cross-Cutting Issues in the transformation of brick industry

Chairperson: Maria Eliana Vega Fernandez, Regional Ministerial Secretary of Environment (SEREMI), Maul Region

4.2.2.1 Development of market for cleaner bricks – O P Badlani, Prayag Clay Products Pvt Ltd, Varanasi, India

Mr Badlani, who is a leading brick maker of India, gave an overview of Prayag Clay Products Pvt Ltd. At present, Prayag is operating three manufacturing facilities in Varanasi, India. Mr Badlani started manufacturing perforated bricks in 2003 with a small production of 300,000 bricks/year (2-3% of the total production). In the initial years, he faced a lot of problems in marketing of perforated bricks. There were apprehensions in the consumer segment regarding the compressive strength of the product. He started market development of perforated bricks among the builders and architects. Gradually the market of perforated bricks developed and production of perforated bricks increased to 1.2 million bricks/year in 2009. In 2012, Mr Badlani installed second extruder for manufacturing of hollow blocks. At present, Prayag Clay products manufactures hollow blocks equivalent to 3.2 million bricks/year.

He has also installed a biomass gasifier for generating electricity to run the extruder. Apart from manufacturing hollow products using extruders, Prayag uses Natural Draft Zigzag firing technology for firing of brick products. His company provides natural draft zigzag kiln technology to other brick producers and have assisted around 150 enterprises in changing over from FCBTK to zig-zag technology. In the end, he mentioned several challenges from the manufacturer's perspective to produce and market cleaner bricks.

4.2.2.2 Labour Policies/Programmes in Promoting Decent Working Conditions in Brick Kilns in India – J John, Centre for Education & Communication, India

Mr John has conducted extensive survey of brick kiln workers across 4 states in India (Uttarakhand, Punjab, Chhatisgarh and Uttar Pradesh) and he presented the findings of the survey. The main points of the presentation are given below

- Bricks kilns provide more than 4% of the total employment in India, ~ 20 million workers are employed at brick kilns
- According to the Decent work framework by ILO, there are four pillars of decent working conditions
 - Freedom of association and the effective recognition of the right to collective bargaining

- The elimination of all forms of forced or compulsory labour
- The effective abolition of child labour
- The elimination of discrimination in respect of employment and occupation
- Generally, brick kiln source their workers through a labour contractor by providing them advances. Majority of the workers are migratory and are sourced on by the labour contractor from various states.
- More than 90% of the workers on the brick kiln belong to lower caste. Around 98% of the workers are farmers, who are landless or have a very small land holding (less than 1 acre)
- 95% of the brick kilns do not have any first aid facility at the kiln. None of the brick kiln workers have been provided the benefit of provident fund and identity cards.
- More than 90% of the workers are sourced through advance. 70% of the surveyed brick kiln workers were not allowed to go home during the brick kiln season and 64% of the workers are not even allowed to go outside the kiln premises.
- The working conditions of the brick kiln workers are akin to slavery

At the end of the presentation, Mr John raised a fundamental question that would require further research for an answer “Whether the technology being used at brick kilns is the main factor for no change in the slavery type of labour or is it the caste based issues of labour withholding the brick industry from technology up gradation?”

4.2.2.3 Regional Networks in Promotion of Cleaner Brick Production – Suresh Shrestha, SAARC Energy Center

Mr Shrestha provided an overview of the activities and administrative set up of the SAARC energy centre at Islamabad. SAARC energy centre has recently conducted a study of evaluating energy conservation potential of brick industry in four countries of South Asia (India, Pakistan, Bangladesh and Nepal). Mr Shrestha presented the main outcomes of the study that are summarized below

- There are four main barriers for the improvements in brick industry
 - i. Lack of policy framework that can incentivize the entrepreneurs and can provide a formal structure to the brick industry
 - ii. Lack of skilled workforce and limited knowledge of the supervisors and owners for optimum operation of the kiln

- iii. Lack of management capacity to scale up modernization as well as lack of marketing skills to sell energy efficient products
- iv. Scattered attempts for awareness on technology, tools and techniques as well as no solid efforts for capitalizing of regional best practices
- Stakeholders recommendation have been provided under five thematic areas
 - i. Policy and procedures:
 - Sensitize stakeholders to have a coherent policy on the brick sector,
 - recognize the industry as a formal one,
 - put in place with political will,
 - encourage feedback and review it, time to time
 - ii. Technology:
 - Undertake rigorous efforts to explore the optimal solution(s) based on the most suitable fuel resources;
 - manage investments to show-case the identified solutions;
 - promotion of energy efficiency techniques and technologies;
 - Develop, document and share simple operational procedures
 - iii. Capacity Building:
 - Creating awareness for building technical, operational and managerial capacities,
 - Promotion of EE bricks (e.g. hollow bricks),
 - Launch operational trainings in vocational training institutions
 - iv. Finance:
 - Support entrepreneurs to link with financial institutions to reduce entry barriers for higher investment on energy efficient and clean technologies,
 - Tailor-made financing packages and technology risk guarantee fund coupled with an effective delivery system,
 - Create special funds to facilitate loan capital to the Brick Entrepreneurs
 - v. Networking and Cooperation:
 - Set up country wise knowledge houses/think tank for policy advocacy and implementation,
 - a regional federation of associations can be created in the SAARC region for mutual cooperation in brick industries

4.2.2.4 Occupational health and safety concerns of brick kiln workers – Bhishma Pandit, Nepal

Mr Bhishma presentation was focused on the OHS conditions of the brick kiln workers in South Asian region. He started with providing a brief overview of the profile of brick kiln workers in South Asia. The main points of his presentation are summarized below

- Every kiln houses around 250 – 300 workers. It is a seasonal industry, hence the labour migrates with their family to the kiln site and stays at the kiln during brick making season. The brick kiln becomes like a small village with 150 – 200 families but without some essential amenities like school, health centre, sanitation or access to clean drinking water
- There are various labour issues at brick kiln related to child labour, bonded Labour, non-compliance to minimum wage set by the government and lack of labour union
- All the four principles of decent working condition laid down by ILO and ratified by WHO are being violated at the brick kilns.
- There are various occupational health and safety hazard for the workers at brick kiln.
- In the last decade, there have several changes in the industry, like use of bicycles, animals or automobiles for transporting the brick instead of manual transportation on the head, mechanization of moulding process at some of the sites, use of soil excavators for soil excavation at some of brick kilns.
- Federation of Nepalese brick makers have made a positive start for improving the working conditions of workers as well as to abolish the child labour and bonded labour at brick kilns.
- Only policy measure will not work alone, any transformation would require a collaborative approach with support of brick manufacturing industry along with support from other stakeholders.

4.2.2.5 Question and Answer on Session – IV

Q: What is the impact of Mahamta Gandhi National Rural Employment Guarantee Act (MNREGA) on migration of labour for working on brick kilns in India?

Mr J John: MNREGA has not prevented migration but has helped in increasing the wages of the workers. It has provided the power to the workers to negotiate with the owners. The brick

industry is deeply embedded in the social fabric of the country and therefore a fundamental question that arises is whether the close relationship with social structure of the country is stopping the industry from innovating or is the lack of innovation that has led the industry to have negative social impacts.

Q: How to you penetrate the hollow products in a conservative solid brick market?

O P Badlani: We started using the blocks in our own buildings and then showcase that buildings to architects and engineers. We focused on educating the engineers and architects, provided them samples and also credit on purchase of the hollow products.

Q: What is the cost difference between the hollow blocks and traditional solid bricks

O P Badlani: The cost is same for the same volume of the product.

Q: Is the cost of manufacturing extruded hollow bricks greater than solid bricks

O P Badlani: The cost of manufacturing is 15-20% lower than traditional solid bricks if we have a dedicated plant for hollow brick production.

4.2.3 Session VI: Policy Advocacy Approaches

Chairperson: Reto Thoenen, Swiss Agency for Development and Cooperation

4.2.3.1 AEPC's Experience on Renewable Energy Promotion in Nepal – Mr Nawa Raj Dhakal, Alternative Energy Promotion Center (AEPC), Nepal

Mr Dhakal presented a case study of programme for renewable energy promotion by Government of Nepal. The main points of the presentation are provided below

- AEPC was established in 1996 as national focal agency for promotion and development of renewable energy technologies in Nepal. It is also the executing agency for renewable energy programme and projects in Nepal
- AEPC followed a PPP (Public Private Partnership) model for promotion of renewable energy in Nepal. The private sector was given the responsibility for manufacturing & supply, sales & installation, after sale service and quality control, whereas the public sector took the responsibility of creating awareness and capacity building, technical and financial assistance, Quality assurance and monitoring and evaluation.

- A subsidy programme was implemented for promoting renewable energy technologies. Appropriate standards and guidelines were developed for qualification, grading and evaluation of manufacturers/suppliers enrolled in the subsidy programme.
- The programme was implemented across the nation through 9 regional centres spread across the Nepal.
- Around 2.8 million households were able to get the benefit of the scheme till July 2014.
- Following were the achievement of renewable energy programme of Nepal till 2014
 - About 14% of rural population have got electricity access through Renewable Energy Technologies,
 - Replacement of firewood by biogas in >317,000 households
 - Saving of more than 30 - 50% firewood & reduced Indoor Air Pollution in more than 893,000 HHs
 - ~30,000 jobs in Renewable Energy (RE) sector; ~500 jobs added each year
 - More than 400 Small and Medium Enterprises in RE sector, scattered all over the country with very good rural coverage
 - Employment & entrepreneurship at local level (e.g., stove masters, biogas masons etc.)
 - Improved health, education, sanitation & ultimately enhanced livelihood

4.2.3.2 Policy Advocacy Approaches in Indian Brick Sector – Time for Leapfrog – Mr Nivit Kumar Yadav, Center for Science and Environment, India

Mr Nivit started with providing a brief introduction of his organization i.e Center for Science and Environment (CSE). CSE is a public interest research and advocacy organization based in New Delhi. CSE researches into, lobbies for and communicates the urgency of development that is both sustainable and equitable.

He gave an example of judicial intervention that forced the textile cluster in the Tiruppur region of Tamilnadu to adopt a zero liquid discharge policy for controlling the water pollution. The legal battle started in 1996 and the verdict came in 2011 by Madras High Court that ordered closure of all 700 dyeing and bleaching units in the Tiruppur area and asked them to either pay compensatory loss to farmers or install zero liquid discharge system.

At present, the residents and environmentalist working in Tiruppur area claims that the pollution levels have reduced significantly. The TDS level of the river has reduced to 1100 ppm from 7000 – 8000 ppm range.

In the end Mr Nivit presented a policy roadmap that included measures for brick sector in India.

4.2.4 Session VII: Group Work- Formulation of Vision and Policy Approaches

The participants were requested to get divided in 3 thematic groups as per their choices

- Group I: Environment and Industrial Policies
- Group II: Development of market for cleaner bricks
- Group III: Reducing negative social impact of brick sector

Participants within the group were requested to have discussion till the evening and present their outputs on the next day.

4.3 Day 3: 20 February 2015

4.3.1 Outputs of the group work

4.3.1.1 Group – I: Environment and Industrial Policies

1. The environment and industrial policy should consider the economic feasibility of the measures in to account. It should be drafted in a manner that is a politically and socio-culturally accepted. The measures advocated should be environmentally optimal
2. An actionable environment policy should be based on standards that need to be followed for parameters of energy, environment and resource. Hence, a robust baseline of the parameters needs to be developed. Also, there should be standard measurement protocols for the parameter that are consistent across the globe. A regular system for monitoring, reporting and evaluation of the standard parameters is also required. A carrot and stick approach is suggested for implementing the standards. The environment policy should have incentive mechanisms for supporting to comply with the standards, at the same time, enforcement measures like increased taxation etc should also be the part of the policy to as to ensure the compliance with the standards.

3. The main objective and elements of the environment policy should be
 - a. Prevention of emissions and mining
 - b. Reduction in energy consumption
 - c. Clay resource management
 - d. Address waste water
 - e. Reduce Noise Pollution
 - f. Environment Impact Assessment and environment management tools should also be the part of the environment policy on brick kilns
4. The industrial policy should focus on establishing a dedicated unit on the brick sector within the department of industries. This would help in strengthening the priority of brick sector.
5. Mechanisms for linkages in environment and industrial policy should be developed.
6. The industrial policy should aim to identify the industrial zones that are best fit for brick production. Identification should take place through a process of multi stakeholder roundtable meet. The policy should also focus on influencing the demand through public procurement process.
7. The group identified two best practice example for the actionable environment and industrial policy
 - a. Industrial Policy of Vietnam that has introduced Integrated Resource Management and Environment Management practices in brick making sector. Under this practice clay resource mapping was conducted to identify the clay rich zones suitable for clay mining for brick production. The policy also had the provisions for regular ambient air monitoring at brick kiln sites and brick kiln clusters to monitor ambient air quality to ensure OHS regulations issued by Ministry of Health.
 - b. Air pollution regulations in Morocco that has specified norms of air quality. Brick making is covered in reducing air pollution law. Regular monitoring of ambient air is conducted at 29 fixed monitoring station as well as mobile monitoring stations. Morocco also has an environment police to enforce regulations.

The Ministry of Environment, Morocco has also established a financial instrument - Industrial Pollution Control Fund (FODEP) to support the

industrial sector in reducing negative impacts on the environment. FODEP is involved in funding remediation projects through grants from 20% to 40% for projects that reduce pollution.

4.3.1.2 Group – II: Development of market for cleaner bricks

1. In order to develop the market of cleaner bricks, the definition of cleaner bricks should be established. An expert group should be constituted for defining cleaner bricks. Several parameters like embodied energy, resources use, OHS, energy consumption during operation etc can be considered while defining cleaner bricks
2. A certification system would be required for certifying the cleaner bricks
3. Promotion of certified cleaner bricks will require measures in the demand side so as to create the market segmentation for cleaner bricks as well as the supply side to support brick makers for manufacturing cleaner bricks
4. On the demand side, certified cleaner bricks can be linked with the green building rating systems to create the market for the cleaner bricks. Incentives like gaining additional credits in green building rating and/or providing lower mortgage rate for the purchase of the house and/or rebate in house tax to the consumer of cleaner bricks can be linked with the green building rating systems. Influencing public procurement for using cleaner bricks can also help in creating the demand.
5. Demonstration building should be build using the certified cleaner bricks to raise awareness and increase confidence among the users.
6. On the supply side, brick makers should be provided technical assistance for upgrading their technology. Financing mechanisms should also be created to support brick makers in technology upgradation. National level funds that have a mandate to support cleaner production can be roped in to provide financing for technology upgradation. In case of import of machinery for the production of cleaner bricks import duty exemption should also be provided.
7. Tax benefits and incentives can also be provided to promote brick makers for manufacturing cleaner bricks.
8. Best practice example of Morocco was cited that has adopted a dual model, which on one side aims to moves towards enforcing stricter environment regulations and at the same time prepare and support the manufacturers in technology upgradation so that they are able to comply with the regulations. Morocco has established a national level

center that helps in providing technical assistance to the industry by bringing the international best practice experiences. Parallel to technical assistance they have created a fund that is used to provide subsidies for technology upgradation, implementing measures for energy efficiency and reducing pollution

9. Example of Colombia, which provides 20% grant and low cost loans for shifting to cleaner production processes, was also mentioned.
10. Energy efficiency tax reduction scheme of South Africa that provides the opportunity to claim back the income tax equivalent to the savings reaped through energy efficiency measures was also mentioned as a best practice example.
11. The need for multi-criteria framework for defining cleaner brick was discussed. In this context, the multi-criteria framework developed by Enzen and Greentech in India was mentioned and the need to further develop the criteria was discussed.

4.3.1.3 Group – III: Reducing negative social impact of brick sector

The group brainstormed together to propose measures to address three key issues in mitigating the negative social impacts of the brick sector. The three key issues identified were:

- i. Decent working conditions
 - ii. Strengthening of small scale brick producers
 - iii. Re-training of brick workers
1. In order to develop policy measures to ensure decent working conditions at brick making enterprises, the various elements of the decent working conditions need to be clearly understood. The key elements of decent working conditions include:
 - Universal rights: The workers should be provided with universal rights such as right to organize and represent, right to choose works, prohibition of discrimination based on gender and ethnicity, prohibition of child labour, probation of bondage labour, etc.
 - Basic amenities: The workers should have access to basic amenities at the kiln site such as safe drinking water, sanitation, first aid, shelter, etc.
 - Occupational safety and health (OSH): The operating practices should be improved so as to reduce the risks to worker’s health and safety. Moreover, the

workers should be provided with safety equipment and training to avoid accidents.

- Social security: This element advocates for social security of workers through provision of pension/gratuity and insurance facilities to the workers.
2. One of the major hurdles in implementation of policies for decent working conditions in the brick sector is identified as the informality of the sector. Because of the seasonal operation and migrant workers, in every season, a different set of workers are employed at a particular brick making enterprise, and implementation of policies (particularly related to social security) becomes difficult. There should be a central agency with which all the workers will be registered and provided with some identity number. This will create a database of the workers and help in maintaining their employment records and in implementation and monitoring of the policies.
 3. In line with the construction industry in India, a central or provincial fund authority should be created which will manage the social security benefits and other entitlements of the workers contributed by their employer and/or government.
 4. The group proposed for the establishment of an exclusive authority/agency for brick sector or brick and construction sector combined which can support the sector in addressing the issues and challenges. The role envisaged for this institution relevant to the issues put before this group are as follow:
 - i. Training of workers: The proposed institution will engage experts and vocational/industrial training institutes to develop standard training modules on various trades of brick making and training delivery and certification mechanisms. The training programme will target existing workers as well as fresh workforce who can then be employed in the sector. This institution will also work towards diversification of skills of brick making workers and providing vocational training to them and their family so that they can get employment at other avenues during the off-season.
 - ii. Support to small and medium scale brick producers: The proposed institution will support the small and medium scale brick producers in technology upgradation and adoption of best practices through:
 - a. Development of standard technology package in consultation with sector experts and empanelment of technology providers.

- b. Training of brick kiln entrepreneurs to enable them to take up technology upgradation and adoption of best practices.
 - c. Engaging experts and technological institutions for assessment and development of appropriate technology/operating practices for continuous improvement in the sector.
- iii. Registration of workers and management of social security fund.
- iv. Apart from these three main activities, the proposed institution can also take up specific/focused programmes for upgradation of the sector as and when required.

4.3.2 Field Visits

Field visit was organized on two types of brick kiln in Kathmandu. The participants were able to get an experience of working and operation of Zigzag kiln, VSBK and an extruder that was indigenously manufactured in Nepal.

The workshop was concluded by vote of thanks from Mr Reto Thonen and Ms Bidya Banmali Pradhan.

5 Way Forward

The main objectives of the workshop were to

1. Identify main development concerns posed by brick production
2. Articulate a common vision for the brick sector
3. Develop an understanding of policy approaches/ specific policies adopted by various countries
4. Prioritize regional actions and prepare an action plan of work to be undertaken by PAN.

The workshop was successful in bringing together all the prevalent knowledge and expertise in the brick sector worldwide under one roof.

The present status along with the main development concerns of brick sector in each of the regions; South Asia, Latin America and Africa were highlighted clearly in the presentations and discussion held during the workshop.

5.1 Common Goal

Moving towards sustainable brick production was highlighted as a common goal for the brick sector worldwide.

5.2 Policy Approaches & Action Plan

Based on the inputs received from presentations and talks given in the six sessions of the workshop, the brick industry world-wide can be characterized in three main categories. The three categories and their pre-dominant characteristics are summarized in table 1.

Table 1: Categorization of brick manufacturing units and their respective characteristics

S.No	Category	Characteristics
1	Artisanal brick making units	<ul style="list-style-type: none"> • Family based brick making units: The unit is owned and operated by a family and substantial amount of brick making activities is performed by family members. • Manual operations: Most of the operations in brick making activities are performed manually. Very small scale production: As these units are family based enterprises, the scale of production is very low, generally less than 1 million bricks/year. • Seasonal production: These brick making units operate only during the dry season as their main occupation is

		<p>agriculture, carried out in monsoon season</p> <ul style="list-style-type: none"> • Intermittent firing technology: The production is batch type and hence intermittent firing technologies (mostly Clamps) are used for firing. • Solid products: The most common product manufactured is solid bricks and clay tiles. • Spread across the three regions: Artisanal brick making units are present in Latin American countries, African nations and South Asian countries.
2	Traditional Proprietor based brick making units/ Traditional industrial production	<ul style="list-style-type: none"> • Traditional Proprietor firms: Majority of such firms operate on Proprietorship model, where the entire management is owner driven. These firms are traditional in nature and often operate outside the formal financial sector. Most of the transactions are carried out in cash and no proper book keeping practices are followed • Manual Operations, Labour dependent: Most of the brick making operations are performed manually. The number of workers employed each of the unit employs 100 – 150 workers for moulding, drying, firing and material handling. • Small to medium scale production: The scale of production from each unit is small to medium level (3- 10 million bricks/year) • Seasonal operation, Migratory labour: The sector is dependent of migratory labour available during the non-agriculture season. The operation of such units is seasonal limited to non-agriculture season. • Traditional Continuous firing technologies: Traditional continuous firing technologies like fixed chimney bulls trench kilns and Zigzag Kilns are used for firing of bricks. • Solid Products: As the moulding operations are manual, only solid products like solid clay fired bricks and clay tiles are manufactured. • Concentrated in South Asia: Such units are mainly concentrated in South Asian countries like India, Pakistan, Bangladesh and Nepal.
3	Modern Industrial Brick making units	<ul style="list-style-type: none"> • Industrial Manufacturing firms: These firms are industrial in nature with modern business and management practices. These units are linked with formal financial sector. • Machine Operations: Almost all operations in brick making activity are performed using machines for e.g., transportation and mixing of clay, Use of extruders for moulding, use of fork lifts and other material handling machines • Large scale production: The scale of production from

		<p>each unit is large level (100 - 120 million bricks/year)</p> <ul style="list-style-type: none"> • Round the year operation: These units have round the year operation. • Modern Continuous firing technologies: Generally modern continuous kilns like Hoffmann or Tunnel Kilns are used for firing. • Variety of products including Hollow/perforated Products: Machine moulding provides the opportunity to produce hollow and perforated products as well as use waste materials to mix with clay. • China, Vietnam, South Africa and Morocco: Such Industrial brick making units are prevalent in all the continents e.g. China and Vietnam in Asia; South Africa and Morocco in Africa; Brazil in South America
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The three categories are distinct and differ significantly from each other. The developmental requirement for each of the category is different and hence the policy approaches required for the development of each of the category will be different.

Three main thematic areas that emerged as crucial elements for moving towards sustainable brick production were identified.

1. Environment and Industrial Policy
2. Market development for cleaner bricks
3. Reducing the negative social impacts of the brick sector

Inputs were received through group discussion activity from the participants on the main elements/actions required under each of the three areas. Participants were also requested to highlight a best practice case study/policy approach for recommended measures.

Table 2 summarizes the main elements/actions for each of the three identified thematic areas along with the best practice case study/policy approaches.

Table 2: Summary of main elements and best practice case study for the three thematic areas

Thematic Areas	Main Elements/Actions	Best Practice Case study/Policy approaches
<p>Group 1: Environment and Industrial Policy</p> <ul style="list-style-type: none"> • What should be the key elements of actionable 	<p><u>Environment Policy</u></p> <ul style="list-style-type: none"> • Develop a robust baseline of emissions from brick kilns. <ul style="list-style-type: none"> ○ Harmonization of measurement protocols 	<p><u>Vietnam:</u></p> <ul style="list-style-type: none"> • Zoning regulation for protection of biodiversity and eco-system

<p>environment policy?</p> <ul style="list-style-type: none"> • What should be the key elements of actionable industrial policy? <p>(Identify best practice case studies for the proposed elements)</p>	<ul style="list-style-type: none"> ○ Regular monitoring, reporting and evaluation • Reduction in Energy consumption and Air Pollution • Clay Resource Management • Enforcement measures (carrot and stick approach) <p><u>Industrial Policy</u></p> <ul style="list-style-type: none"> • Close linkages with Environment policy • Development of dedicated unit for brick sector in Department of Industries <ul style="list-style-type: none"> ○ Identification of Industrial zones for brick production ○ Capacity Building ○ Incentives for upgradation • Influence Public Procurement 	<ul style="list-style-type: none"> • Training of fire masters • Monitoring and evaluation <p><u>Morocco:</u></p> <ul style="list-style-type: none"> • Emissions Monitoring • Mobile monitoring stations • Surveillance and Enforcement • Subsidies and Incentives
<p>Group 2: Development of Market for cleaner brick</p> <ul style="list-style-type: none"> • Market mechanisms for cleaner bricks • Innovative financing? <p>(Identify best practice case studies for the proposed elements)</p>	<ul style="list-style-type: none"> • Expert Group to develop a multi-criteria framework to define cleaner bricks (Embodied Energy, Resources use, OHS, Energy consumption during operation etc) • Develop certification mechanism for cleaner bricks • Develop linkages with green building rating systems/tools e.g LEED, GRIHA, EDGE etc, for use of certified cleaner bricks <ul style="list-style-type: none"> ○ Additional credits for green building certification ○ Lower mortgage rates ○ Lower house tax • Influence public procurement for certified cleaner bricks • Branding and awareness through demonstration buildings • Technical assistance to brick makers for upgradation • Providing Finance to brick makers from National level funds for cleaner production/energy 	<p><u>Morocco:</u></p> <ul style="list-style-type: none"> • A national level centre for industries to provide technical know-how and bring international best practices • A national level fund to provide subsidy and finance for technology upgradation <p>Colombia</p> <ul style="list-style-type: none"> • A national level centre for cleaner production provides grants and low cost loans for shifting to cleaner technologies <p>South Africa</p> <ul style="list-style-type: none"> • Energy efficiency



	<ul style="list-style-type: none"> ○ Low interest finance ○ Subsidies • Tax exemptions and benefits for brick makers producing cleaner bricks 	<p>tax reduction scheme provides benefits for claiming income tax returns based on amount of energy saved.</p>
<p>Group 3: Reducing negative social impact of brick sector</p> <ul style="list-style-type: none"> • Decent working conditions <p>(Identify best practice case studies for the proposed elements)</p>	<p>Defining the key elements of decent working condition:</p> <ul style="list-style-type: none"> • Access to Universal Rights <ul style="list-style-type: none"> ○ Right to Organize and Represent ○ Right to choose work ○ Prohibition of discrimination based on gender/ethnicity ○ Prohibition of child labour • Occupational Safety and Health <ul style="list-style-type: none"> ○ Appropriate mechanization ○ Safety equipment's • Access to Basic Amenities <ul style="list-style-type: none"> ○ Safe drinking water ○ Sanitation ○ First Aid ○ Shelter etc • Social Security <ul style="list-style-type: none"> ○ Pension/Gratuity benefits for brick workers ○ Registration of workers at central/provincial level <p>Exclusive authority for brick making and construction sector</p> <ul style="list-style-type: none"> • Programme for transformation of brick sector <ul style="list-style-type: none"> ○ Implementation of Programmes ○ Monitoring and Verification • Technology Upgradation <ul style="list-style-type: none"> ○ Standard Technology Packages ○ Empaneled technology providers ○ Engaging with experts • Registration of workers and Entrepreneurs <ul style="list-style-type: none"> ○ Management of social security fund 	<p><u>India</u></p> <ul style="list-style-type: none"> • For the workers of construction sector, there is an agency with which all the workers are registered and their social security benefits are deposited there irrespective of their employer. <p><u>Vietnam</u></p> <ul style="list-style-type: none"> • Vietnam has established various institutions to intervene in different aspects of the brick making such as development of appropriate technologies, training of workers, ensuring social security of workers, etc.



	<ul style="list-style-type: none"> ○ Contribution to kiln owners directly to this fund • Training and Capacity building <ul style="list-style-type: none"> ○ Vocational/industrial training for brick kiln owners and workers ○ Diversification of skills of workers 	
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6 Annexure – I: List of Participants

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