3.2. Industry

This section focuses on the mitigation of GHG emissions from cement industries, since they are the most important industrial source of CO_2 emissions reaching 92% of total industrial GHG emissions. In Lebanon, there are three Portland cement plants with a total production of clinker of 4,143,809 tonnes in 2004 and total emission of 2,156 Gg of CO_2 eq.

3.2.1. Baseline Scenario

Two baseline scenarios are suggested to portray possible future clinker production and CO_2 emissions from the cement industry in Lebanon until year 2030. Scenario A assumes a low growth rate of 2% in the cement industry while scenario B uses a higher growth rate of 4%. Figure 3-7 represents forecasts of cement production and CO_2 emissions under scenario A (3,607 Gg CO_2 eq.) and scenario B (5,976 Gg CO_2 eq.).

3.2.2. Mitigation scenario

Mitigation scenario: Increasing the additive blend in cement production

The production of clinker is the most energy-intensive step in the cement manufacturing process and causes large process emissions of CO_2. In blended cement, a portion of the clinker is replaced with industrial by-products. The reduction in clinker requirement in the production of cement results in reduction of CO_2 associated with calcination of limestone in kilns (UNFCCC, 2005).

The future potential for application of blended cement in Lebanon depends on the current application level, on the availability of blending materials, and on standards and legislative requirements. An increase of the share of additive (i.e., fly ash) from 27.66% to 35% would reduce the emissions by an estimated average of 1.32% of CO_2 emissions, at a cost between USD 15 and USD 30/Gg for fly ash and USD 24/Gg for blast furnace slag (UNFCCC, 2005).

3.2.3. Mitigation Strategy

Other mitigation measures could be applied or further explored in Lebanon to reduce GHG emissions from the cement sector such as:

- Substitution of conventional pre-calcination method by a pre-calcination method aimed at CO_2 production in a highly concentrated form;
- Replacing parts of the plant (motors, raw mill vent fan, preheater fan, kiln drives, etc.) by high efficiency ones;
- Applying energy management and process control in grinding;
- Modification of clinker cooler (use of mechanical flow regulator);

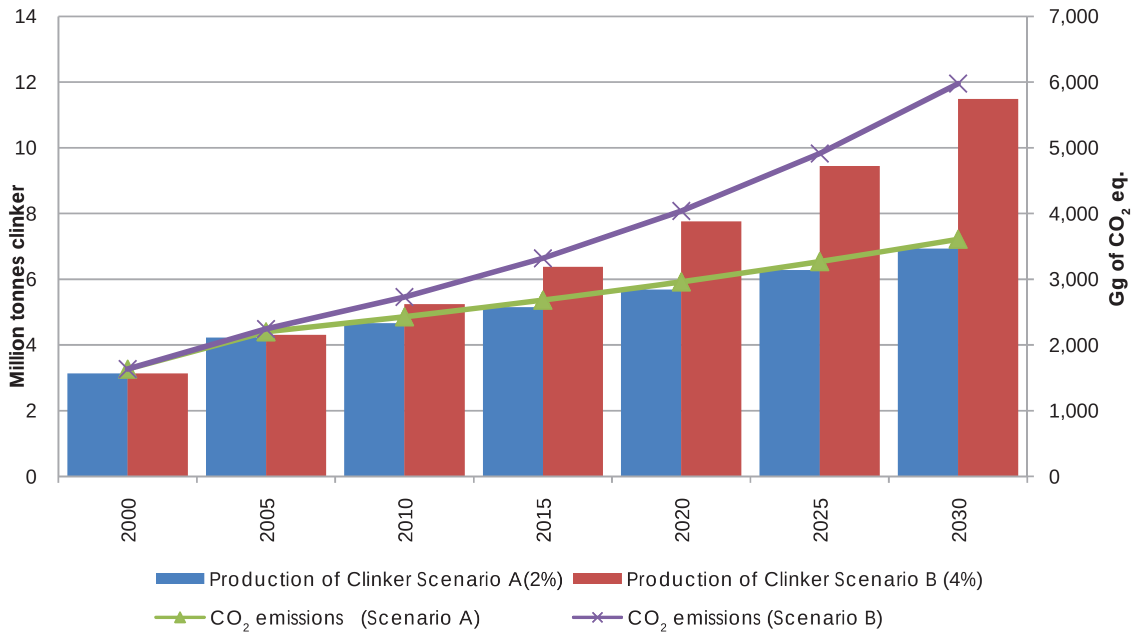

Figure 3-7 Projected clinker production and CO_2 emissions under scenario A and scenario B

- Optimization of heat recovery/upgrade clinker cooler;
- Using efficient transport system (mechanical transport instead of pneumatic transport);
- Establishment of annual targets for GHG emissions reduction in cement factories;
- Support to increase the flow of CDM revenues to encourage costly mitigation measures in the cement sector;
- Creation of a dialogue platform between the government and the cement factories management representatives.

3.3. Agriculture

The total GHG emissions from the agricultural sector do not constitute more than 3.7% of the national total emissions. The main GHGs are N_2O and CH_4, generated from agricultural soils, manure management and enteric fermentation. The 2004 total emissions from the agriculture sector amounted to 685 tCO_2 eq., distributed as follows: 131 tCO_2 eq. from enteric fermentation; 127 tCO_2 eq. from manure management; 426 tCO_2 eq. from agricultural soils; and 1 tCO_2 eq. from field burning of agricultural residues.

3.3.1. Baseline scenario

Many agricultural activities known to generate GHG emissions are not practiced in Lebanon (forest burning, rice cultivation, intensive fodder and leguminous species cultivation, intensive animal husbandry, etc.). Therefore, the limited development in agricultural practices and activities could be seen as an advantage for Lebanon in terms of limiting GHG emissions from the agriculture sector.

The number of animals in the farming sector has not considerably increased over the past years, except for poultry, and the trend is expected to remain stable by 2030 as shown in Table 3-10. The expected rise in emissions from the animal husbandry sub-sector is expected to be alleviated by improved breeding and feeding management, and thus higher food conversion efficiency that lowers emissions from manure (Smith et al., 2007).

Emissions from agricultural soils and field burning of agricultural residues are not expected to increase either, given the forecast that total agricultural area will fluctuate at the expense of other land uses (construction, land reclamation, forests) that vary with time. The national GHG emissions inventory shows a decrease of 3.5% in N_2O emissions between 2004 and 2006, while the IPCC report on mitigation measures in agriculture (Smith et al., 2007) estimates a potential of 0 to 10% annual decrease in N_2O emissions in warm dry climates. Since such reductions can be easily obtained from annual variability in cropping patterns and yields, it is estimated that N_2O, CH_4 and NO_x emissions from agriculture soils will decrease by 3.5% annually even if there is no clear policy for GHG reduction from the agriculture sector. Hence, by 2030, GHG emissions from agriculture soils could be at 60% less than the emissions in the baseline year, without taking into consideration CO_2 emissions or sequestration.

The National Action Plan (NAP) for Combating Desertification (MoA, 2003) developed by the Ministry of Agriculture (Table 3-11) is expected to help reduce GHG emissions from agricultural soils through the promotion of sustainable agriculture, improved rangeland management, and soil conservation practices. The implementation of the NAP for Combating Desertification could therefore count GHG emission reduction as a co-benefit, provided that more detailed and structured calculations add value to the NAP's contribution.

3.3.2. Mitigation scenarios

It is to be noted that the mitigation scenarios developed hereafter are to be considered as complementary.

Mitigation scenario 1: Field level measures

Improve Manure management: Large modern farms need to better manage their manure and other agricultural

Table 3-10 Poultry and livestock head numbers per year

	2000	2004	2006	2007	2030
Dairy cows	38,900	43,850	36,500	45,300	55,719
Other cattle	38,100	36,550	36,500	40,100	45,634
Poultry*	10,898,630	13,200,000	13,389,534	12,676,712	18,508,000
Sheep and goat	591,575	732,000	854,800	759,100	950,000

* Number of birds per year is adjusted from an average bird life cycle of 38 days.