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BOSNIA AND HERZEGOVINA
Ministry of Foreign Trade and Economic Relations

HCFC PHASE-OUT MANAGEMENT PLAN IN BOSNIA AND HERZEGOVINA

Sarajevo, January 2012

PROJECT COVER SHEET

COUNTRY NAME	**BOSNIA AND HERZEGOVINA**
LEAD IMPLEMENTING AGENCY	**UNIDO**
CO-OPERATING IMPLEMENTING AGENCY	**N/A**

SUBMISSION OF COMPLETE DOCUMENTATION		
Document	**Yes/No**	**Comments**
Letter of transmittal	Yes	
HPMP	Yes	
Draft agreement	Yes	
MYA tables (on-line)	Yes	
Technical review (where applicable)	N/A	
Executive summary	Yes	

DATES OF RATIFICATION OF AMENDMENTS TO THE PROTOCOL			
Copenhagen	August 2003	**Beijing**	August 2011
Comments:			

HCFC REGULATIONS IN PLACE		
Regulation	**Yes/No**	**Comments**
HCFC regulation	Yes	
HCFC licensing system	Yes	
HCFC quota system	No	

SUBMISSION OF ODS DATA REPORTS			
Report	**Yes/No**	**Year reported data**	**Comments**
Country programme	Yes	2010	
Article 7 data	Yes	2010	
Calculated HCFC baseline (ODP tonnes)			4.722
Starting point for aggregate reductions in HCFC consumption (ODP tonnes)			7.402
Explain any data discrepancies:			

HPMP DOCUMENT					
Servicing only	No	**Manufacturing only**	No	**Servicing and manufacturing**	Yes
Freeze and 10%	Yes	**Freeze, 10% and 35%**			Yes
Main components included					Yes
Overarching strategy					Yes
Strategy and action plan for stage I					Yes
Co-financing included					No
Impact on the environment					Yes
Implementation work programme and timeframe included					Yes
Implementation modalities (project monitoring unit)					No

FUNDING	
Funding consistent with guidelines (servicing sector, cut-off date, second stage, HCFC-141b imported in polyols, cost effectiveness, technology upgrade, ~~foreign ownership, export to non-Article 5 countries~~)	Yes
Funding of last tranche requested at the last year of implementation:	Yes
Priority given to manufacturing over servicing sector (if applicable)	Yes

CONTENT

EXECUTIVE SUMMARY

The HCFC Phase-out Management Plan (HPMP) is developed to enable the Government of Bosnia and Herzegovina a Party of the Montreal Protocol to meet its commitments under the Decision XIX/6 of the Nineteenth Meeting of the Parties, accelerating the phase-out of the HCFCs in Article 5 countries.

This document is a part of policies of the Bosnia and Herzegovina in the field of environmental protection specifically designed to address the issue of ODS (HCFC) consumption phase-out.

BiH Institutions involved in the preparation of HPMP

In the preparation of the HPMP for Bosnia and Herzegovina an expert team consisting of experts from both BiH constitutive Entities (Federation of Bosnia and Herzegovina - FBiH and Republika Srpska -RS) was engaged as well some independent experts, experts from both key BiH Universities (Sarajevo and Banja Luka) and also some professional advisors – consultants with a grate experience in the field of environment protection and implementation of the Montreal Protocol.

During the preparation of this HPMP Project Document, the BiH national expert team had made various consultations with the key BiH institutions and organisations and used their official statistical data and reports related to the collected data on use, import and consumption of ODSs, particularly HCFCs and equipment containing these substances in the period 2003-2010.

The following institutions from the State and Entities' levels were directly or indirectly involved in the preparation of this HPMP documents:

- Ministry of Foreign Trade and Economic Relations of Bosnia and Herzegovina (MoFTER), as the responsible Authority for creation of Environmental Policy and coordination of the implementation of all International Multilateral and Bilateral Environmental Agreements ratified or accessed by Bosnia and Herzegovina;

- (BiH) Entities' Ministries: Ministry of Environment and Tourism of the Federation BiH and Ministry of Spatial Planning, Construction and Ecology of the Republika Srpska (RS), as the Entities' responsible institutions for environmental protection issues;

- National Ozone Unit as the key and principal national body responsible for the coordination of the Country's actions related to the Ozone Layer protection and facilitation of the ODS / HCFC phase-out.

- State Agency for Statistics and (BiH) Entities' Institutes for Statistics;

- Foreign Trade Chamber of Commerce of Bosnia and Herzegovina;

- National Indirect Taxation Authority and its Custom Division;

- BiH Official Gazette and Official Gazettes of both Entities

ODS regulations in Bosnia and Herzegovina

The key regulations (as ODS phase-out Legal Acts) adopted in Bosnia and Herzegovina for the implementation of the Montreal Protocol and ODSs phase-out, which contents, among the others assumptions, the Licensing and Monitoring System for ODS import / export and reporting rules are as folows:

At State level:

"DECREE on Conditions and Procedures for the Implementation of the Montreal Protocol and Phase-out of Substances that Deplete the Ozone Layer in Bosnia and Herzegovina" (Off. Gazette BiH No. 36/07), which is adjusted and harmonized with the Annexes A,B,C,D and E of the Montreal Protocol and the European Union Regulations;

At Entities' level *(in both Entities - Federation of BiH and Republika Srpska):*

"Regulation on Phase-out of Substances that Deplete the Ozone Layer (Off. Gazette F BiH No. 39/05 and Off. Gazette RS No. 94/05).

HCFC Consumption in Bosnia and Herzegovina

During the preparation of the HPMP the national expert team made a country-wide survey on installed quantities and annual import/consumption of HCFCs in Bosnia and Herzegovina

In the tables billow are shown the summaries of results achieved in these on the desk and site investigations.

HCFC import data (base: Article 7 Data Reports, by years 2005-2010)

Year	*Annual Import (Mt)*		
	HCFC-22	*HCFC-141b*	*Total*
2005	51.00	66.24	117.24
2006	39.51	15.00	54.51
2007	50.84	25.00	75.84
2008	47.91	44.48	92.39
2009	54.36	27.00	81.36
2010	63.34	0	63.34

HCFC consumption data and its sartorial distribution

(Base: Surveying of actual consumption, by sectors and by years 2005-2010, including consumption of HCFC-141b, both: as pure-imported substance and in pre-blended Polyol)

Year / *Substance*	*Annual Import/ Consumption (Mt)*					
	HCFC-22	*HCFC-141b*				*Grand total HCFCs*
SECTOR ⇨	Refrigeration[1)]	Foam[2)]	Refrigeration[3)]	Others	Total	
2005	51.00	19.96	57.20	9.04	66.24	117.24
2006	39.51	27.96	10.20	1.35	39.20	81.05
2007	50.84	44.20	12.80	-	57.00	107.78
2008	47.91	45.11	14.40	-	59.51	107.42
2009	54.36	41.07	13.00	-	53.07	107.43
2010	63.34	40.26	12.20	2.14	54.60	117.94

LEGENDE: [1)]*Actual import/consumption in Refrigeration sector (manufacturing and service activities)*

[2)] *Consumption in pre-blended Polyol (in manufacturing activities)*

[3)] *Consumption in manufacturing of insulation foam for refrigeration appliances*

HCFC Base-line for compliance and Starting Point for reduction of HCFC consumption

Substance		Consumption by years (M tone)					
		2005	*2006*	*2007*	*2008*	*2009*	*2010*
Total consumption of HCFC-22		51.10	39.51	50.84	47.91	**54.36**	**63.34**
Consumption of HCFC-141b (as reported under Art. 7)		66.24	15.00	25.00	44.48	27.00	0
Consumption of HCFC-141b in pre-blended Polyol		0	24.20	22.00	15.43	26.03	54.60
Total consumption of HCFC-141b (pure and in pre-blended Polyol)		66.24	39.20	57.00	59.51	53.07	54.60
Base-line and Starting point for assistance and reduction of HCFC consumption (Mt / ODP t)	**HCFC-22 – Base-line / Starting Point (average 2009-2010)**					**58.85 M t / 3.24 ODP t**	
	HCFC-141b –Base-line (average 2009-2010)					**13.5 Mt / 1.485 ODP t**	
	HCFC-141b Starting Point (Base-line+Average cons. in pre-blended Polyol 2007-09)	**13.50 + 24.37 = 37.87 M t / 4.17 ODP t**					
	National HCFCs reduction Starting Point	**58.85 + 37.87 = 96.72 M t / 7.41 ODP t**					

HCFC phase-out overarching strategy

The HCFC phase-out overarching strategy of Bosnia and Herzegovina is based on the implementation of the HPMP as the strategic document of the Country for its target to continue implementation of the Montreal Protocol, gradual reduction and phase-out of the HCFC consumption in the Country.

Due to Countries' target to become a member of the European Union by the year of 2020, then the implementation of the HPMP should be mostly completed till that year, and accelerated reduction and phase-out of HCFC consumption should be done by 2025, with remaining of HCFCs consumption (actually HCFC-22 only) in an amount up to 2.5 % for servicing refrigeration and air-conditioning facilities till 2030.

The Country's targeting policy for HCFCs consumption phase-out is based on the following National plan for HPMP implementation, divided in two phases /stages:

Stage 1:

– Freeze the consumption of HCFCs at the Starting Point level baseline level: 2013
– 75% reduction: by 2020

Stage 2:

- 92 % reduction: by 2025
- 97.5 % reduction: by 2030
- 100 % phase-out: by 2035

Strategy and phase-out plan for Stage 1 of the HPMP

The overall HCFC phase-plan for the implementation of the HPMP- Stage I include the following specific activities for HCFCs gradual reduction and phase-out, estimation of incremental costs for the implementation of HCFC conversion investment activities as well as appropriate policy and non-investment activities to be generate in Bosnia and Herzegovina during the implementation period of the Stage I and its implementation frame time schedule:

Non-investment activities:

Establish a Legislative Framework for phase-out of HCFCs and equipment containing HCFCs, such as:
- Import quotas, permits, price control and import taxes on imported HCFCs and equipment containing HCFCs,
- Plan for reduction and baning of import of equipment containing or using HCFC refrigerants or blended HCFCs,
- Improving of reporting system;

Generate Training activities*:*
- Training workshops for custom officers, custom agences and importers ,
- Training workshops for service technicians and mechanics;

Awareness raising activities:

- Promotion activities-workshops for introduction of new non-HCFC technologies in refrigeration sector,
- Establisment and support of activities for Refrigeration & Air-condition Assiciation,
- Technical seminars and workshops for HCFC end users,
- Establish Code of Good Practice in Refrigeration and Air–condition Sub-sectors,
- Promotion activities on Radio, TV and written media,
- Establish and develop NOU Web site.

The total requested MLF assistance / support for the implementation of non-investment activities of the HPMP-Stage 1 (to be implemented up to 2020) is estimated to the amount of US$ 280.000, without funds for the support of the HPMP Management and Monitoring Unit for the implementation of the HCFC Phase-out Management Plan.

Investment activities:

Implementation of the following two (2) HCFC-conversion investment projects in Foam and Refrigeration manufacturing Sub-sectors:
- *Project 1:* Conversion of HCFC-141b to non-HCFC technology (using n-pentane as blowing agent) in the foam manufacturing industry "ALTERNATIVA" Hrasnica, Sarajevo and
- *Project 2:* "UMBRELLA" project for conversion of HCFC-141b to Methyl formate blowing agent and HCFC-22 to HFC / HCFC blends in 6 Small and Medium-size Enterprises (6 SMEs) refrigeration manufactories.

By the implementation of these two investment projects, the Country will be able to reduce the consumption of HCFCs (particularly HCFC-141b and HCFC-22) in total amount of metric tone (Mt), starting the gradual reduction from the calculated National Starting Point (96.72 Mt/7.41ODP t)

The total requested MLF assistance / MLF Grant (Incremental Capital Cost) for the implementation of these two projects is estimated to the amount of US$ 750,310 (without funds for the support of the International Implementation Agency -UNIDO).

Estimated impact on the environment including on the climate

The impact on environment was developed taking into consideration the ODP and GWP of the HCFC substances to be replaced (HCFC-141b and HCFC-22) and the selected alternative substances (Cyclo-pentane and Methyl formate as the alternative of HCFC-141b and HCFC blend R-134a as the alternative for replaced HCFC-22).

The ODP and GWP values of used HCFCs and calculated environmental impact (annual phase-out of calculated CO_2 equivalent) after replacement of HCFCs in (two) investment projects are shown in the table below:

Before the conversion					
HCFC substance	**Starting Point of HCFCs consumption by two projects (Mton)**	**ODP**	**GWP**	**ODP tone**	**Equival. CO_2 tone/year**
HCFC-141b in "ALTERNATIVA" Proj.	43.46	0.11	713	4.781	30,987
HCFC-141b in "6SMEs" Proj	13.40	0.11	713	1.474	9,554
HCFC-22 in "6SMEs" Proj	14.58	0.055	1,810	0.802	26,390
Total	71.44			7.057	**66,931**
After the conversion					
Converted substance	**Annual consumption (tone)**	**ODP**	**GWP**	**ODP tone**	**Equival. CO_2 tone/year**
Cyclo-pentane	16.2*	0.00	11	0.00	178
Methyl Formate	5.4*	0.00	negligible	0.00	0.00
HFC-134a (R-134a)	14.58	0.00	1,300	0.00	18,954
Total					**19,132**
Environmental impact					
HCFCs vs. non-HCFCs comparison				**ODP phased out**	**Equival. CO_2 tone/year**
HCFC-141b vs Cyclo-pentane				4.781	30,809
HCFC-141b vs Methyl Formate				1.474	9,554
HCFC-22 vs HFC-134a				0.802	7,436
				7.057	**47,799**

NOTE: * estimation

Implementation modalities and the Project Management Unit.

Different Government Institutions and Authorities (both from State and Entities levels) have been involved in the preparation and development of the HPMP. The Ministry of Foreign Trade and Economic Relations (MoFTER) of Bosnia and Herzegovina in cooperation with the relevant Entities' Ministries of Environment have a legal obligation to create the policy of Bosnia and Herzegovina and to coordinate the national activities for the implementation of accesed / ratified international Agrements in the field of protection of the environment.

Formulation of policies, strategies and action plans, creation of the legal framework and institutional network for their application is on the legal responsibility of MoFTER

The National Ozone Unit of Bosnia and Herzegovina (NOU BiH), which is located in the (State) Ministry of Foreign Trade and Economic Relations is the principal national body (with its Branches in both Entities) responsible for the coordination of the overall Country's actions and activities related to the Ozone Layer protection, implementation of the Montreal Protocol (as concluded International Agreement of Bosnia and Herzegovina) and facilitation of the HPMP implementation.
Both BiH Entities' (Federation of Bosnia and Herzegovina-FBiH and Republika Srpska-RS) are according to the State Constitution responsible for environment protection at their administrative territories, while the responsibility for the coordination of the implementation of International Agreements of Bosnia and Herzegovina is on the State Administration (relevant Ministries).
The other State's and Entities' key authorities who will, under the coordination of MoFTER, play a significant role in the implementation of the HPMP BiH are as follows:
State Custom Authority,
State Border Police,
Ministry of Environment and Tourism of FBiH and
Ministry of Spatial Planning, Construction and Ecology of RS

With the technical assistance of the selected and nominated International Implementation Agency – UNIDO and with the support of the Multilateral Fund, Bosnia and Herzegovina is able to implement the prepared HPMP and fulfil all commitments raised from this strategic document for HCFCs phase-out within the prepared Programme and Implementation Time Schedule.

Due to complex situation in Bosnia and Herzegovina, it would be necessary to investigate a possibility to establish a Project Implementation Unit (PIU) which will be able under the monitoring of the NOU to manage the operational activities for the implementation of the HPMP.

1. GENERAL INFORMATION

1.1 Country Profile

1.1.1 Geography

Bosnia and Herzegovina (in local language named as Bosna i Hercegovina - BiH) has a land area of 51,209 km^2 and is situated on the Balkan Peninsula in South-eastern Europe and belongs to the "Western Balkan" countries, as shown in the map of Figure 1.1. The country is bounded to the north, west, and southwest by Croatia, to the east by Serbia and southeast by Montenegro.
The country also has a short coastline (21.2 km) along the Adriatic Sea around the town of Neum and Peninsula Klek and shares a sea border with Croatia.

Figure 1.1: Map of Bosnia and Herzegovina

Bosnia and Herzegovina is a mountainous country with 62% of the land more than 700 m above sea level, as shown in Figure 1.2. The Dinaric Alps cross the country from its western border with Croatia to the southeast border with Montenegro. The central and western parts of the country are heavily forested, while the north (Posavina) and far south-west (Herzegovina) have flatter areas and valleys of fertile soil used primarily as farmland. The highest peak of Bosnia and Herzegovina is Maglic (on the souteast) at 2386 meters above the sea level.

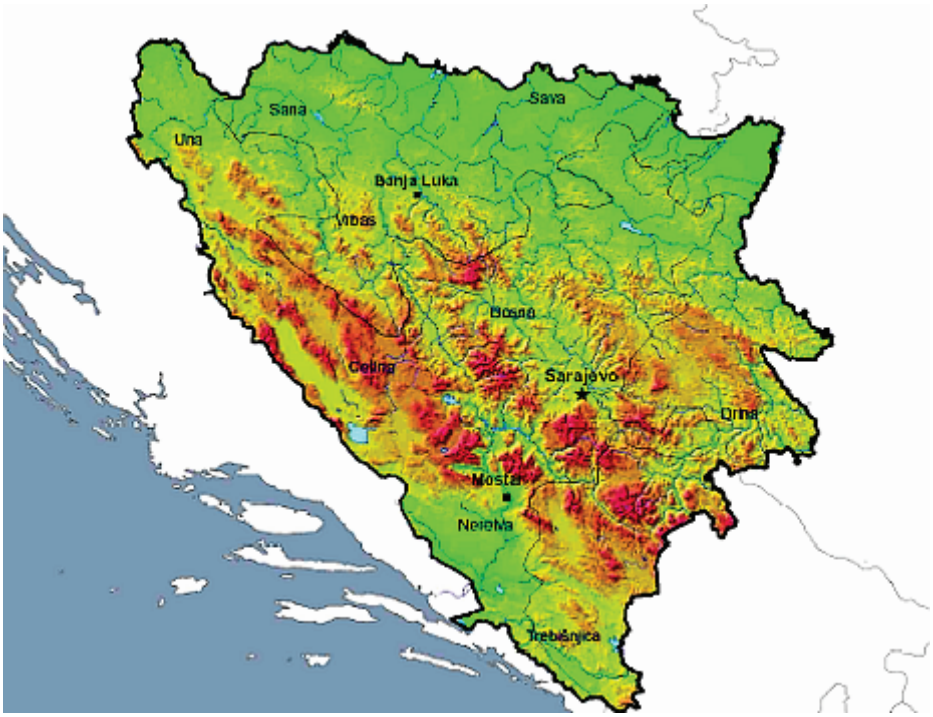


Figure 1.2: Geophysical map of Bosnia and Herzegovina

1.1.2 Climate and Natural Resources

The country is situated between the continental and Mediterranean climatic zones, which creates three local climatic areas. The northern inland territory has a moderate continental climate with warm summers and cold, snowy winters. The mountain areas above 700 m have a mountain climate with short, cool summers and long, severe winters with snow. The south has an Adriatic-Mediterranean climate with sunny, warm summers and short, mild, rainy winters. The average temperature in the capital of Sarajevo, in the continental zone, is -1 ºC in January and 20 ºC in July.

Bosnia and Herzegovina has significant water resources, many natural and mineral water springs and hydropower potential capacities which should be a key factor in the economic development of most areas in the near future. The longest river is Sava (331 km), which runs in flat area along the northern border. Sava and its tributaries, Bosna river (by which is named the country and State Bosna / Bosnia) passing by Sarajevo, Una at West, Drina at East and Vrbas at Northwest all flow to the north. Few rivers, notably Neretva (218 km) and Trebisnica flow towards the Adriatic Sea. Rivers also define the country's two historical provinces; Bosnia (one of the oldest European states – Middle-age Kingdom of Bosnae) lies between the rivers Una (on West), Sava (on North and Drina (on East) and Herzegovina is crossed by the Neretva river.

Forest and woodland cover 39% of the country, meadows and pastures 20%. About 14% of the land is arable, with 5% under permanent crops. Before the war Bosnia and Herzegovina produced and exported some of agricultural products, such as fruits and tobacco, but now it has to import more than half of its food, including essential staples.

The main natural resources of Bosnia and Herzegovina are its natural forests and biodiversity, coal and renewable energy sources, such as: hydro, wind, biomass, thermal and solar energy power potentials.
The country's natural resources include significant deposits of several minerals such as salt, manganese, silver, lead, iron and zinc ore, bauxite, chromium and coal.

1.1.3 Population

In the latest national census (1991), Bosnia and Herzegovina had 4.377 mill inhabitants and the population density was 85.5 inhabitants/km^2. Current population figures vary depending on the source but are estimated to be around 3.84 million (the last estimation from 2006 done by the Agency for Statistics of Bosnia and Herzegovina in the Country are leaving 3,842,762 inhabitants or 75.04 inhabitants/km^2).
The population of Bosnia and Herzegovina is relatively young with median age of 36.2 years.

The largest cities include the capital Sarajevo, which is also an important cultural and commercial centre (estimated population 400,000), then the other cities, with the estimated population: Banja Luka (250,000), Tuzla (180,000), Bijeljina (150,000), Mostar (140,000) and Zenica (135,000). Between 1991 and 2002 the population movement from the countryside to the towns increased the urban population from 40 to 60%. Bosnia and Herzegovina has three major population ethnic groups: Bosniaks, Serbs and Croats.
In 2006 the country's human development index, measured by the United Nations Development Programme (UNDP), was 0.800 (on the scale of 0.0 to 1.0). Bosnia and Herzegovina was 62nd out of 177 countries reviewed, which puts it in the group of countries with medium human development.

1.2 Economy

Before the last war in the Western Balkans (1992-1995), Bosnia and Herzegovina (BIH) had a diversified economic structure. Industrial production (43%), Agriculture and Forestry (18%) and Mining (14%) were important and produced the main part of the country's GDP. Tourism was also well developed. Yugoslavia's military industries were heavily concentrated there, and the defense industry, producing about 40% of Yugoslavia's armaments, was a significant part of the BiH economy.

The war caused industrial production to plunge, and in 1993 it was only about 20% of the 1989 pre-war level. Neither the end of the war nor international lending or aid has helped industry to regain its former production levels. Industrial output grew at high annual percentage rates from 1995 to 2000 and slowed down after that, but the original starting point was so low that production still remains lower than its 1989 level.

As a consequence of the war, inflation and industrial decline, unemployment soared to an estimated 70-80% in 1995. The economic recovery began after the 1995 Dayton Peace Agreement. The end of the hostilities and the very low level of economic activity during the war caused GDP to grow 54.2% in 1996. The fast growth continued until 1999 but slowed in the period 2000-2002. GDP is continuing fast growth with real growth rate of GDP per capita at around 7%, for two consecutive years 2007 and 2008, exceeded the amount over 3,000 EUR (3,648 in 2008). BiH has not directly suffered repercussions from the financial crisis and it is expected that in next few years it will be continued relatively high GDP growth rate. The recent evolution of the country's GDP is presented in Figure 1.3.

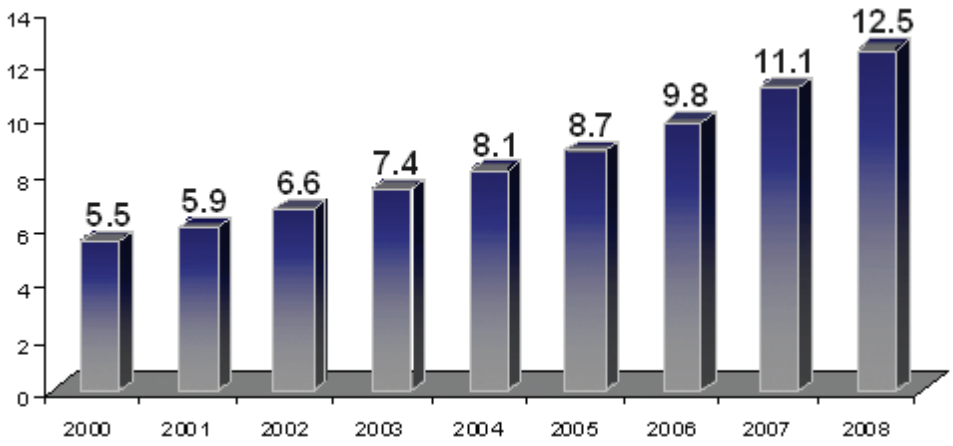


Figure 1.3: GDP evolution in recent years, billion €
(Source: Agency for Statistics of BiH, FIPA BiH, 2009)

The annual growth rate of industrial production in the decade from 1999 to 2008 was in an average of 9%.
Unemployment, as one of the most serious problems of domestic economy, indicates a modest trend of decrease. Registered unemployment in 2004 and 2005 was estimated at around 43%; though with the grey economy included might be in the order of 25-30%. The Labour Force Survey, which is regularly conducted from 2006 according to the international methodology, provides a real picture of labour market in BiH with unemployment rate at 23.4% in 2008

1.3 National Legislative Framework and Institutional Structure

1.3.1 Constitutional Framework and Governmental Structure

According to the Constitution of Bosnia and Herzegovina (BiH) - Annex IV of the General Peace Agreement for Bosnia and Herzegovina (concluded in November 1995 in Dayton, USA, and formally signed in Paris, France on 14 December 1995), BIH is a composite state consisting of two Entities: the Federation of Bosnia and Herzegovina (FBiH) and the Republika Srpska (RS) and the District Brčko of Bosnia and Herzegovina, which is under administrative management of the BiH Government. The Constitution stipulates free movement of persons, goods, capital and services in the entire territory of BiH. The Constitution also stipulates the division of competencies between the BiH state institutions and institutions of both Entities.
The Parliamentary Assembly has two chambers, the House of Representatives and the House of Peoples. The Parliamentary Assembly adopts laws and decides on the budget of the State institutions. The Presidency of Bosnia and Herzegovina ratifies international treaties after approval of the Parliamentary Assembly. All legislation on State level requires the approval of both houses.

The FBiH has its own constitution, a bicameral parliament and a government headed by a Prime Minister, who is nominated by the Parliament. The significant centers of political power in the Federation are the ten cantons, which have their own parliaments and governments.

The RS has a unified governmental structure and a unicameral People's Assembly (parliament) and a government headed by a Prime Minister, who is nominated by the People's Assembly of Republika Srpska.

1.3.2 Constitutional Provisions and Legal System in relation to International Treaties

The former SFR Yugoslavia (which BiH was one of the six Federal Republics) ratified the Vienna Convention on the Law on Treaties. On the basis of accepted Notification on succession / accession, BiH, as the one of the states successors of former SFR Yugoslavia, has applied this Treaty since 1994.

The Constitution of BiH contains the commitment under which general principles of international law shall be an integral part of the law of BiH and its entities. International treaties that BiH has ratified and which have entered into force become a part of the BiH legal system and their provisions prevail over those of domestic legislation that may contradict them.

By the State Law on the "Procedure of Conclusion and Implementation of International Contracts" (Official Gazette of BiH No. 29/90 dated 39 November 2000), all aspects and procedures for conclusion, process of ratification and implementation of international agreements and contracts and other activities related to the international contracts that are concluding by BiH, are regulated.

1.4 Environmental Overview and Implementation of the Montreal Protocol

1.4.1 Institutional Structure and Legislative Framework in BiH in the Sector of Environment

According to the Constitution of Bosnia and Herzegovina (based on the international agreement from Dayton, known as the "Dayton Peace Agreement for Bosnia and Herzegovina", concluded in Dayton, USA in November 2005 and signed in Paris, France in May 2006), main jurisdictions and duties of national administration in the field of environmental protection and nature resources are on entity level, while forming of strategic policy and international relations, including conclusion and implementation of international multilateral and bilateral agreements and contracts, is in the competence of the national administration, while ratification/approval of international agreements is done by the Presidency of Bosnia and Herzegovina, after given approval of both Houses (House of Representatives and the House of Peoples) of the Parliamentary Assembly

Bosnia and Herzegovina does not have an established national Ministry for Environment, neither has an adopted Law on Environment Protection on national level, but according to current "Law on Ministries and other Bodies of Bosnia and Herzegovina" from 2003, creating environmental policy and coordination of international relations of lower authorities in this field, and for coordination of implementation of international environmental multilateral agreements, the Ministry of Foreign Trade and Economic Relations is competent.
For implementing of environmental policy and operational implementation of ratified/accepted international agreements of Bosnia and Herzegovina in the field of environmental protection, entity ministries are competent (with current structure and names):

- Ministry of Environment and Tourism (Entity: FBiH)
- Ministry of Construction, Spatial Planning and Ecology (Entity: RS)

Both entity ministries have established operational subdivisions – sector for environmental protection

In District Brčko for those affairs the Department for Municipal Affairs of the District is competent.

Bosnia and Herzegovina has no special (specific) legislation in the field of environmental protection and natural resources on the national level. This issue is regulated by legislation of both Eentities (FBiH and RS) and by the legislation of District Brčko.

Most important legislation of both Entities and District Brčko in this field are:

- Law of the Republika Srpska on the Protection of Air**,** adopted by the Parliament of the Republika Srpska in 2002 (Off. Gazette RS No. 53/02);
- Law of the Federation Bosnia and Herzegovina on the Protection of Air adopted by the Parliament of the FBiH in 2003 and amended it in 2010 (Off. Gazette FBiH No. 33/03 and 4/10) and
- Law of the District Brcko of BiH on the Protection of Air adopted in 2004 and amended in 2005 (Off. Gaz. of Brcko District No. 25/04 & 1/05)

These Laws also (generally) regulate main issues and policy tasks for the protection of the Ozone Layer, but did not regulate direct measures for the protection of the Ozone Layer in both Entities, or management of ODSs phase-out, but among the other issues announced the obligation of the Entity's Governments, particularly the Ministry of Physical Planning and Environment of the FBiH and the Government of the RS to regulate all operational issues for the protection of the Ozone Layer by issuing an additional Legal Act (By-law) for these issues.

1.4.2 Ratification of Multilateral Agreements for Ozone Layer protection

Bosnia and Herzegovina is classified as an Article 5 country of the Montreal Protocol and has ratified the following multilateral agreements on the protection of the Ozone Layer shown in the Table 1 bellow.

Table 1: **Status of Ratification of the Multilateral Agreements for the Ozone Layer protection**

Agreement / Amendment	*Entry into Force*	*Status of BiH Ratification**	*Date of BiH Ratification*	*Published in National Official Gazette*
Vienna Convention	November 1988	(Sc)	September 2003	Off. Gaz. SFRJ, MU No. 16/90; Off. Gaz. RBiH No 13/94)
Montreal Protocol	January 1989	(Sc)	September 2003	Off. Gaz. SFRJ, MU No. 16/90; Off. Gaz. RBiH No 13/94).
London Amendment	August 1992	(Ac)	August, 2003	Off. Gaz. BiH, MU, No 8/2003
Copenhagen Amendment	June 1994	(Ac)	August, 2003	Off. Gaz. BiH, MU, No 8/2003
Montreal Amendment	November 1995	(Ac)	August, 2003	Off. Gaz. BiH, MU, No 8/2003
Beijing Amendment	October 2011	(Ac)	August, 2011	Off. Gaz. BiH, MU, No 6/2011 (15.Sept. 2011)

Notes: **Statues of Ratification: (Sc) Succession; (Ac) Accession*

The Republic of Bosnia and Herzegovina which successor, from the adopted International Agreement for Bosnia and Herzegovina (known as the "Dayton Peace Agreement for Bosnia and Herzegovina", concluded in Dayton, USA in November 2005 and signed by the concerned parties in Paris, France in May 2006) is the State of Bosnia and Herzegovina (BiH) has accepted the ratification of the Vienna Convention and the Montreal Protocol through the succession from the SFRJ in 1992 by accepting and taking over all international obligations of the former joint state – SFR Yugoslavia, concerning interests and rights of Bosnia and Herzegovina as an independent state in international affairs.

Bosnia and Herzegovina become the Party of the London, Copenhagen and Montreal Amendments by adopting its own ratification acts - Decrees of the Presidency of Bosnia and Herzegovina on the Ratification of the London, Copenhagen and Montreal Amendments to the Montreal Protocol (August 2003).

The Beijing Amendment was ratified by the Presidency of Bosnia and Herzegovina in August 2011, and the Decision of the Presidency of the on the ratification of this Amendment is published in the Official Gazette of Bosnia and Herzegovina, and submitted the Government's Notice on the ratification/accession to the Amendment to the Montreal Protocol Depositary, in October 2011, by which action this Amendment has been taken into force in Bosnia and Herzegovina

1.4.3 Background of Montreal Protocol implementation in Bosnia and Herzegovina

The former SFR Yugoslavia ratified the Vienna Convention and the Montreal Protocol in 1989 and as the developing country and country with annual low consumption of ODSs had been classified as the Article 5 country to Montreal Protocol. The war has prevented undertaking of concrete regulatory measures for monitoring, control, limitation and phasing-out of ODSs in this part of the former common country. With the succession of the former Yugoslavia, newly formed independent countries (former federal republics), and Bosnia and Herzegovina among them, according to the international legal relations, overtook the obligations of the former country in the implementation of the Montreal Protocol and its accompanying conventions. Unfortunately, BiH, ruined and destroyed by the war, in the post-war (post-Dayton) period of rehabilitation and reconstruction, had to deal with much more significant priorities than with those related to the environment and enforcement of the international obligations of the Montreal Protocol.

Due to the devastation of the pre-war economy, and especially due to the industrial sector and enormous decrease of the production, Bosnia and Herzegovina reached, in the first post-Dayton year – 1996, only 8-10% of the pre-war production and operational capacity, and 5 years later – in 2000 only 20 – 30% of the pre-war industrial production. Therefore, the production of the ODS in the country is unnaturally reduced in relation to the pre-war period (1991) for about 70 – 80%.

The recovery of the industrial capacities, the return of the BiH industrial products, as well as those who use the controlled ODS in the production and service process, on old – traditional markets, cause slow but constant growth of the consumption (use) of these substances in the country. This growth is slowed down also by the slow privatization process of these state companies. Thus, occurred one unusual specific case when relation to Bosnia and Herzegovina is concerned, when compared with other Article 5 countries, when projection and planning of ODS phasing-out is concerned.

On one hand, BiH has one much reduced consumption of ODSs in relation to the installed industrial capacities and pre-war production, especially in production of refrigeration domestic and commercial appliances and equipment, as well as flexible and rigid foams, which indicates that the level of the necessary interventions and assistance is low. On the other hand, there were significant installed capacities, as well as the trend of significant production growth and the come-back of these

manufacturers to the former markets, first of all to the local markets in BiH, in the neighboring countries of the former Yugoslavia (Croatia, Macedonia, Serbia) and the Balkan countries (Romania, Bulgaria, Albania). Thus, Bosnia and Herzegovina was in the very delicate and complex position that the country was in non compliance status with its obligations to the Montreal Protocol implementation, specifically to follow the phase-out program of CFCs, Methyl Bromide, Halons and TCAs (Methycloroform), which base lines for BiH were established based on the very low consumption in the country during the War and first after-war period (1995-2000).

1.4.4 Institutional Framework for Implementation of the Montreal Protocol

On the initiative of UNIDO, and with the support of the Multilateral Fund for the implementation of the Montreal Protocol, at the state Ministry of Foreign Trade and Economic Relations, at the beginning of 2000, the activities for establishment of Ozone Unit of Bosnia and Herzegovina were initiated through the Institutional Strengthening Project which was approved by the Multilateral Fund.

With the support of both BiH Entities, namely their relevant Ministries for environment (Ministry of Physical Planning and Environment of FBiH, and the Ministry for Physical Planning, Housing, Construction and Ecology of Republika Srpska), the Council of Ministers of BiH in July 2000 approved the project "Establishment of the Ozone Secretariat / Ozone Unit BiH" and concluding the Project document No. MP/BIH/99/053 with UNIDO and appointed the State Ministry of Foreign Trade and Economic Relations, as the National Agency for implementation of the project. In such a way an Ozone Unit of Bosnia and Herzegovina was established, with the premises and logistical support in the Ministry of Foreign Trade and Economic Relations and the two Branches of the National Ozone Unit, located in the two Entity Ministries: Ministry of Physical Planning and Environment and Environment of FBiH, and the Ministry for Physical Planning, Housing, Construction and Ecology of Republika Srpska. The Ministry of Foreign Trade and Economic Relations had appointed the Manager of the National Ozone Unit.

1.4.5 Country Programme for ODSs Phase-out and NOPP

The first proposal of the Country Programme for ODSs Phase-out in Bosnia and Herzegovina was prepared by the UNIDO technical assistance during 1997/1998 and was supported by the Entities' Authorities (Governments of FBiH and RS), and the Ministry of Foreign Affairs of Bosnia and Herzegovina before its approval done by the Executive Committee of the Multilateral Fund This Programme should have been the basis for obtaining the technical and financial assistance from the Multilateral Fund for the implementation of the Montreal Protocol for carrying out the obligations of Bosnia and Herzegovina (BiH), as a country (Party to the Montreal Protocol) categorized as the Article 5 country.
Under the support of the Multilateral Fund and technical assistance of UNIDO, in 2001, and under organization of the National Ozone Unit was updated and revised the Country Programme and developed the Action Plan for its implementation, which were approved by the Multilateral Fund.

The main goals of this Programme were:

- Establishing and institutional strengthening of the National Ozone Unit in BiH with its priority tasks to coordinate all operational activities in Bosnia and Herzegovina for the implementation of the Montreal Protocol and assist the ODS consumers and other relevant Entities' authorities, and eligible enterprises (ODS consumers) in formulating and preparing of conversion (investment) projects for ODS phasing-out;
- Preparation and coordination of the implementation of an Action Plan for ODSs, specifically CFCs, Methyl Bromide, Halons and TCAs phase-out and Projects Business Operational Plan;

- Initiation and participation in activities in BiH for establishment of legal and institutional framework for ODSs phase-out management as well as monitoring and control of import / export and consumption of ODS in BiH.

In 2003 the National Ozone Unit with the assistance of UNIDO prepared the "National ODS Phase-out Plan" (NOPP) for Bosnia and Herzegovina, which was approved by the Executive Committee of the MLF in December 2003.

Under the "National ODS Phase-Out Plan" and Decision XV/30 of the 15th Meeting of the Parties to the Montreal Protocol of November 25, 2003, the committed annual consumption of ODSs in Bosnia and Herzegovina and the plan for their phase out are shown in the Table 2 billow.

Table 2. Base-lines and BiH Plan - commitment for ODSs Phase-out

Montreal Protocol Annex/ Group	***Controlled substances (ODSs)***	***Obligation of the countries classified according to the Article 5 of the Montreal Protocol (Article 5 countries)***	***Obligation of Bosnia and Herzegovina according to the National Plan and MOP Decision XV/30 from Nov. 2003 Annual consumption (M Ton)***
A I	**CFCs**	Base level: Average of 1995-1997 Freeze : July 1, 1999 50% reduction: January 1, 2005 85% reduction : January 1, 2007 100% reduction : January 1, 2010	**Base level: 24.160** 235.300 – for year 2003 167.000 – for 2004 102.100 – for 2005 63.000 – for 2006 33.000 – for 2007 3.000 – for 2008 **0 from 1st. Jan. 2009**
A II	**Halons**	Base level : Average of 1995-1997 Freeze : January 1, 2002 50% reduction : January 1, 2005 100% reduction : January 1, 2010	**Base level: 0.680** 0.680 – for year 2005 0.680 – for 2006 **0 from 1.st. Jan. 2007**
B III	**1,1,1,-tricloroethane** (methyl chloroform)	Base level : Average of 1998-2000 Freeze : January 1, 2003 30% reduction : January 1, 2005 70% reduction : January 1, 2010 100% reduction : January 1, 2015	**Base level: 17.000** 17.000 for year 2003 17.000 for 2004 11.000 for 2005 5.000 for 2006 **0 from 1st. Jan 2007**
E I	**Methyl Bromide**	Base level : Average of 1995-1998 Freeze : January 1, 2002 20% reduction: January 1, 2005 100% reduction : January 1, 2015	**Base level: 19.650** 19.650 for year 2004 8.900 for 2005 8.900 for 2005 **0 from 1st. Jan 2007**

In spite of all specific circumstances and unconvinced position of the country in the implementation of its obligations towards the Montreal Protocol and ongoing obstacles, Bosnia and Herzegovina successfully implemented the most of plans and activities undertaken from the Country Programme and NOPP in past years and reached the compliance status in the phasing-out of all 4 groups of ODSs: CFCs, Halons, 1,1,1, - trichloroethane and Methyl Bromide.

The Review of the implementation of the NOPP and the phase-out of consumption / import of these 4 groups of the control substances and the achieving the compliance status towards the Montreal Protocol implementation is shown on the Table 3 bellow.

Table 3. *Implementation of Programmes and Projects for ODSs consumption phase-out in Bosnia and Herzegovina in the period 2003-2009*

	Annual consumption (in Metric Tons-MT) by years								
GROUP OF ODSs	***2003***	***2004***	***2005***	***2006***	***2007***	***2008***	***2009***	***2010***	***2015***
Annex A-II CFCs									
Max allowable total consumption of CFCs	24.16 *(baseline)*	24.16	12.08	12.08	3.6	3.6	3.6	0	
Expected total consumption	240	173	76	33	3	0	0	0	
Consumption reduction under the NPP	0	0	50	43	30	3	0	0	
Total annual reduction (under the Country Programme & NPP Plans)	0	77	87	43	30	3	0	0	
Compliance status with the Montreal Protocol (NOPP Plan 2003)	Non compliance period				⇨ Plan to achieve compliance				
Actual total consumption (Ref.: BiH Annual Reports to MLF)	230	230	51.2	31.7	22.2	8.8	0		
Compliance status with the Montreal Protocol	Non compliance period						⇨ **ACHIEVED COMPLIANCE**		
Annex A-II Halon(s)									
Max allowable total consumption	-	-	-	-	-	-	-	0	0
Expected total consumption (NOPP Plan)	0.68	0.68	0	0	0	0	0	0	0
Total annual reduction of Halons (under BiH Plan)	0	0	0.68	0	0	0	0	0	0
Compliance status with the Montreal Protocol (NOPP Plan 2003)	Non compliance period			⇨ Plan to achieve compliance					
Actual total consumption (Ref.: BiH Annual Reports to MLF)	0.68	0.68	0	0	0	0	0		
Compliance status with the Montreal Protocol	Non compliance period		⇨ **ACHIEVED COMPLIANCE**						
Annex B-III TCA (Solvents)									
Max allowable total consumption	17 (*baseline*)	17	11.9	11.9	11.9	11.9	11.9	5.1	0
Expected total consumption	22.6	16.6	0	0	0	0	0	0	0
Total annual reduction (under NOPP Plan)	0	6	16.6	0	0	0	0	0	0
Compliance status with the Montreal Protocol (NOPP Plan 2003)	Non compliance period			⇨ Plan to achieve compliance					
Actual total consumption (Ref.: BiH Annual Reports to MLF)	3	36	6.84	0	0	0	0		
Achieved compliance status with the Montreal Protocol	Non compliance period			⇨ **ACHIEVED COMPLIANCE**					

Annex E Methyl Bromide									
Max allowable total consumption	4.2 (*baseline*)	4.2	4.2	4.2	4.2	4.2	4.2	4.2	0
Expected total consumption	19.65	19.65	9.8	0	0	0	0	0	0
Total annual reduction (under NOPP Plan)	0	0	9.8	9.8	0	0	0	0	0
Compliance status with the Montreal Protocol (NOPP Plan 2003)	Non compliance period				⇨ Plan to achieve compliance				
Actual total consumption (Ref.: BiH Annual Reports to MLF)	16.4	16.4	1.29	0	0	0	0		
Achieved compliance status with the Montreal Protocol	Non compliance period			⇨ **ACHIEVED COMPLIANCE**					

1.5 Implemented Programmes and Projects for ODS Phase-out

Table 4. **Status of the implementation of BiH projects approved by MLF trough the Country Programme and NOPP**

Project No.	*Project Name (Name of International Implementation Agency)*	*Project amount ($)*	*Status of implementation*	*ODSs phased-out (ODP t)*
	(International Implementation Agency: UNIDO)			
MP/BIH/99/053	Establishment of an Ozone Secretariat / NOU	**104,709**	***Completed***	***n/a***
MP/BIH/00/035	Project preparation in the flexible foam sector	**14,763**	***Completed***	***n/a***
MP/BIH/01/071	Project preparation in the commercial / domestic refrigeration sector	**6,976**	***Completed***	***n/a***
MP/BIH/01/072	Project preparation in the commercial refrigeration sector	**13,388**	***Completed***	***n/a***
MP/BIH/01/163	Preparation of two investment projects in the flexible foam sector	**14,263**	***Completed***	*n/a*
MP/BIH/01/218	Replacement of refrigerant **CFC-12 with HFC-134a** and foam blowing agent **CFC-11 with cyclo-Pentane** in the **manufacture of domestic refrigeration equipment** at **BIRA**, Bihac	**536,161**	***Completed***	***33.4***
MP/BIH/01/219	Replacement of refrigerants **CFC-12 and R-502 with hfc-134a and r-404a, and foam blowing agent CFC-11 with HCFC-141b** in the **manufacture of commercial refrigeration equipment and cold refrigeration chambers at SOKO-RKT,** Mostar	**158,889**	***Completed***	***21.2***
MP/BIH/01/227	Conversion from **CFC-11 to methylene chloride** in the **production of flexible slab stock foam at INGA Co**, B. Gradiska.	**100,445**	***Completed***	***21.0***
MP/BIH/02/016	Preparation of a **National ODS phase-out Plan**	**78,078**	***Completed***	*n/a*
MP/BIH/02/049	Preparation of two investment projects in the commercial refrigeration sector	**11,537**	***Completed***	*n/a*
MP/BIH/02/063	Preparation of an investment project in the rigid foam sector	**14,584**	***Completed***	*n/a*
MP/BIH/03/029	Replacement of **CFC-12 with HFC-134a, CFC-11 with HCFC-141b**, and **TCA with non-cleaning process** in the **manufacture of commercial refrigeration equipment, panels**, **and heat exchangers at three enterprises** (**Soko Paneli**, Ljubinje; **Soko IPV**, Čitluk and **Kuca Leda**, Mostar)	**169,414**	***Completed***	***14.9***
MP/BIH/03/030	**Phase-out of CFC-11 by conversion to n-Petane** in the **manufacture of rigid foam products** at **Stirokart Co**, Srbac	**364,635**	***Completed***	***33.0***
MP/BIH/03/090	**Phase-out of Methyl Bromide in tobacco seedling vegetables and flower production sector**	**225,663**	***Completed***	***11.8***
MP/BIH/03/091	**National ODS phase-out Plan** (first tranche)	**263,302**	***Completed***	***28.5***
MP/BIH/04/019	**Phase-out of halon consumption**	**64.000**	*Completed*	***4.14***
MP/BIH/04/065	**Extension of Institutional Strengthening**: **Phase II**		*Ongoing*	*n/a*
MP/BIH/04/123	**National ODS Phase-out Plan** (second tranche)	**228,996**	***Completed***	***5.6***
MP/BIH/07/001	**National ODS Phase-out Plan** (third tranche)	**303,000**	*Ongoing*	
TOTAL CFCs PHASED-OUT				***173.5***
	(International Implementation Agency: UNEP)			
IML/5070-2761	**Assistance for regional awareness raising -2004**	**7,770**	*Completed*	*n/a*
IML/5070-2A43	**Assistance for regional awareness raising-2007**	**13,000**	*Completed*	*n/a*
IML/5070-2529	**UNEP Compliance Assistant Programme 2008**	**10,000**	*Completed*	*n/a*

On the Table 4 above is shown an overview of all by the MLF approved projects for Bosnia and Herzegovina and the current status (October 2010) of their implementation, including the ODS phased-out quantities (in ODP tonnes) for each particular approved and completed investment project, implemented trough the Country Programme and NOPP.

The following Programmes and Group of the particular investment and training projects were successfully implemented in the sectors:

Investment conversion projects

- Industrial production of refrigeration appliances and foam (conversion of CFCs to HCFCs and HFCs) -7 sub-projects;
- Technical assistance for Solvent sector program (conversion of TCA use to non-TCA cleaning technology) – 1 project
- Halon Management Program (phase-out of Halons use in BiH);
- Methyl Bromide Phase-out Program in agriculture manufacturing sector

Training programmes

- Custom Empowerment Program (training of Custom and State Border Police officers on the implementation of the Montreal Protocol and Ozone Legislation in place in BiH)
- Training of refrigeration service technicians is in the final phase of preparation, expecting to start in October 2011

List of Multilateral Fund CFC projects that have been replaced with HCFCs

The following investment projects for CFCs conversion to HCFCs were implemented trough the Country ODS Phase-out Programme and through the National ODS Phase-out Plan (NOPP) during the period 2002-2006:

Table 5. List of investment projects approved and funded by the Multilateral Fund implemented in BiH for conversion of CFC to HCFC technology

Project No.	*Project Name (Name of International Implementation Agency)*	*Year of comple-tion*	*Main equipment supplied trough the project (using HCFCs in current operation)*	*Current used HCFCs in enterprises' manufacture process*
	(International Implementation Agency: UNIDO)			
MP/BIH/01/219	Replacement of refrigerant **CFC-12 with HCFC-22 and HFC-134a,** and foam blowing agent **CFC-11 with HCFC-141b** in the manufacture of commercial refrigeration equipment and cold refrigeration chambers / stores at the enterprise **SOKO-RKT,** Mostar	***December 2004***		**-** HCFC-22 as refrigerant in production of commerc. refrig. appliances; - HCFC-141b as blowing agent for insulation foam
MP/BIH/03/029 (Umbrella project)	Replacement of refrigerant **CFC-12 with HFC-134a and HCFC-22,** and foam blowing agent **CFC-11 with HCFC-141b** in the **manufacture of commercial refrigeration equipment, insulation panels**, **and vehicles cold rooms at three enterprises:**	***December 2005***		
	∗ **KUCA LEDA**, Mostar		- Foaming spray machine & refrigerant charging machine	- HCFC-22 for charging of comm. refrig. appliances; - HCFC-141b for refrig. insul. foam & panels
	∗ IPV, Citluk		- No equipm. supplied	- No current HCFC technology applied
	∗ SOKO PANELI, Ljubinje		- Foaming machine	- No HCFCs used
MP/BIH/03/091	**National ODS Phase-out Plan – Investment Projects:** Replacement of refrigerant **CFC-12 with HFC-134a and HCFC-22,** and foam blowing agent **CFC-11 with HCFC-141b** in the **manufacture of commercial refrigeration equipment and cold rooms at 6 SMS enterprises, of which the following enterprises still use HCFCs technologies:**			
	∗ **ORDAGIC, Srebrenik**		- Foaming machine & set of refrigerant charging equipment	- HCFC-22 for charging of comm. refrig. appliances; - HCFC-141b for refrig. insul. foam & panels
	∗ **SOFREL, Sarajevo**		Foaming machine & set of refrigerant charging equipment	- HCFC-22 for charging of comm. refrig. appliances; - HCFC-141b for refrig. insul. foam
	∗ **EKO FRIGO, Banja Luka**		Refrigerant charging machine	- HCFC-22 for charging of comm. refrig. appliances; - HCFC-141b for refrig. insul. foam

1.6 ODS Legislation –Licensing and Monitoring System

1.6.1 ODS Legislation at State and Entities' levels

The crucial legislation adopted in Bosnia and Herzegovina for the implementation of the Montreal Protocol and establishment the National Programme for ODSs phase-out as well as establishment and put at place a Licensing and Monitoring System is:

At State level:

"DECREE on Conditions and Procedures for the Implementation of the Montreal Protocol and Phase-out of Substances that Deplete the Ozone Layer in Bosnia and Herzegovina" (Off. Gazette BiH No. 36/07).

This the first (ODS Legal Act) established at State level in BiH contents the following main regulations:

- Conditions for import and export of substances that deplete Ozone Layer (Licensing System, Import Quotas and Import Permits - procedures of issuance;
- Conditions for import and export of products and equipment, which contain or functionally use of ODSs;
- Plan and Programme of BiH for the implementation of the Montreal Protocol and phase-out of ODSs
- Monitoring and control system of ODSs and equipment containing or using ODSs import / export;
- List of controlled ODSs and the list of equipment containing ODSs with the Custom Codes, adjusted and harmonized with the Annexes A,B,C,D and E of the Montreal Protocol and the European Union Regulations;
- Reporting procedures and reporting standard formats for reporting to the relevant domestic and international authorities, organizations or bodies on the import / export and annual consumption of ODSs.

At Entities' level *(in both Entities: Federation of BiH and Republika Srpska):*

"Regulation / DECREE on Phase-out of Substances that Deplete the Ozone Layer (Off. Gazette F BiH No. 39/05 and Off. Gazette RS No. 94/05).

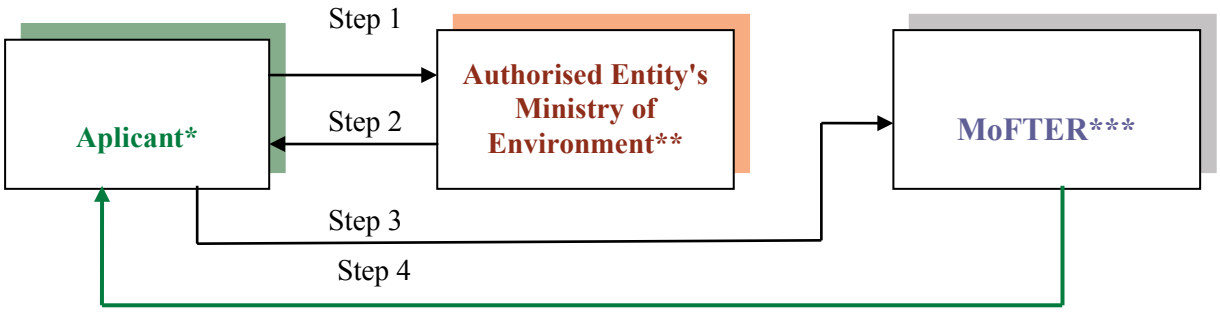
This Legislative Act among the others contains:

- Conditions and Procedures for Phase-out of ODSs and there substitution with alternatives;
- Procedure and responsibilities of owners of equipment which contain or use ODSs during its charging and discharging process and equipment deposing regulations;
- Procedures for Management of Equipment that contain or made of ODSs;
- Registration of ODSs import / export and consumption and data reporting procedures in accordance with International Agreements
- Terms and conditions for registration and operational activities of refrigeration services in Republika Srpska;
- Role and responsibility of the Ministry of Environment of FBiH and RS in issuing Licenses, Import Quotas and Permits.
- Responsibilities of ODSs importers regarding registration of imported substances and reporting to the Ministry;

1.6.2 Licensing and Monitoring System for ODSs import / export

The procedure for obtaining and issuing licenses, import quotas and import/export permits for ODSs import / export in Bosnia and Herzegovina is schematically shown and described on the schemas 6a, 6b & 6c billow

Scheme 6a: Procedure for obtaining an ODS Import License:



LEGEND:

* **Aplicant** - Any legal business entity regularly registered for the import/export of goods in Bosnia and Herzegovina

* **Authorised Entity's Ministry of Environment** is a related Ministry of Environment in that Entity (RS or in FBiH) where the Aplicant's business was registered:

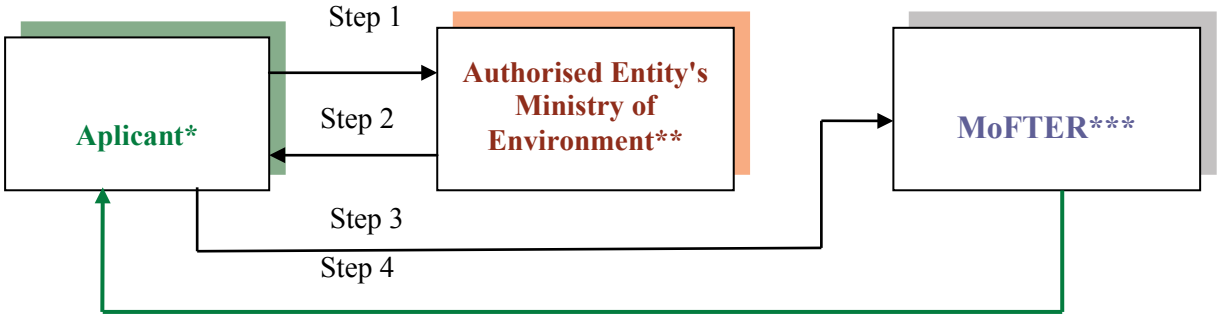
- Ministry of Environmet and Tourism of the F B&H
- Ministry for Physical Planning, Civil Engineering and Ecology of the RS

*** **MoFTER**-Ministry of Foreign Trade and Economic Relations

Steps for obtaining of ODS Import Licence

Step 1: Aplication for licence delivered for consideration/opinion to the Authorised Entity's Ministry (Entity's Ministry)
Step 2: The Ministry considers the Aplication and issues a written positive opinion to the Aplicant;
Step 3: The Aplicant delivers an Aplication, with enclosed written positive opinion from the Enity's Ministry to MoFTER
Step 4: The MoFTER issues the License (valid for one calender year duration) to the Aplicant

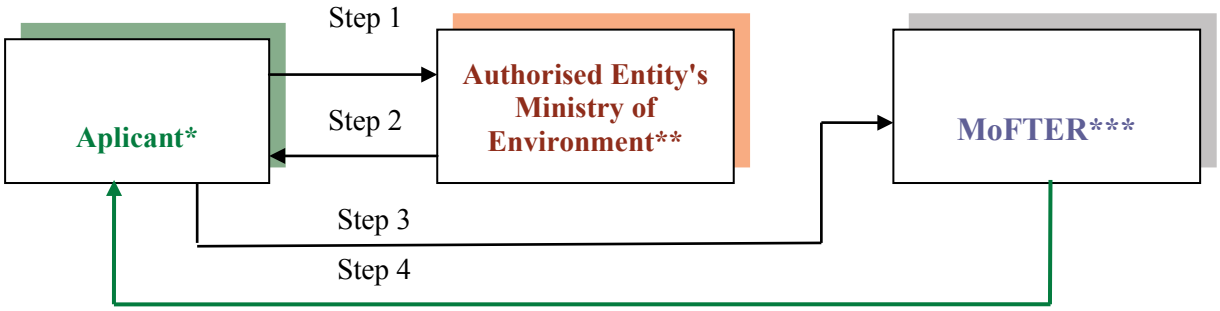
Scheme 6b: Procedure for obtaining an ODS Import Quota Permit:



Steps for obtaining of ODS Import / Export Quota Permit

Step 1: Aplication for the Annual Import Quota delivered for consideration/acceptance to the Authorised Entity's Ministry
Step 2: The Ministry considers the Aplication and issues a written acceptance for such requested annual import quota to the Aplicant;
Step 3: The Aplicant delivers an Aplication, with enclosed written acceptance from the Enity's Ministry to MoFTER
Step 4: The MoFTER, on the base of the NOU reccomendation issues an Annual Import Quota to the Aplicant (taking into consideration the totals of alowable import quantities for each of requested controlled substances.

Scheme 6c: Procedure for obtaining an ODS Import / Export Permit:



Steps for obtaining of ODS Import / Export Permit

Step 1: Aplication for each particular requested quantity of ODSs, based on the issued Annual Quota Permit delivered for consideration/acceptance to the Authorised Entity's Ministry
Step 2: The Ministry considers the Aplication and issues a written acceptance to the Aplicant for each requested ODS import contigent / lot;
Step 3: The Aplicant delivers an Aplication for Import Permit, with enclosed written acceptance from the Enity's Ministry to MoFTER
Step 4: The MoFTER, on the base of the NOU reccomendation and already issued Annual Quota Permit issues the Import Permit to the Aplicant (taking into consideration the total of approved Annual Quota for such Aplicant.

Each particular license and annual quota permit as well as import permit is issuing on the State level, by the MoFTER and should be signed by the Minister or his Deputy only.

The National Ozone Unit on behalf of the Ministry of Foreign Trade and Economic Relations and the National Custom Office are the Authorities that supervise and control imports and exports of ODSs in Bosnia and Herzegovina.

1.7 Lessons learned concerning HCFCs

Bosnia and Herzegovina established the ODS Phase-out Programme (Country Programme and NOPP) for phase-out of CFCs, Methyl Bromide, TCAs and Halons, by which successful implementation of the approved projects enabled the Country to phase-out consumption of CFCs, Methyl Bromide, Trichloroethane and Halons within the planned and agreed time.

Most of the investment projects implemented in the Industrial Refrigeration and Foam Production Sectors provided conversion of CFC-11 used as a foaming agent in production of flexible and rigid foam to:

- use of cyclo-Pentane in production of domestic refrigeration appliances at the production plant BIRA, Bihac;
- use of n-Pentane in production of rigid foam insulation sandwich panels at the STIROKART, Srbac production plant
- use of Methylencloride in the production process of flexible foam at the INGA/ORGANIKA production plant.

For all the other implemented projects, approved and co-funded by the Multilateral Fund in the Refrigeration Sector, conversion of CFC-11 blowing agent have been converted to use HCFC-141b in production of insulation foam in the production processes in the Commercial Refrigeration Sector (see the Table 5 above).

The national adopted Ozone Legislation (at state and Entities' levels) introduced and put in place the Licensing and Quota System as well as issuing of Import Permit for each of imported contingent of HCFCs, but without any limitation of approved imported quantities.
There is not proposed any oblige of Importers of equipment containing or using HCFCs to obtain import license, Quota permit or import permit to import or re-export of such goods.

There is not proposed or in the implementation any training or awareness raising management programme or project for HCFC conversion to any alternative substances.

2. DATA COLLECTION AND HCFC SURVEYS

2.1. Content of the Data Collection and Surveys done

This Research (surveying), that have been made by the national team for the preparation of HPMP Bosnia and Herzegovina, collected information and surveys done from the NOU Data Base and from the Project Site, shows collected data and information, relevant for preparation of the HPMP:

- Description of methodology for information collection „on the Desk data collection" and „on the Project Site data collection" and used source of information;
- Statistical data for BiH relevant for collection of HCFC consumption
- Consumption of CFCs in BiH
- Consumption of HCFCs in BiH
- Import and distribution of HCFCs and equipment containing HCFCs
- Import and installation of air-condition equipment
- Installed capacities/quantities of HCFCs at end users in refrigeration and air-condition sub-sectors
- Commercial refrigeration devices and cooling systems – installed capacities with HCFC-22 refrigerant
- Water cooling chillers charged with HCFC-22 refrigerant
- Transport refrigeration
- Consumption of HCFCs in manufacturing sector
- Price of imported HCFC substances and their alternatives

2.2. Description of Surveying Methodology

The main sources of the data and information collected during the preparation of the HCFC Phase-out Management Plan (HPMP) document were:

For "On desk data collection":

- National Ozone Unit and the State Custom Office database and reports issued to the domestic and international authorities (Annual National Reports for Import / Consumption of CFCs for the period 1989-2009 and consumption of HCFCs during the period 2003-2009), and for the preparation of a list of registered Importers and Distributors of HCFCs to BiH Market);
- Agency for Statistics of Bosnia and Herzegovina and both Institutes for Statistics of the Entities Federation of BiH and Republika Srpska for all statistical data relevant for the preparation of HPMP.

Having into consideration that in Bosnia and Herzegovina **ODSs annual import is equal to ODSs annual consumption**, due to the fact that there was no production and not any registered exports of these control substances in the mentioned period, all presented data of CFCs and HCFCs imports are also the annual consumptions of these substances;

For "On Project Site data collection":

a) For official statistical basic data:

- Number of population, number of households, registered business entities and public utilities, registered refrigeration vehicles and installed cold chambers and cold stores
- Agency for Statistics of Bosnia and Herzegovina and both Institutes for Statistics of the Entities: Federation of BiH and Republika Srpska and Bureau of Statistics of the District Brcko - for all basic statistical data relevant for the preparation of analyses and estimations of installed quantities of HCFC refrigerants in existed appliances and air-condition and cooling installations in operation;

b) For import HCFCs and distribution at BiH market and import of equipment using HCFCs as refrigerant:

- Information Reports directly received from the Importers and Distributors of HCFCs (particularly HCFC-141b, pre-blended Polyol with HCFC-141b blowing agent and HCFC-22) to BiH Market;
- Information on import of air-condition equipment using HCFCs as refrigerant and the list of Importers for years 2005 - 2010 received from the State Custom Office;
- Information on types and quantities of registered import of "split" and "unit"-types of air-condition equipment, using HCFC-22 as refrigerant received from the State Custom Office and from 24 of the main Importers, who imported over 92% of the total quantity of this equipment in Bosnia and Herzegovina in the years 2005-2010.

c) For verification and consolidation of "on the desk" surveyed data on HCFCs import & distribution to BiH Market and installed quantities & consumption:

- Verification and control of HCFCs Import & Distribution to BiH Market, by years from 2003 to 2009 was done trough each registered, and from the year 2008 authorized and licensed importers (*note: the ODS Import / Export Licensing System was established and taken into force in Bosnia and Herzegovina from the 1st. January 2008*), based on their submitted reports on imported HCFC quantities for this period and recorded in the UNIDO's Questionnaire for all particular importers who were registered by the State Custom Office. Also, due to lack of relevant information / reports received from the State Custom Office on registered annually import of the component "A" used for production of rigid polyurethane foam (pre-blended Polyol with HCFC-141b foaming agent), the relevant information on import / consumption of this chemical containing HCFC-141b in Bosnia and Herzegovina were collected / surveyed from the only rel ;
- Data on HCFCs installed quantities in BiH Refrigeration commercial sector were collected through the direct surveying at site, using of an internal established model of questionnaires sent to more than 500 registered business, government and non-government entities (production and trade companies, hotels, restaurants, public utilities and other business legally registered entities)
- Data on import and installation of air-condition equipment (mainly split and unitary types) with HCFC-22 refrigerant and installed quantities in BiH Air condition sub-sector were collected through the direct surveying at site, using of an internal established model of questionnaires sent to 24 (of the totally registered 86) the greatest importers and distributors of this equipment at BiH Market;

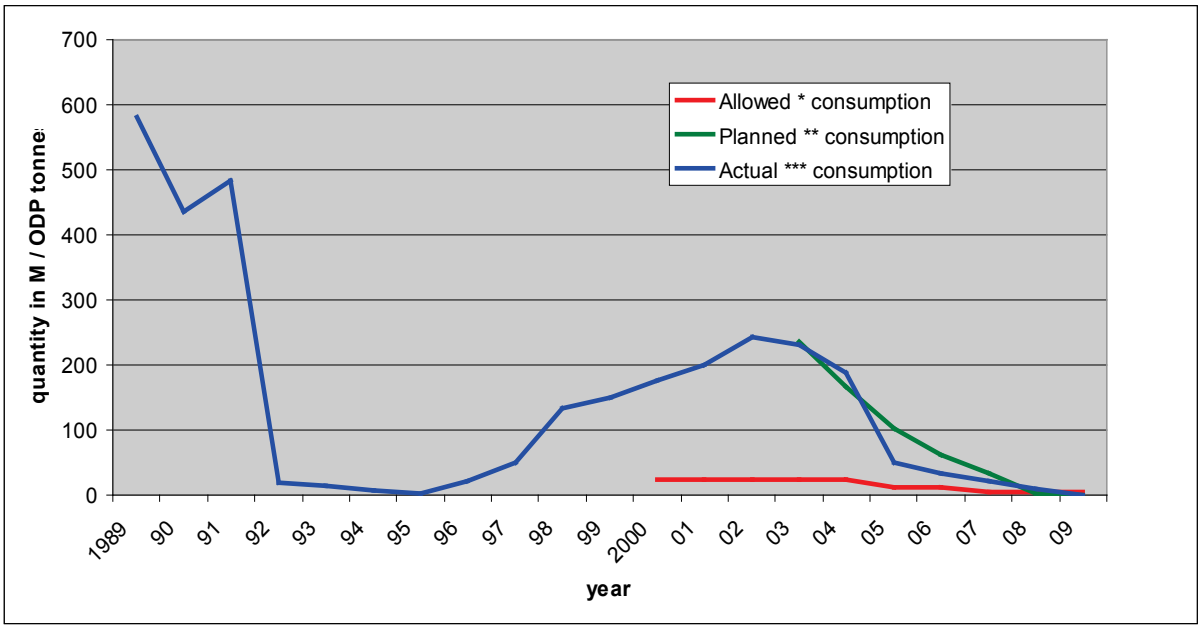
- Data on HCFCs consumption in BiH production and service sectors and main BiH Manufacturers and Service Shops in the Refrigeration Sector for surveyed quantities of installed HCFCs were collected through the direct surveying at site, using of an internal established model of questionnaires sent to more than 60 identified main buyers of HCFCs at BiH Market (companies registered for production, assembling and maintenance of appliances and equipment using HCFCs) as well as from direct interviews done during the visit at site with 10 the biggest producers of insulation foam and refrigeration commercial appliances.

2.3. Consumption of CFCs in Bosnia and Herzegovina

On the Table 6 and Graph 1 billow are showing the actual annual quantities of the National CFCs consumption by years for the period 1989-2009 and compared with the allowed consumption based on the National CFC Baseline and the National CFCs Phase-out Plan and the Decision XV/30 of the 15th Meeting of the Parties to the Montreal Protocol of November 25, 2003.
Since January 2009, the import of CFCs (all control substances specified in the Annex A, Group I under the Montreal Protocol,) have been banned.

Table 6. Consumption of CFCs (Annex A, Group I substances) in Bosnia and Herzegovina in the period 1989-2009 (in M / ODP tonnes)

Year	1989	90	91	92	93	94	95	96	97	98	99	2000	01	02	03	04	05	06	07	08	09
Allowed * consumption												24	24	24	24	24	12	12	3.6	3.6	3.6
Planned ** consumption															235	167	102	63	33	3	0
Actual *** consumption	582	436	484	19.5	15.0	7.5	3.0	20.6	49	134	150	176	200	**244**	230	188	51	33	22	9	**0**



Graph 1: ***Consumption of CFCs in BiH in the period 1989-2009 (in M / ODP tonnes)***

LEGEND:
* Allowed consumption of CFCs (in Metric / ODP tonnes) according to the established BiH Baseline

** ——— Planned consumption according to (NOPP) Plan for CFCs phase-out and the Decision XV/30 of the 15th MOP of November 2003

** ——— Actual annual consumption in BiH reported to the MLF and to the Ozone Secretariat

Table 7. Statistical data for Bosnia and Herzegovina relevant for collection of HCFCs consumption (base: year of 2009)

Total population:	3,843,301
Number of households:	1,054,613
Registered business and administration entities	
Food and pharmaceutical processing industry:	3,326
Health & Social works:	1,622
Hotels, restaurants & sport halls:	1,193
Wholesale and retail trade:	24,961
Public administration, communal & cultural institutions:	5,292
Financial institutions (banks and their site offices):	256
Petrol services	364
Registered transportation units-truck cooling chambers:	326

2.4. Consumption of HCFCs in Bosnia and Herzegovina

The data on annual HCFCs import / consumption in Bosnia and Herzegovina for the period 2005-2010, as officially reported under Article 7 of the Montreal Protocol by the National Ozone Unit to the Ozone Secretariat are shown in the Table 8 billow.

Table 8. Art. 7 Reported data on National HCFC Consumption, by years from 2005 to 2010

Year	*Annual Import (MT)*			
	HCFC-22	*HCFC-141b*	*Total*	*Total (ODP t)*
2005	51.00	66.24	117.24	10.14
2006	39.51	15.00	54.51	3.82
2007	50.84	25.00	75.84	5.55
2008	47.91	44.48	92.39	7.53
2009	54.36	27.00	81.36	5.96
2010	63.34	0	63.34	3.48

Table 9. Summary data on actual import / consumption of HCFCs, HFCs and HFC-blends in BiH, by years 2005-2010

Year	Re-export (Mt)								
	HCFC-22 (1)	HCFC-141b[1)] (2)	HCFC-141b in preblended Polyol[2)] (3)	Total HCFC-141b (pure & blended with Polyol) (4=2+3)	Main end-users/consumers of HCFC-141b (5)	Total HCFCs import (7=1+4)	HFC-134a (R-134a) (8)	HFC Blends (R-404a, R-406, R-407c, R-410a R-600) (9)	HCFC-22 (10)
2005	51.100	46.800	19.440	66.240	- BIRA, Bihać-refriger. manufactur. - ALTERNATIVA, Sarajevo - 6 SMEs in commerc refriger.	117.391	27.990	13.525	
2006	41.847	15.000	24.200	39.200	Foam & Refrigeration manufacturing sectors: - POLIOLCHEM, Tuzla - ALTERNATIVA, Sarajevo (foam panels manufactrer) - 6 SMEs (commerc refrigeration manufacturers)	81.047	27.054	6.196	
2007	50.780	25.000	**32.000**	57.000		107.780	60.279	30.113	
2008	47.914	44.476	**15.035**	59.511		107.425	37.624	10.330	
2009	**54.360**	**27.000**	**26.070**	53.070		107.430	50.950	32.540	
2010	**63.340**	**0**	54.600	54.600		117.939	50.741	60.814	3.400
National Bas-line of HCFCs consumpt. (average **2009-2010**)	**58.850**	**13.500**							
National average cons. of HCFC-141b in pre-blended Polyol (**2007-2009**)			**24.368**						

NOTES: <u>Source of information</u>:

[1)] Import, by years, recorded by the Custom Authority, with data on import of substances verified by the registered / licensed Importers in BiH;

[2)] Data on imported / or on BiH market purchased/ Polyol pre-blended with R-141b collected from end users-PUR foam manufacturers

***<u>Data on import / consumption of Polyol pre-blended with HCFC-141b</u>,** used as component "A" for production of rigid PU foam has been collected from the biggest end-users (manufacturers of PU insulation sandwich panels and refrigeration commercial appliances) in BiH and from some of registered importers*

2.5. Import and distribution of HCFCs and equipment containing HCFCs

2.5.1. List of HCFC Importers in BiH

In the Table 9 below are listed the main Importers (trade and manufacturing companies) who were registered by the National Custom Authority and by the MoFTER / NOU as the authorized importers of HCFCs to Bosnia and Herzegovina, who already performed the import of all HCFCs quantities used for their own consumption needs (in their manufacturing process and / or for refrigeration / air-condition equipment servicing) as well as for distribution to BiH Market in one or more years during the period from 2003 to 2009.

Table 9. Registered Importers of HCFCs to Bosnia and Herzegovina – period: 2003-2009

No.	*Name of Company*	*Address, contact data*
1	**SERVIS JELIĆ, Široki Brijeg***	Vaganska 4, 88220 Široki Brijeg , tel & fax: 387 39 705 675, E-mail: info@servis-jelic.com; Mr. Ivo Jelić, Director
2	**ELDOM, Tuzla**	Albina Herljevića 45, Tuzla, tel 035 282 233, 035 228 009, E-mail: smajic@bih.net.ba Mr. Jasmin Smajić, Director
3	**SLATKOM Alfa & Omega, Banja Luka**	The company transferred its business to Africa; Does not exist more in BiH Market
4	**KLIMOTEHNA, Sarajevo***	Ul. Velikih Drveta 6, 71000 Sarajevo; Tel. 387 33 767 075; Fax: 387 33 76 70 76; E-mail: klimtech@bih.net.ba Mr. Abdulah Turković, Director
5	**EKO ELEKTRO FRIGO, Banja Luka**	Pave Radana 51, Banja Luka, tel. 387 51 323 182, fax. 387 51 323 180 Mr. Bugarski Zoran, Director
6	**ORDAGIĆ, Srebrenik***	9. septembra 11, Srebrenik, tel & fax.: 387 35 643 440 i 642-950, ordagicdoo@bih.net.ba , Muhamed Ordagić, Director
7	**AN-GO FRIGO ELEKTRIC, Prijedor**	Kralja Aleksandra bb, Prijedor, tel. & fax. 387 52 233 770, an-go@poen.net, Goran Šobot, Director
8	**BIRA, Bihać**	Jablanska bb, Bihać; tel. 037 311 095, fax.387 37 311 784, bira@bih.net.ba, Mr. Edin Muslić, Director
9	**ELEKTRO FRIGO, Banja Luka**	Braće Potkonjaka 15 A, B. Luka; tel. i fax. 051 466 166, elektrof@teol.net, Mr. Nenad Džilit, Director
10	**HBM, Vitez**	Kamenjače bb, 72250 Vitez, tel. 387 30 717 218, fax.387 30 717 219 Ms. Ankica Mlakic, Director
11	**ALTERNATIVA, Sarajevo***	Put Famosa 38, 71212 Hrasnica-Sarajevo, tel. 387 33 475 850, fax. 387 33 475 860, info@alternativa.ba, Mr. Salih Lemeš, Director
12	**MASTER FRIGO, B. Luka***	Put srpskih branilaca 332a, 78 000 Banja Luka; tel: 387 51 389 800, fax. 051 389 802, E-mail: masterfrigo@poen.net , Ms. Dijana Stanković, Director
13	**POLIOLCHEM, Tuzla***	M.P.Đurina bb, 75000 Tuzla, Tel: 387 35 288866, Fax. 387 35 288 867
14	**FRIGO KLIMA I HLADJENJE, Sarajevo***	Blažujski drum 4, 71000 Sarajevo, Tel: 387 33 762 111, Fax. 387 33 762 112, E-mail: info@mbfrigo.ba, Mr. Siniša Trifunović, Director
15	**JOKO, Široki Brijeg***	Knešpolje bb, 88220 Široki Brijeg; Tel & Fax: 387 39 701 331, Ms. Tanja Bubalo, Director

The Importers marked with (*) are licensed importers (with the obtained Import Licenses from MoFTER) from the year of 2008 (since the Import Licensing System had been put in place in Bosnia and Herzegovina). These companies were the only Importers of HCFCs

during the last thre years (2008 & 2010), who imported 100% of the total registered import of these substances.

2.5.2. Prices of HCFCs

Table 10. Prices of HCFCs and pre-blended Polyol in BiH (imported prices, without Custom Tax and VAT)

Year	2008		2009		2010	
HCFC Substance	***HCFC-141b***	***HCFC-22***	***HCFC-141b***	***HCFC-22***	***Pre-blended Polyol with HCFC-141b***	***HCFC-22***
Average price (€/kg)	1.93	1.81	1.69	1.58	2.12	1.62
Max. price (€/kg)	2.15	2.15	1.77	3.36	2.20	2.20
Min. price (€/kg)	1.44	1.49	1.67	0.99	2.00	1.44

2.5.3. Distributors HCFCs to BiH Market

Table 11. List of main HCFC Distributors

No.	*Name of Company*	*Address, contact data*	*Geographic area of (main) distribution coverage*	*Types of HCFC distributed*
1	**SERVIS JELIĆ, Široki Brijeg**	Vaganska 4, 88220 Široki Brijeg Tel & Fax: 387 39 705 675, E-mail: info@servis-jelic.com; Mr. Ivo Jelić, Director	Entire Bosnia and Herzegovina	HCFC-22, HCFC-141b pre-blended Polyol
2	**KLIMOTEHNA, Sarajevo**	Ul. Velikih Drveta 6, 71000 Sarajevo; Tel. 387 33 767 075; Fax: 387 33 76 70 76; E-mail: klimtech@bih.net.ba Mr. Abdulah Turković, Director	Entire Bosnia and Herzegovina	HCFC-22
3	**HBM, Vitez**	Kamenjače bb, 72250 Vitez, Tel. 387 30 717 218, Fax. 387 30 717 219, Ms. Ankica Mlakic, Director	Entity Federation of BiH	HCFC-22 HCFC-141b
4	**MB FRIGO KLIMA I HLADJENJE, Sarajevo**	Blažujski drum 4, 71 000 Sarajevo, Tel: 387 33 762 111; Fax: 387 33 762 112 E-mail: info@mbfrigo.ba Mr. Siniša Trifunović, Director	Entity Federation of BiH	HCFC-22
5	**JOKO, Široki Brijeg**	Knešpolje bb, 88220 Široki Brijeg; Tel & Fax: 387 39 701 331 Ms. Tanja Bubalo, Director	Entity Federation of BiH	HCFC-22
6	**MASTER FRIGO, Banja Luka**	Put srpskih branilaca 332a, 78 000 B. Luka; Tel: 387 51 389 800, Fax. 051 389 802, E-mail:masterfrigo@poen.net Ms. Dijana Stanković, Director	Entity Republika Srpska and District Brcko	HCFC-22
7	**POLIOLCHEM, Tuzla**	M.P.Đurina bb, 75000 Tuzla, Tel: 387 35 288 866, Fax. 387 35 288 867	Entity Federation of BiH	HCFC-141b
8	**ALTERNATIVA, Sarajevo**	Put Famosa 38, 71212 Hrasnica-Sarajevo, tel. 387 33 475 850, fax. 387 33 475 860, info@alternativa.ba, Mr. Salih Lemeš, Director	Entire Bosnia and Herzegovina	HCFC-141b Pre-blended Polyol with HCFC-141b

In the Table 11 above are listed the main Distributors of HCFCs in BiH (companies for trade and retail selling) who were registered by the National Custom Authority and by the MoFTER / NOU for the years 2008 - 2010 (after taking into force the established License and Quota

Import / Export System in BiH) as the authorized (licensed) importers of HCFCs to Bosnia and Herzegovina and their distributors / retail selling to the local market.

The companies "POLIOLCHEM" and "ALTERNATIVA" were producers of pre-blended Polyol house system (Polyol pre-blended with HCFC-141b foaming agent) during certain period, because they have installed facilities for necessary blending technology, and "POLIOLCHEM" was also the only producer of Polyol chemicals in Bosnia and Herzegovina. The produced quantities of pre-blended Polyol both companies used these chemicals for their own manufacturing process, or to distribute them to the domestic-BiH market: "ALTERNATIVA" for production of sandwich PU foam construction and refrigeration insulation panels and "POLIOLCHEM" for sell / distribution to other refrigeration manufacturers in Bosnia and Herzegovina for their production process (mainly for manufacturing of commercial refrigeration appliances and sandwich panels), and also for supply to the company "ALTERNATIVA" for its own use (especially during the years of 2005 and 2009.

Due to economical reasons, taking into consideration current world market prices of certain chemicals relevant for this issue (HCFC-141b, Polyol and pre-blended Polyol with HCFC-141b blowing agent), the main BiH end users of HCFC-141b (companies ALTERNATIVA and POLIOLCHEM) for the preparation of Polyol pre-blended house system have imported HCFC-141b and Polyol alone ("ALTERNATIVA") and mixed them in their own facilities. "ALTERNATIVA" had during some years behind self produced quantities of pre-blended Polyol also imported from abroad ready made pre-blended Polyol system (containing 30% of HCFC-141b) and used it in their own production process or partially distributed these semi-products to the BiH market.

2.6. Import and installation of air-condition equipment up to 2009 and forecasting of import for the period 2010-2012

In the Table 12 billow are shown registered and / or estimated import of air-condition equipment unitary, split and other types in the period 2003-2009

Table 12. Import of air-condition equipment, all types and with all refrigerants types

Item	***Type***	***Quantity of imported units, by years (sets)***							
		2003**	**2004****	**2005***	**2006***	**2007***	**2008***	**2009***	**TOTAL**
1	Unitary type	366	530	648	596	1,880	858	629	**5,507**
2	Split type	13,800	15,600	18,745	18,813	26,135	36,230	35,947	**165,270**
3	Other types	120	320	276	104	1,260	1,156	1,260	**4,496**
Total		**14,286**	**16,450**	**19,669**	**19,513**	**29,275**	**38,244**	**37,836**	**175,273**

Legend: ** Registered import by the State Custom Authority and verified trough to information / reports received from the 20 the biggest importers of this equipment to BiH*
*** Estimated imported and installed quantities*

Unfortunately, the tariff system and registration of imported refrigeration and air condition appliances (unitary, split and other units), as well as statistical system for registration of import of goods in Bosnia and Herzegovina does not allow an identification of real imported quantities of those goods and getting information of basic elements that define them: type of unit, producer, power (kW), type and quantity of refrigerant charging.

Data of imported contingents of this equipment, registered by the State Custom Authority of BiH, that were used for determining of imported quantities of particular units, include only: tariff code (according to which, based on the valid "Tariff Regulation on the Classification of Goods Imported into BiH" basic type of imported equipment can be recognized), total mass and price (without custom duty and VAT) of imported contingent and country of origin of this contingent.

Based on above mentioned data, that the State Custom Authority made available to the national team for the preparation of the HPMP, total imported quantities were calculated and are shown for the period of 2005 – 2009 and estimated imported quantity for the period 2003 – 2004 (when the State Custom Authority did not made any evidence and reports of imported units / equipment). Since in the period were evidence has been made and today, the evidence of imported quantities includes only basic information: mass of certain types of units in an import contingent / lot and import price, there is no exact evidence about units or sets of imported equipment.
Therefore for the analysis of imported (and installed) quantities of air condition appliances (in units) the following calculation method is used:

- Average weight of imported units ("split", unitary and other types): 65 kg
- Average capacity / power (in kW) of imported devices: 5 kW / unit

By direct surveying at site and interviews done with the most of 20 main importers, who have a share of more than 90% of total import of air-condition equipment in the period 2005 – 201, it was possible to determine and to verify with a relative high assurance the total of estimated imported quantities of different types of this equipment for this period (estimated to total number of 175,273 units), which is shown in the Table 12 above, and also to estimate a ratio between the use of HCFC-22 refrigerant and other alternative substances in this equipment – 85 % (about 150,000 units) with HCFC-22 and the rest of 15% with other bland refrigerants (407c and 410a).
The reasons for so large participation of air condition equipment – unitary and split types charging with HCFC-22 refrigerant in the total quantities of this imported equipment which was mostly origin from the Asia region countries (China, Singapore, Hong Kong), with the dominant refrigerant R-22, are their much lower prices of the equipment and such refrigerant at the World market comparing with the similar equipment charged with the HFC bands (R-407c and R-410a).

Having into consideration that almost 100% of air-condition units imported and installed in the period before 2003 are operating with R-22 refrigerant, and the still operating number of this equipment is estimated to approx. 30.000, the total number of operating these air-condition appliances is estimated to **180,000** units.

2.7. Installed quantity of HCFC-22 in refrigeration and air-condition appliances

2.7.1. Installed HCFCs in air-condition appliances and cooling systems

Table 13. Estimation of installed quantities of HCFC-22 refrigerant in air-condition appliances and annual needs for servicing

*Total number of installed units in operation**	*Average installed qty of HCFC-22 (kg/ unit) ***	*Total installed qty of HCFC-22 (kg)*	*Annual leakage of refrigerant (%)*	*Total annual leakage (kg)*	*Estimation on annual needs for servicing in 2010 (kg)*
180,000	1.2	216,000	15%	32,400	**32,400**

Legend:

** Total number of installed units is based on estimated quantities of these appliances operating in 2009, taking into consideration that about 90% of all installed units use HCFC-22 as refrigerant*

*** Average use of HCFC-22 refrigerant in air-condition appliances of average capacity / power of 4 kW and distance between two „split"–type units of 4m is estimated to 1.2 kg of refrigerant per unit/set*

Presented data on import of different types of unitary, split and other types of air condition equipment in Bosnia and Herzegovina in the period 2003 – 2009, with HCFC-22 as refrigerant, is a good basis to determine (existing) installed quantities of refrigeration and air-condition equipment. It is assumed that all imported and installed quantities in different appliances in BiH during this period are still in operation condition. An estimation of needed quantities for their servicing in the next three-year period (2010-2012) has been done having in mind expected (estimated) such gradually decreased annually import of these appliances during this period, compared with the significant increased import in the period 2007-2009 and expected good operating conditions of the previously installed appliances.

The surveyed and estimated data (by years) of imported and installed quantities of the mentioned types of air condition appliances, shown in the Table 13 above, are determined on the following basis:

- Data on imported goods – refrigeration and air condition equipment for the period 2005 – 2009, received from the Custom Authority Register, and verified by the most of the greatest importers / distributors of this equipment to BiH market.
- Data on estimated import for the period 2003 and 2004, are based on average registered annual import for the period 2005 – 2009, reduced by 15–20%

In accordance with the experiences from the practice, a life time of these air-condition appliances is 8-10 years; Taking into consideration this facts, it is estimated that the end of the year 2009 there were in operations about 180,000 of these imported and installed units in Bosnia and Herzegovina, operating with R-22 refrigerant. This installed quantity will, together with a new supply (import and installation) of these categories of air-condition equipment for a few next year's need, in spite of expecting decreasing of such annually import in the period 2010-2012 will be the certain needs of HCFC-22 refrigerant for the maintenance of such equipment.

2.7.2. Forecasting for import and installation of air-condition equipment with HCFC – 22 and its consumption needs for servicing for the period 2010 – 2012

Forecasting data on the future HCFCs and equipment containing HCFCs import and consumption in BiH were collected through the direct surveying at site, using of an internal established model of questionnaires sent to more than 60 identified main buyers of HCFCs at BiH Market (companies registered for production, assembling and maintenance of appliances and equipment using HCFCs) as well as from direct interviews done during the visit at site with 10 the biggest producers and services of refrigeration commercial appliances.
This forecasting was done on the base of information received from the main BiH registered importers, assemblers and service shops who imported last a few years, installed and serviced over 80% of the total imported and installed air condition equipment in Bosnia and Herzegovina.

In the
Table ***14*** billow are shown the data on forecasting – estimation of import of air-condition equipment and estimation of annual needs, for the period 2010-2012 of refrigerant HCFC-22 for servicing of the equipment already installed.

Table 14. Estimation of the import of air-condition equipment and annual needs of refrigerant HCF-22 (R-22) for servicing of these appliances for period 2010-2012

Item	*Type*	*Estimation for quantity of imported units, with R-22 refrigerant and installed quantities of R-22*						*Estimation of annual needs for servicing*					
		Estimated import and installation of air-condition equipment			*Increase of installed R-22 quantities * ((kg)*			*Expected total of installed quantities of R-22 (based on 2009 as starting year)***			*Estimation of annual needs of R-22 for servicing of installed devices****		
		2010	**2011**	**2012**	**2010**	**2011**	**2012**	**2010**	**2011**	**2012**	**2010**	**2011**	**2012**
1	Unitary type	1,000	880	680									
2	Split type	24,800	20,000	16,500									
3	Other types	500	420	350									
	Total	**26,300**	**21,300**	**17,530**	**31,560**	**25,560**	**21,036**	**236,760**	**250,482**	**258,994**	**35,514**	**35,572**	**38,850**

Legend:
** Increase of installed quantities of HCFC-22, by years taking into consideration annual new installations of air-condition equipment - split and unitary types*
*** Estimated installed total quantities of HCFC-22, taking into consideration installed quantities, based on the year 2009 (216,000 kg) with 5% annual reduction from the operation of already installed capacities from the previous year and actual annual increase of newly installed capacities*
**** Annual needs of the refrigerant HCFC-22 for installed equipment servicing purposes are estimated to an annual amount, taking into consideration an average annual losing / leakage of 15% of the refrigerant R-22 in already installed installations.*

2.8. Commercial refrigeration devices and cooling systems

2.8.1. Cold stores and cold chambers

Table 15. Installed quantities of HCFC-22 in Agriculture-Fruit and Vegetable Cold Storage

BiH Administrative units	Total capacity of cold stores (tonne)*	Total cooled space of cold stores (m^3)*	Increase of cold stores installed capacities in the period 2006-2009 (m^3)**	Total cooled space of cold stores in 2009 (m^3)	Estimated total space of cold stores with R-22 refrigerant (m^3)***	Average use of R-22 in cold stores installations kg/m^3****	Total estimated installed quantity of R-22 in cold stores (kg)
Federation of BiH	19,011	7,604	4,600	12,204	4,882	0.35	**1,953**
Republika Srpska	36,123	14,410	8,800	23,210	9,284	0.35	**3,714**
Brčko District	2,517	1,007	400	1,407	562	0.35	**225**
Total BiH	57,651	23,021	13,800	32,821	14,728	0.35	**5,892**

Legend:

* *Data on installed capacities of cold stores in the year of 2005 (Source of information: Ministry of Agriculture, Forestry and Water Management of Federation BiH*, Sarajevo 2005)

** *Estimated increase of cold stores capacities in BiH in the period 2005-2009 (data collected from the Site)*

*** *There is estimated, on the base of investigated data from the Site, that 40% of total existed and operating cold stores are with R-22 refrigerant (most of them constructed before 2005)*

**** *Having into consideration, the investigated data from about 60 operating projects, it is evident that the charging of HCFC-22 refrigerant in cold stores and cold chambers installations wearied from 0.25 to 0.45 kg/m^3 of cooling space. So, an average calculated charging of R-22 refrigerant in cold stores is* ***0.35*** *kg / m^3 of refrigeration space*

Table 16. Installed quantities of HCFC-22 in cold stores / chambers -Industry and Trade sectors

HCFC End users –Industrial sectors	Total (estimated) refrigeration capacity of cold stores*(*)* (m^3)				Total estimated installed quantities of HCFC-22 (kg)
	Federation BiH *(1)*	Republika Srpska *(2)*	District Brcko *(3)*	Total installed capacities in BiH	
Wholesale and Retail Trade	30,739	18,500	3,200	52,439	18,354
Other Industries and Public Sector	37,282	20,400	2,600	60,282	21,100
Total	**68,021**	**38,900**	**5,800**	**112,721**	**39,454**

Legend:

(*) Estimation of cold stores and cold chambers capacities in both BiH Entities: Federation of BiH and Republika Srpska, as well as from the District Brcko are based on the real investigation from the site and information received from the main BiH servicing organizations who are doing more than 70 of maintenance services at the end users of these facilities

Table 17. Summary of installed quantities of HCFC-22 in existed cold stores and cold chambers in BiH for all sectors and estimation of needs for servicing

BiH Administrative Units	*Installed quantities of HCFC-22 (kg)*			*Estimation of annual needs for servicing (kg)*					
	Agriculture and Food Processing Industries	*Industry, Public and Trade Sectors*	*Total installed quantities*	*Expected total of installed quantities of R-22 (based on 2009 as starting year) (1)*			*Estimation of annual needs of R-22 for servicing of installed devices (2)*		
	(base year 2009)		**2009**	**2010**	**2011**	**2012**	**2010**	**2011**	**2012**
Grand Total BiH	**5,892**	**39,454**	**45,346**	**47,613**	**49,994**	**52,494**	**9,523**	**10,000**	**10,500**

Legend:

(1) The estimated increase of cold stores and cold chambers' installation, charged with R-22 is by 5% annually and an assumption that all operating facilities in 2009 will stay in function also during the period 2010-2012

(2) Estimation of needs for refrigerant R-22 for servicing is 20% of installed quantities annually, taking into consideration that the most of existed cold stores facilities, charged with R-22 are between 10 and 30 years old

2.8.2. Commercial refrigeration equipment

Food processing and commercial refrigeration sector is the third largest sector with installed quantities of HCFC-22 refrigerant and certain needs for servicing of this installed and operating equipment and will considerably contribute to increased HCFC-22 consumption in coming years.

The main commercial refrigeration equipment in this sector is equipment used in food and beverage processing industry, wholesale and retail trade shops, hotels and restaurants such as bottle coolers, display cabinets, ice cream freezers used in shops and supermarkets, display cases in shops and restaurants and small chillers.

Table 18. Installed quantities of HCFC-22 in commercial refrigeration equipment (vertical & horizontal cold showcases and cold cupboards)-based year 2009

Business sector	**Total number of registered business units**	**Estimated number of commercial refrigeration units/ business unit**	**Number of commercial refrigeration units**	**Total number of units charged with R-22 *(1)***	**Average charging of R-22 /unit (kg)**	**Total installed quantity of R-22 (kg)**
Food industry	3,326	2	6,652			
Wholesale and retail trade	24,961	1.5	37,442			
Hotels and restaurants	1,193	2	2,386			
Health and social works	1,622	0.5	831			
Public, communal and cultural	5,292	0.2	1,058			
Financial and petrol services	650	2	1,300			
Total	**37,402**		49,669	29,801	0.6	**17,880**

Legend: *(1) It is estimated that approx. 60% of the total installed commercial refrigeration units (vertical and horizontal show cases and cold cabinets) are charged with HCFC-22 refrigerant of an average of 0.6 kg/ per unit*

There are expectations of a very limited increase of quantities of these appliances charged with R-22 which will be supplied to BiH Market in coming years (2010-2012). Most of them would be domestic products, and some may be imported as secondary used equipment from abroad, what was the case with the import of this category equipment used CFC-12 as the refrigerant in the period before 2006, when this equipment import was banded in Bosnia and Herzegovina

2.9. Water Chillers

There are not any official or registered data or information on installed water chillers and nor any data of their operating refrigerants and installed quantities of HCFC-22 refrigerant in these facilities.
During the surveying of HCFC installed quantities done at site, with the main assistance of some the best and the greatest BiH service shops that are in the same time the biggest buyers and users of R-22 refrigerant, mainly for the purpose of its use for maintenance and servicing of cooling systems in the country, there were recognized and identified over 40 cooling facilities with installed and still operating chillers. Most of these chillers are installed as cooling systems mainly in hospitals and other medical institutions, wholesale trade centers, industrial manufactories, hotels and other administration buildings.
The total cooling space of these recognized chillers overcomes 2,500,000 m^3, and there particular installed power capacities are between 40 and 300 kW. About 40% of these chillers are operating with R-22 charged refrigerant and its particular installed – charging quantities are between 20 and 300 kg / unit. The others chillers are operating with refrigerants: R-407c, R-410a, R-134a and ammonia.
Having into consideration these investigations at site, there is such estimation that in Bosnia and Herzegovina are still operating about 90-100 water chillers with installed quantities of refrigerant R-22 about **14,000** kg
There are no expectations for any increase of new water chillers installation charged with R-22 refrigerant in the period 2011-2012.

On the billow Table 19 are listed installed and operating water-chillers charged with R-22 refrigerant in the public medical institutions which retrofitting and/or replacement can be appreciated with conversions of refrigerant R-22 to non-HCFC once.

Table 19. Installed chillers charged with R-22 refrigerant in the public medical institutions

	Name of public medical institution	***Number of intalled chillers***	***Power of generator (kW)***	***Installed quantity of R-22 by chillers***	***Total installed quantity of R-22 (kg)***
1	Croatian Hospital „Dr. Fra Mato Bilić“, Nova Bila	4	2x153+2x34	2x100+2x20	**240**
2	Clinic Centre of the University Sarajevo, Sarajevo	2	3x90+3x90	270+270	**540**
3	General Hospital „Abdulah Nakaš”, Sarajevo	2	2x34	29+29	**58**
4	Clinic Hospital Mostar, Mostar	4	4x2x90	4x120	**480**
5	Clinic Center in Banja Luka	3	315+160+194	300+150+430	**880**
6	Medicinska elektronika, B. Luka	2	2x75	60+60	**120**
GRAND TOTAL INSTALLED R-22		**17**			**2,318**

2.10. Transport refrigeration

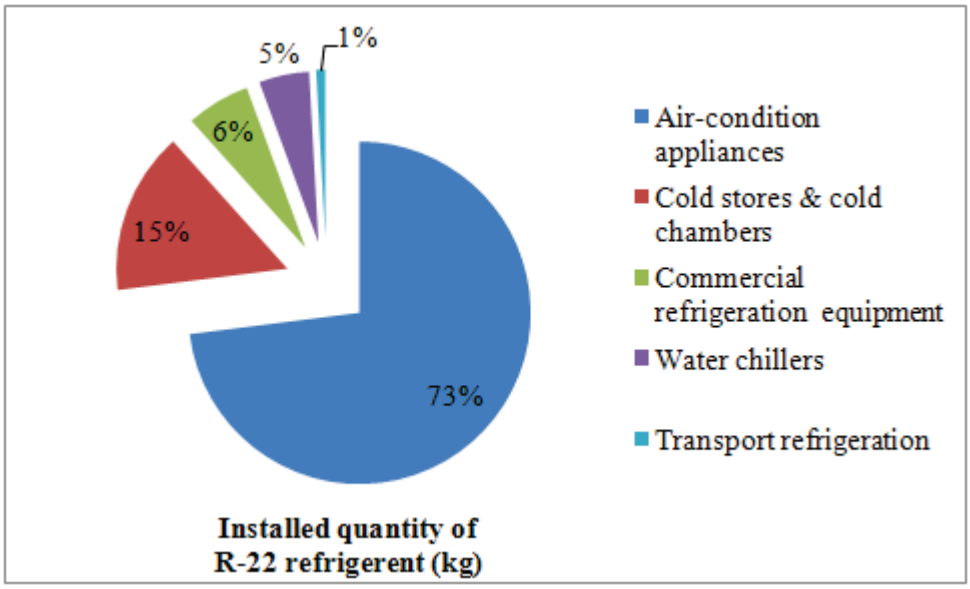
Transportation refrigeration sector comprises transport vehicles in food processing industry, dairy industry, wholesale and trade centres, and in a wery small share some transport busses whose air-condition equipment is charged with HCFC-22. Unfortunately, these kinds of vehicles are not registered in the both Entities' Ministries of Internal Affairs (where is official annual registration of all operating transport means) by this category of vehicles, but just as "transport vehicles" of different carrying capacity (in tone).

The data on operating transport refrigeration vehicles are (about 60% of the estimated ones) collected from vareous service workshops that work on the maintenance of these refrigeration appliances. The rest of estimated operating vehicles (about 40 %) is an estimation of the HPMP working team.
According to these information and estimations, in Bosnia and Herzegovina are operating about 128 big refrigeration trucks and about 340 refrigeration vans and pickups; It is estimated that about 60% of these car's refrigeration apliences are operating with R-22 refrigerant.
The average charging of R-22 in these appliancs are estimated to:
- in refrigeration trucks: 18 kg
- in refrigeration vans and pickups: 6 kg
So, the **installed quantities of R-22 in operating vehicles** are estimated to:
128 x 0.6 x 18kg + 340 x 0.6 x 6kg = **2,606 kg**

There is only one producer of refrigeration appliences for the transportation means – refrigeration vehicles. This is the enterprise "KUCA LEDA" from Mostar. This company is building-assembling wehicle cold chambers on standard vehicles –trucks, pick-ups and vans.
So, there are expectations that this company will continue in the future to produce these appliances with R-22 refrigerant may be during the period 2010-2012 if demand of the domestic BiH Market will ask for that.

Table 20. Sumary of installed quantities and forcasting-calculation of HCFC-22 needs for servicing in installed and operating refrigeration and cooling facilities

Sector	*Installed quantity of R-22 refrigerant (kg)*					*Annual needs of R-22 for servicing*				
	Base year	*Share ratio (%)*	*Forecast of total installed quantities, by years (kg)*			*Forecast of total needs for servicing (kg)*				
	2009		**2010**	**2011**	**2012**	*Annual leakage rate (%)*	**2009**	**2010**	**2011**	**2012**
Air-condition appliances	**216,000**	73.1	236,760	250,482	258,994	**15 %**	32,400	35,514	37,572	38,850
Cold stores & cold chambers	**45,346**	15.3	47,613	49,994	52,494	**15%**	6,802	7,142	7,499	7,874
Commercial refrigeration equipment	**17,880**	6.0	18,774	19,713	19,000	**20 %**	3,576	3,755	3,943	3,800
Water chillers	**14,000**	4.7	14,000	14,000	14,000	**20 %**	2,800	2,800	2,800	2,800
Transport refrigeration	**2,606**	0.9	2,950	2,850	2,800	**30 %**	885	855	840	825
Total	**295,832**	**100**	**319,997**	**337,317**	**347,288**		**46,463**	**50,086**	**52,654**	**54,149**



Graph 2: Share of installed quantities of HCFC-22 refrigerant in refrigeration and air-condition sectors – base year: 2009

2.11. HCFC consumption in manufacturing sector

2.11.1. Consumption of HCFC-141b in rigid foam production

There is only one currently manufactoring company – in Foam sector as producer of polyurethane rigid foam for sandwich insulation panels and self-producer of pre-blended Polyol System in Bosnia and Herzegovina, full operating with HCFC-141b foam blowing agent and 6 small and medium size enterprises (SMEs) in Refrogeration commercial manufacturing sub-sector also using HCFC-141b in industrial production of commercial refrigeration appliences (refrigeration insulation panels for food cold stores and chambers, insulation rigid PU foam in shaw cases, reach-in cabinets and other commercial refrigeration equipment).
These main end-users of HCFC-141b in the investigated period 2005-2010 are the following industrial manufacturers in Bosnia and Herzegovina:

- Manufacturer of sandwich rigid foam panels and pre-blended Polyol System house: "ALTERNATIVA", Hrasnica-Sarajevo
- 6 SMEs – manufacturers of commercial refrigeration appliences and modular PU refrigeration insulation panels:
  - "ORDAGIC", Srebrenik
  - "SOKO-RKT", Mostar
  - "KUCA LEDA", Mostar
  - "EKO FRIGO", Banja Luka
  - "ELEKTRO FRIGO", Banja Luka and
  - "FRIGOKLIMA", Banja Luka

It is necessary to point up that the enterprise "ALTERNATIVA" has installed its own facilities for mixing HCFC-141b with Polyol and preparation of pre-blended Polyol as a component "A" necessary for production of rigid insulation foam. The other end users of HCFC-141b had purchased pre-blended Polyol (from abroad or from domestic market when it

was available) and used it in production process of commercial refrigeration appliences and facilities

The annual consumption of HCFC-141b by these above mentioned main end users in BiH – manufacturing enterprises in the period 2005-2010 is shown in Table 21 billow.

Table 21. Annual consumption of HCFC-141b (R-141b) in Foam and Refrigeration sectors

Year	*FOAM SECTOR (in M tone)*			*COMMERCIAL REFRIGERATION SUB-SECTOR* [1] *(in M tone)*						
	ALTERNATIVA			*ORDAGIC*	*SOKO-RKT*	*KUCA LEDA*	*EKO FRIGO*	*ELEKTRO FRIGO*	*FRIGO KLIMA*	*Total 6 SMEs*
	Pure imported R-141b	*R-141b blended with Polyol*	*Total R-141b*							
2005	0	19.959	19.959	3.88	3.20	0.78	0.90	0.82	0.80	10.38
2006	15.000	12.961	27.961	3.28	2.85	0.93	0.94	0.85	0.70	10.20
2007	25.000	19.201	**44.201**	4.19	3.91	1.20	1.28	1.17	1.05	**12.80**
2008	21.000	34.111	**45.111**	5.35	4.22	1.32	1.26	1.19	1.06	**14.40**
2009	0	41.067	**41.067**	4.74	3.93	1.30	1.15	0.96	0.92	**13.00**
2010	**0**	40.260	40.260	4.62	3.15	1.51	1.12	0.92	0.88	12.20
Base-line consumption 2009-2010 (under Art. 7)	**0**									**0**
Actual average consumption 2007-2009	**43.460**									**13.40**

NOTE: [1] *consumption of HCFC-141b in pre-blended Polyol only*

The other consumers of the HCFC-141b in manufacture sector are some very small manufacturies producers and assemblers of low quantities of commercial refrigeration appliences, such as: cold shaw cases and small cold cabinets

2.11.2. Consumption of HCFC-22 in commercial refrigeration manufacture

There are no companies in Bosnia and Herzegovina in the refrigeration and air-conditioning sectors manufacturing basic equipments/components which contain or use HCFC refrigerants, but there are some manufactoring companies constructing commercial refrigeration facilities (cold chambers and cold stores) as well as manufactoring of commercial refrigeration appliances (display cases and cold cabinets) using foam blowing agent HCFC-141b in production of insulation rigid foam and refrigerant HCFC-22 for charging of commercial refrigeration appliances.
Otherwise, approximately 75-80 % of the total annual consumption of HCFC-22 in Bosnia and Herzegovina last a few years was used for the maintenance / servicing of existed operated refrigeration, cooling and air-condition facilities and about 20-25 % of this refrigerant

imported quantities were used in production –charging of this commercial refrigeration equipment and charging of air-condition facilities first assembling installation.
The total HCFC-22 consumption in the refrigeration and air-condition service sector for the base year 2009 is estimated to **46,500** kg **(46.5 Mt**), while the total consumption of this substance in manufacturing sector in Bosnia and Herzegovina is estimated to around **15 Mt** .

In the Table 22 billow are shown the biggest recognised consumers of HCFC-22 refrigerant in Bosnia and Herzegovina in Refrigeration commercial equipment manufacturing sector (producers of commercial refrigeration facilities), and their annual consumption in the past four years (2007-2010), their Base-line consumption and forcusting of their consumption in the period 2011-2012.

Table 22. Annual consumption of HCFC-22 by the biggest recognised consummers in BiH in Refrigeration Manufacturing Sector (in kg)

Enterprise- manufacturer of commercial refrigeration appliences	*Annual consumption by years [1)]*				*Average consumption*	*Forecasting consumption 2011-2012*	
	2007	*2008*	*2009*	*2010*	*2009-2010*	*2011*	*2012*
"ORDAGIC", *Srabrenik*	4,760	6,280	5,890	5,200	**5,545**	4,200	3,800
"SOKO-RKT", *Mostar*	4,400	5,100	4,120	3,800	**3,960**	3,600	3,200
"KUCA LEDA", *Mostar*	1,650	1,720	1,410	1,350	**1,380**	1,100	980
"EKO FRIGO", *B. Luka*	1,350	1,480	1,320	1,250	**1,285**	1,100	1,000
"ELEKTRO FRIGO" *B.Luka*	1,220	1,100	1,200	1,240	**1,220**	980	920
"FRIGOKLIMA" *B. Luka*	1,195	1,215	1,320	1.060	**1,190**	920	860
TOTAL	**14,575**	**16,895**	**15,260**	**13,900**	**14,580**	**11,900**	**10,760**

Legend: *[1)] Sorce of information: Filled written quastionnaries, received from the listed companies; the received data were revised after wisiting of these companies and justification done at site*

2.12. HCFC alternatives

2.12.1. Conversion of HCFCs to eligible alternatives

Product / Sector	*Used HCFC*	*HCFC alternatives*	
		for retrofitting	*for new installations*
Production of polyurethane rigid foam - insulation sandwich panels	R-141b		**n-Pentane**, **cyclo-Pentane**, (CO_2) - water, hydrocarbons (HFC)
Production of polyurethane insulation foam in refrigeration commercial appliances	R-141b		cyclo-Pentane; (CO_2) - water, **Methyl formate**, hydrocarbons;
Refrigeration commercial appliances – industrial refrigeration and cooling systems	R-22	R-407c	R-407c, R-410a, Ammonia

Small commercial refrigeration equipment	R-22	R-404a	R-404a,
Commercial refrigeration equipment –middle & low temperature (cold stores & chambers)	R-22	R-404a	R-404a, R-507, R-134a
Water cooling chillers	R-22		R-134a, R-407c, R-410a Ammonia
Air-conditioning (split & unitary) equipment	R-22	R-407c	R-407c, R-410a; R-134a
Transport refrigeration	R-22		R-404a; R-134a

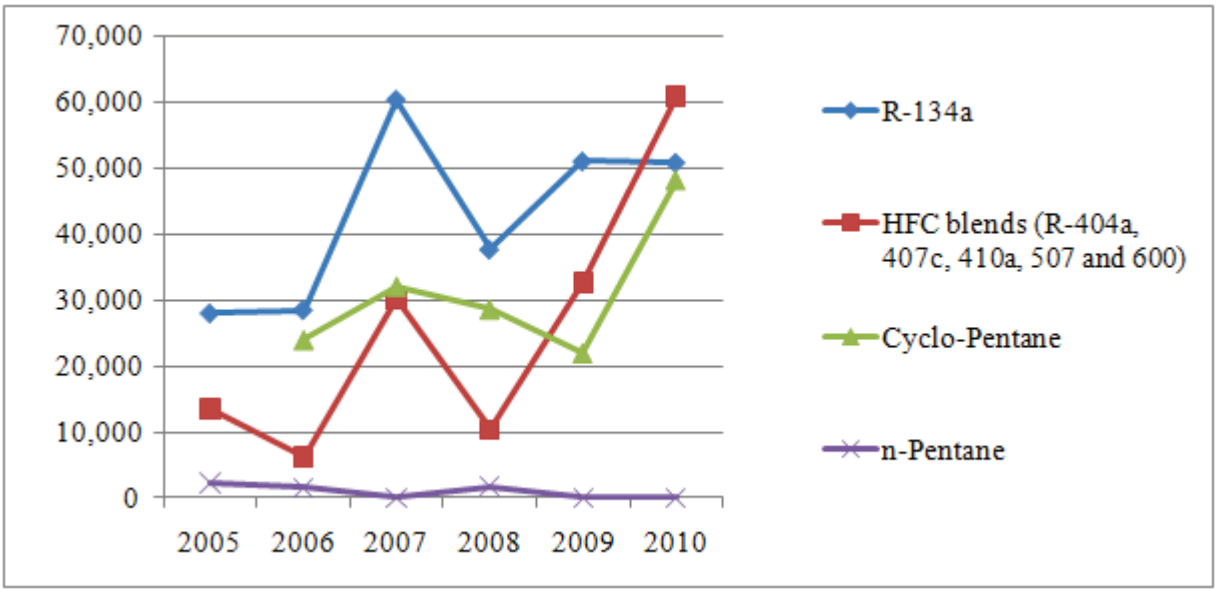
Table 23. Eligible HCFC alternatives – for use in foam production and in refrigeration and air-condition sub-sectors

2.12.2. Consumption of HCFC alternatives for the period 2005-2010

Due to the fact that the import of HCFC alternative refrigerants –like R-134a and HFC blends such as R-404a, 407c, 410a, 507 and 600 is not regulated by any national regulations, (and nor by the License and Import Quota System at place) and it is on a free import regime, as well as the equipment containing or use these substances, there are not any issued import quotas or import permits. The same legislative situation is with the import of foam blowing agents- chemicals n-pentane and cyclo-pentane, and the data collected on their import and consumption for rigid foam production are collected directly from the two main end users: "BIRA", Bihac, producer of domestic refrigeration appliances and "STIROKART", Srbac, producer of rigid foam sandwich pannels.

Table 24. Consumption of HCFC alternatives in BiH for the period 2005-2010

Year	*R-134a*	*HFC blends (R-404a, 407c, 410a, 507 and 600)*	*Cyclo-Pentane*	*n-Pentane*
2005	27.990	13,525		2,300
2006	27.054	6,176	24,000	1,600
2007	60.279	30,113	32,000	
2008	37.624	10,330	28,600	1,800
2009	50.950	32,540	22,000	
2010	50.741	60,814	48,000	



Graph 4: Annual consumption of HCFC alternatives in BiH for the period 2005-2010

2.12.3. Market prices for HCFC alternatives

In the billow Table 25 are shown the awerage prices of HCFC alternatives imported by BiH licensed importers (without calculated Custom tax and WAT), during the period 2008-2010

Table 25. Prices of imported HCFC alternatives in BiH (imported prices, without calculated custom tax and VAT)

Year	2008					2009				
Substance	***R-134a***	***R-404a***	***R-407c***	***R-410a***	***cyclo-P***	***R-134a***	***R-404a***	***R-407c***	***R-410a***	***cyclo-P***
Average price (€/kg)	6.06	7.23	6.72	6.92	1.94	6.85	7.89	7.36	7.34	1.95
	2010									
Substance	***R-134a***	***R-404a***	***R-407c***	***R-410a***	***cyclo-P***					
Average price (€/kg)	7.10	8.70	8.33	7.84	1.98					

3. SELECTION OF PRIORITY AREAS OF POLICY AND CONVERSION INTERVENTIONS FOR THE IMPLEMENTATION OF HPMP STAGE 1.

3.1. General strategy

3.1.1. Commitments of the Article 5 countries

The phase-out schedule for HCFCs for Article 5 countries agreed at the XIX MOP (Decision XIX/6) includes the following:
– Baseline: Average 2009-2010 consumption
– Freeze at baseline level: 2013
– 10 % reduction: 2015
– 35% reduction: 2020
– 67.5 % reduction: 2025
– 100 % reduction: 2030, except 2.5% for servicing use
– 100 % reduction: 2040

3.1.2. HCFC Phase-out Programme for Bosnia and Herzegovina

The HCFC phase-out strategy of Bosnia and Herzegovina should be created and adopted trough the process of consideration and adoption of HPMP as the strategic document of the Country for its target to continue implementation of the Montreal Protocol and Phase-out Plan of the remaining ODSs.

If the Country wants to become the member of the European Union, what is expected to be achieved by the year of 2020, then the implementation of the Stage 1 and the Stage 2 of the HPMP should be completed till that year, and phase-out of HCFC consumption should be done by 2025, with may be remaining of HCFC-22 annual consumption in an amount up to 8% necessary for servicing earlier installed refrigeration and air-conditioning facilities up o 2030.
This can be the frame policy of the Country for adopting of such Programme of activities in two phases / stages:

Stage 1:

– National Starting Point for HCFCs reduction & phase-out:
Baseline-average consumption 2009-2010 + Average consumption of HCFC-141b in pre-blended Polyol
– Freeze at Starting Point: 2013
– 75% reduction: by 2020

Stage 2:

- 92 % reduction: by 2025
- 97.5 % reduction: by 2030
- 100 % phase-out: by 2035

3.1.3. Calculation of National Starting Point for reduction of HCFCs consumption

Due to specific case in Bosnia and Herzegovina where the consumption of HCFC-141b during the period 2005-2010 was combined with consumption of this pure imported substance and pre-mixed with imported or locally produced Polyol or imported pre-blended Polyol (Polyol pre-blended system house), which was not reported under Artcle 7. of the MP, according to instructions and recommendations received from the Ozone Secretariat and from representatives of the Multilateral Fund for the calculation of Starting Point for consumption of HCFC-141b in pre-blended Polyol was taken into consideration the following formula:

Starting Point (for gradual reduction of HCFC-141b) = **Base line for consumption of pure HCF-141b** (average consumption 2009-2010) + **Average consumption of HCFC-141b in pre-blended Polyol 2007-2009-** ExCom Decision 61/58 (in M tone).

Having in mind the above mentioned assumptions, as well as the basic data on HCFCs consumption:
- **HCFC-141b Base-line** (2009-2010)= **13.500** M tone
- **Average consumption** (2007-2009) **of HCFC-141b in pre-blended Polyol=24.368** M tone
- **HCFC-22 Base-line** (2009-2010) = **58.850** M tone,

the **National Starting Point (NSP)** for **HCFC-141b** consumption can be calculated as follows:

- **NSP** (**HCFC-141b**) = **13.500 + 24.368 = 37.868** M tone (**4.165** ODP tone),

and the **National Starting Point (NSP) for HCFCs**

- **NSP (**for **HCFCs)=Base-line for HCFC-22+NSP for HCFC-141b=58.850 + 37.868= 96.718 Mtone (7.402 ODP tone)**

3.2. Selection of priority areas of policy and conversion interventions for the implementation of HPMP Stage 1

The frame priority areas of the Country's policy and interventions for the implementation of the HPMP-Stage 1 which will enable to achieve the targeted reduction of HCFCs consumption by 75 % of the freased baseline level up to 2020 would be:

3.2.1. Policy and non-investment activities

Legislative acts and Policy:
- Establish and put in place the Legislative Framework for phase-out of HCFCs and equipment containing HCFCs at State and Entities' levels:

- Import quotas, permits, price control and import taxes on imported HCFCs and equipment containing HCFCs,
- Plan for baning import of equipment containing or using refrigerants HCFCs or blended HCFCs;
- Improving of reporting system (annual reporting of HCFCs importers/exporters, distributors and consummers)

Training activities:
- Training workshops for custom officers, custom clearance and meritime agences and importers of HCFCs'(two stages of seminars);
- Training workshops for service technicians and mechanics;

Awareness raising:
- Promotion activities-workshops for and introduction of new non-HCFC technologies in refrigeration sector,
- Establisment and support of activities of a Refrigeration & Air-condition Assiciation,
- Technical seminars and workshops for HCFC end users (including workshops for introduction of retrofitting technologies in conversion of HCFC refrigerant to the eligible non-HCFC technology,
- Establish Code of Good Practice in Refrigeration and Air–condition Sectors
- Promotion activities on Radio, TV and written media
- Establishment and maintenance of NOU Web site and follow the implementation of the HPMP

3.2.2. Conversion investment projects

- Implementation of selected priority investment HCFC conversion projects for phase-out of HCFC-141b and HCFC-22 in Foam and Refrigeration sectors (manufactoring industries of rigid polyorethane foam and foam insulation panels and manufacturing of commercial refrigeration appliences);

3.3. Selection of priority areas of policy and conversion interventions for the implementation of HP MP Stage 2

3.3.1. Policy and non-investment activities

Training activities and certifications:
- Training workshops for custom officers, custom clearance and meritime agences and importers of HCFCs' on newly established HCFC phase-out legislative acts and operational measures;
- Support of education and training activities in vocational scools and at the universities on introduction of upgrated non-HCFC refrigeration technollogies and using of natural refrigerants;
- Certification of refrigeration service technicians and mechanics;
- Certification of refrigeration service workshops

Awareness raising:
- Promotion seminars for HCFCs end users;

- Publish brochures and pamphlets;
- Promotion activities on Radio, TV and written media

3.3.3. Other interventions and legislative measures:

- Set-up a regulations for re-usable refrigerant cylinders;
- Ban of import of equipment containing HCFCs;
- Ban of import non-refillable HCFCs refrigerant containers
- Development of Recovering / Recycling schema

4. STRATEGY AND PLAN FOR THE IMPLEMENTATION OF HCFC PHASE-OUT

4.1. Overall strategy and HCFC Phase-out Plans

The overall HCFC Phase-out Strategy of Bosnia and Herzegovina, Plan of action and Phase-out activities required to meet the phase-out targets:

- to freeze HCFCs consumption at the National Starting Point level on 2013;
- to meet 2020 phase-out targets and
- phase-out of HCFC consumption (excluding up to 2.5 % for servicing purposes) up-to 2030
- total (100%) phase-out of HCFC consumption up-to 2035

is based on the General Strategy for HCFCs Phase-out, defined in the above sub-chapter 3.1.2. – HCFC Phase-out Programme for Bosnia and Herzegovina.

To meet this challenged schedule it would be necessary to follow national plan of gradual reduction of HCFC consumption in accordance with the schedule shown on the Table 26 billow.

Table 26. HCFC consumption reduction and phase-out schedule for BiH

Base Line / Action for reduction	*Total quantity of HCFCs consumption reduction*		*Plan for HCFC consumption reduction up to year*
	Metric tone	*ODP tone*	
HCFC-22 Base-line (Average consumption 2009-2010)	**58.850**	**3.237**	
HCFC-141b Base-line (Average consumption 2009-2010)	**13.500**	**1.485**	
Average consumption of HCFC-141b in pre-blended Polyol	**24.368**	**2.680**	
National Starting Point (NSP) for HCFCs reduction / phase-out	**96.718**	**7.402**	
Freeze at NSP level (Starting Point for reduction)	**96.718**	**7.402**	2013
50 % reduction	48.359	3.701	2015
75 % reduction	72.539	5.552	2020
92 % reduction	88.980	6.811	2025
97.5 % reduction	94.300	7.217	2030
100 % reduction	**96.718**	**7.402**	**2035**

4.1.1. National policy measures and instruments for HCFC phase-out

The following non-investment activities which will enable Bosnia and Herzegovina to meet the achievement of planned targets for HCFCs phase-out will be:

Policy measures:
- Establish and put in place the HCFC regulations on import quota and permits and limit annual import of HCFCs and equipment containing HCFCs;
- HCFCs distribution price control at BiH market;
- Ban of import HCFCs and equipment containing HCFCs

Policy instruments:

- Put in place a HCFC Plan for phase-out and regulations on import quotas and permits for import of HCFCs and equipment containing or using HCFC substances and strengthen the monitoring of the regulations implementation;
- Limitation of import of new HCFC containing equipment –national annual import quota for each year adjust with the Plan for gradually reduction of import of HCFC containing equipment. Prepare and adopt (on national level) a Plan for limitation of the import of HCFC containing equipment (for the period 2013-2015) up to the end of 2012 and start with its implementation beginning the 2013;
- Establish a price control through the introducing of a new - increased import taxes on HCFCs and HCFC containing equipment, applied in Stage 1 of the HPMP implementation;
- Plan and schedule for limit and gradually reduction of import of new air-conditioning equipment containing HCFC refrigerant and ban of import of second-hand / used HCFCs containing equipment and new HCFC-based refrigeration and air-conditioning installations, based on the Plan for HCFCs gradually reduction (Stage 1) and phase-out (Stage 2) of the HPMP implementation.

Unfortunately, due to a very complex present constitutional and institutional structures in Bosnia and Herzegovina, and the facts that the all-over Environmental Policy is on the Entities' level, and that does not exist any national environmental policy, except environmental international relations and implementation of international environmental agreements that are delegated to the state level, it is impossible for the time being to introduce any additional "environmental taxes" except a regular import tax for goods imported to Bosnia and Herzegovina from non-EU and non-CEFTA countries.

4.1.2. Policy instruments and import quotas

Annual import quota for new Air-conditioning equipment containing HCFC

Major use of HCFCs (R-22) in Bosnia and Herzegovina is in air-conditioning sub-sector and more then 70% of R-22 consumption is in the servicing sub-sector –maintenance and installation of this equipment.

According to the detailed survey done during the preparation of this HPMP document, there was found a significant increase of import of split and unitary air-conditioning equipment containing HCFC-22 in last years (2008-2010), comparing with earlier period (2005-2007).

The Ministry of Foreign Trade and Economic Relations as the State ministry responsible for foreign trade and environmental issues at State level will establish Import Quota System to avoid build up of "stock". The base line for limitation of import of new air-conditioning

equipment (split and unitary) will be the Base-line (average number of imported units in the years 2009-2010 which is around 36,000.

The allowed annual import of air-conditioning equipment containing or using of HCFC-22 will be as follows:

- 36.000 units - Base line (January 2013 - starting point)
- 20.000 units - from 1 January 2014 to 31 December 2014
- 10.000 units - from 1 January 2015 to 31 December 2015
- **Ban of import and 0** units – from 1 January 2016

During this period the MoFTER will establish a new Licensing, Quota and Import / Re-export Permit System for regulation of import / re-export of this equipment in Bosnia and Herzegovina on similar way as is to be regulated issue of quota and import permits for import of HCFC substances in the Country.

The Import Quota System will decrease installation of new air-conditioning equipment containing HCFC-22 in the country and will generate of lower consumption of this substance within the 5-8 next years and decreasing of HCFC-22 import needs for their maintenance.

4.1.3. HCFC conversion investment projects:

Preparation and implementation of the priority selected investment conversion projects in Foam and Refrigeration sectors till 2015, will enable Bosnia and Herzegovina to meet its planned commitments for phase-out more than 30% of its HCFC consumption Base-line.

Those selected projects are:

- **Investment project for conversion of blowing agent HCFC-141b to eligible non-HCFC technology using cyclo-Pentane as a blowing agent in the manufacturing company "ALTERNATIVA" Hrasnica Sarajevo,** which produce rigid-polyurethane foam insulation panels, modular PU rigid foam and pre-blended Polyol.

Implementation of this project will enable to phase-out **43.459 Metric tons (4.78 ODP tones)** of **HCFC-141b** (average consumption of pure HCFC-141b plus HCFC in pre-blended Polyol);

- **"UMBRELLA" Investment project for conversion of blowing agent HCFC-141b to non-HCFC technology –i.e conversion of HCFC-141b blowing agent to a low-GWP blowing agent Matyl formate and refrigerant HCFC-22 to HFC and its blends or natural refrigerants in 6 small and medium size refrigeration manufacturing enterprises**:
  - „**ORDAGIC**", Srabrenik;
  - „**SOKO-RKT**", Mostar";
  - „**KUCA LEDA**", Mostar";
  - „**EKO FRIGO**", Banja Luka";
  - „**ELEKTRO FRIGO**" Banja Luka and
  - „**FRIGOKLIMA**" Banja Luka

It is necessary to stress, that HCFC-141b blowing agent, used in production of insulated polyurethane rigid foam is consumed by these companies in purchased pre-blended Polyol (pre-mixed Polyol system)
Implementation of this project will enable to phase-out 14.58 Metric tone (0.802 ODP tones) of HCFC-22 and 13.40 Metric tones (1.474 ODP tones) of HCFC-141b;

4.1.4. Plan for gradually reduction of HCFC consumption (Stage 1 of the HPMP implementation)

The activities of all stakeholders in Bosnia and Herzegovina who may contribute to gradually reduction of HCFCs consumption during the Stage 1 of the HPMP implementation and measures which will be taken in this regard are as follows:

- Completion of the selected investment projects for conversion of HCFC-used technologies to non-HCFC alternatives in manufacturing sector (production of rigid foam panels and production of refrigeration commercial appliances), and reduction of consumption of HCFCs (43.46 M tone of HCFC-141b by "ALTERNATIVA" project and HCFC-22 by 15.58 M tone - and 13.40 M tone of HCFC-141b), what will bring the phase out of HCFCs in total quantity of 72.44 M tone till the end of 2015;
- Ban of import of equipment containing or using HCFCs (target: ban of import of air-conditioning equipment), during the Stage / Phase 1 of the planned gradual consumption reduction of HCFCs (period 2013-2020) and reduce needs for HCFCs import (target: HCFC-22 refrigerant for servicing of installed air-condition equipment);
- Decreasing of needs for HCFCs' import in refrigeration and air-conditioning servicing sector through the establishment of Annual Import Quota System and gradually reduction of allowed total import of R-22 and air-condition equipment (unitary and split types) containing refrigerant R-22 in the period 2013-2020;
- Raising awareness and control measures (for import of HCFC refrigerants-targeting R-22 and equipment containing R-22), with active participation of all the most important national stakeholders such as: NOU-Ministry of Foreign Trade and Economic Relations, Entities' Ministries of Environment and Trade, Government of the District Brcko BiH, National Custom Authority and Association of Refrigeration and Air-condition Manufacturing and Servicing Organizations, as well as licensed Importers and Distributors of these goods at BiH Market.

The starting point for the gradual limitation of the total import quotas (for R-22 in kg) and for equipment containing HCFCs (number of units), starting from 2013 will be a Base line (average import 2009-2010) of import of these goods.

The Ministry of Foreign Trade and Economic Relations in close cooperation with the two Entities' Ministries of Environment and the Government of District Brcko will establish an Import-Quota Plan for annual quota reduction. The Plan will be the integral part of this HPMP.

In the Table 27 billow are shown all planned activities and actions in Bosnia and Herzegovina for the implementation of the **HPMP-Stage 1** and key national stakeholders - authorities and institutions and NGOs which will participate in its implementation, as well as a plan for gradually reduction of HCFCs consumption.

Table 27. Plan of activities for the implementation of HPMP–Stage 1 and reduction of HCFCs

Activity/Project	*Completion term / put in place*	*Key stakeholders*	*Reduction (Mt /ODP t)*
STAGE 1 (2012-2020)			
Policy and non-investment activities			
Legislative acts and Policy			
Legislative Framework for phase-out of HCFCs consumption and import of equipment containing HCFCs	December 2012	►NOU-MoFTER; ►Entities' Ministries of Environment	
Plan for gradual reduction of import of HCFCs and HCFC equipment for the period 2013-2016	December 2012	►NOU-MoFTER	
Import quotas & permits for HCFCs and equipment containing HCFCs	December 2012	►NOU-MoFTER ►Custom Authority	
Price control – increasing of import taxes on HCFCs and equipment containing HCFCs	January 2013	►NOU-MoFTER ►Custom Authority	
Improving of reporting system inland country	Up to December 2012	►Importers/exporters, Custom Authority; Distributors and End-consummers of HCFCs	
Training activities and certifications:			
Project: Training workshops for custom officers, custom clearance and meritime agences & importers	Febr.–March 2013 & Febr.-Mar. 2016	►NOU-MoFTER ►Custom Authority	
Project: Training workshops and certifiction for service technicians and mechanics	February - May 2013	►NOU and BiH Training Centers	
Awareness raising:			
Establishment of NOU Web site	June 2012	►NOU with assistance of UNIDO	
Promotion activities-seminars	2014-2018	►NOU	
Establisment and support of activities of a Refrigeration & Air-condition Assiciation	2012-2013	►Refrigeration producers and services with assist. of NOU	
Technical seminars and workshops for HCFCs end users	2013-2015	►NOU	
Put in place Polycy & ban import of HCFC-141b	June 2016	►MoFTER-NOU	
Development of Recover. / Recycling. schema	2016-2017	►NOU & UNIDO	
Ban of import of equipment containing HCFCs	From: Jan. 2017	►MoFTER ►Custom Authority	
Training workshops and certification of refrigeration service technicians / mechanics	2016-2017	►NOU and BiH Refrigeration Training Centers	
Establish Code of Good Practice in Refrigeration and Air–condition Sectors	December 2015	►NOU-MoFTER	
Promotion activities on Radio, TV & media	2014-2020	►NOU	
Conversion investment projects			
Project: Conversion of HCFC-141b to non-HCFC technology in the foam manufacturing company ALTERNATIVA Hrasnica-Sar.	December 2014	►Technical assistance: UNIDO ►National Implementation Agency: NOU-MoFTER	**43.46 / *4.770***
Project: "UMBRELLA" project for conversion of HCFCs at SMEs	December 2015	►Technical assistance: UNIDO ► Agency: NOU-MoFTER	**28.98 / 2.276**
TOTAL HCFC phase-out	HPMP-Stage 1		**7.046**

4.1.5. HCFC Consumption in Bosnia and Herzegovina–targets and plan of reduction up-to 2020

Table 28. Plan for reduction of HCFC consumption during the implementation of HPMP-Stage 1

Row	*Parameter / Year*		*2011*	*2012*	*2013*	*2014*	*2015*	*2016*	*2017*	*2018*	*2019*	*2020*
1	Montreal Protocol reduction schedule of Annex C, Group I substances (ODP tones)	Article 5 countries target (% of baseline)	n/a	n/a	0	0	10	0	0	0	0	35
		Allowed consumption for BiH (ODP tone)			7.402	7.402	6.662	6.662	6.662	6.662	6.662	4.811
2	Maximum allowable total consumption of Annex C, Group I substances in BiH (according to implem. of Stage 1 of HPMP up to 2020) (ODP tones)				7.402	7.402	6.662	6.662	6.662	6.662	6.662	4.811
3	Plan for reduction in Stage1 of the HPMP implementation schedule in BiH	Reduction of HCFC consumpt. (ODP tone)			0	0	* 4.77	** 2.27	0	0	0	*** 1.00
		Remaining for allowed consumption (ODP tone)			7.402	7.402	2.63	0.36	0.36	0.36	0.36	0.36

LEGEND:

**** Reduction of HCFC consumption through the implementation of foam project ALTERNATIVA;***
***** Reduction of HCFC consumption through the implementation of com. refrig. project for"6SMEs"***
****** Reduction of HCFC consumption through implementation of non-investment activities***

4.1.6. HCFC consumption forecasting

HCFC consumption forecast is based on the analyses of the collected data as shown in the ***Table 28a*** billow.

Table 28a: HCFC consumption (constrained and unconstrained) forecast for HPMP-Stage 1

		2009	*2010*	*2011*	*2012*	*2013*	*2014*	*2015*	*2016*	*2017*	*2018*	*2019*	*2020*
Constrained HCFC consumption	Mt	107.43	117.94	120.00	124.16	130.80	136.80	90.20	62.20	62.20	62.20	44.00	44.00
	ODPt	8.83	9.49	9.64	10.09	10.09.	10.44	6.43	4.18	4.18	4.18	3.18	3.18
Unconstrained HCFC consumption	Mt	107.43	117.94	132.00	145.00	159,70	179.90	193.26	212.58	218.50	225.60	232.80	240.00
	ODPt	8.83	9.49	10.62	12.36	13.47	15.16	16.25	17.93	18.43	19.28	19.87	20.46

4.2. Plan for phase-out of HCFCs consumption (Stage 2 of the HPMP implementation)

In the billow Table 29 are shown frame planned activities in Bosnia and Herzegovina for the implementation of Stage 2 of the HPMP for full phase-out of HCFCs import / consumption of these virgin substances in the country.

This plan shows that during the period 2021-2035 will not be any activities for conversion interventions – nor implementation of any HCFC investment conversion project.

All activities, mostly delegated to the National Ozone Unit (NOU) of Bosnia and Herzegovina will be focused non-investment activities, such as: updating of training activities, coordination of certification process for refrigeration and air-conditioning service technicians and mechanics and service workshops, as well as on different activities in establishing or / and updating of legislative acts and measures on state and entities' levels which will strengthen the implementation of the HPMP and the Montreal protocol as well.

An awareness raising and promotion activities will also take a significant portion in the implementation of the HPMP's activities during this period.

Table 29. Frame Plan of activities for the implementation of HPMP –Stage 2 and phase-out of HCFCs

HPMP STAGE 2-Implementation Schedule (2021-2030)			
Activity/Project	***Scheduled completion term / put in place***	***Key stakeholders / Organizers***	***HCFC reduction / phase-out (Mt /ODPt)***
Policy and non-investment activities			
Trainings, Education and Certifications			
Project: Certification of refrigeration service workshops	2021-2022	►BiH Refrigeration Training Centers	
Project: Training workshops for custom officers, custom clearance and meritime agences & importers	2021	►NOU-MoFTER ►Custom Authority	
Support of education and training activities in vocational scools and at the universities	2021-2022	►NOU-MoFTER ►Entities' Ministries of Education	
Awareness raising			
Promotion seminars for HCFCs end users	2022	►NOU	
Development of Recover. / Recycling. schema	2021-2022	►NOU & UNIDO	
Publishing brochures and pamphlets	2023-2024	►NOU	
Promotion activities on Radio, TV and written media	2021-2030	►NOU	
Other interventions and legislative measures			
Set-up a regulations for re-usable refrigerant cylinders	2021	►NOU-MoFTER	
Ban of import non-refillable HCFCs containers	2023	►MoFTER ►Custom Authority	
Phase-out and ban of import of HCFCs	**From January 2036**	►MoFTER ►Custom Authority	**100% of the Starting Point**

4.2. Project coordination and monitoring

Bosnia and Herzegovina has the successful experience in coordination and management of the implementation of the Montreal Protocol and programmes, implemented through the approved Country Programme for ODSs Phase-out and the NOPP-and projects for Ozone Layer protection.

The National Ozone Unit (NOU BiH)) is the key national body established within the Ministry of Foreign Trade and Economic Relations (MoFTER), which is responsible for all over coordination of the activities at state and entities' levels for facilitation of ODS phase-out and implementation of by the Multilateral Fund funding projects and other activities.

The NOU BiH in cooperation with UNIDO-Multilateral Agreements Branch is managing all activities and represents the Government of Bosnia and Herzegovina since 1999 in the implementation of the country's commitments for the protection of the Ozone Layer and the Montreal Protocol implementation.

So, it is expecting that the State Government (Council of Ministers), with the acceptance of the both Entities (Federation BiH and Republika Srpska) will delegate the implementation of the HPMP to the NOU-MoFTER.
The management of the implementation of the HPMP planned activities will be allocated to the NOU in cooperation with UNIDO as an International Implementing Agency.

The main stakeholders in Bosnia and Herzegovina, besides NOU, which will be involved in the implementation of the HPMP are:
- Ministry of Foreign Trade and Economic Relations (as the National Focal Point for the implementation of the Vienna Convention and the Montreal Protocol);
- Both Entities' Ministries of Environment;
- Government of the District Brcko BiH;
- State Custom Authority;
- ODS (HCFC) and HCFC containing equipment importers and distributors to BiH Market;
- Manufacturing companies and service shops in refrigeration and air-conditioning sector;
- Local end users of HCFCs.

UNIDO was delegated and authorized as the International Implementation Agency for monitoring of the HPMP implementation and this agency is also responsible for financial the management of the approved financial assistance for Bosnia and Herzegovina received from the Multilateral Fund.

4.3. Reports and verification

National Ozone Unit of Bosnia and Herzegovina (NOU BiH) is authorized in full capacities, for preparing and sending on behalf of Bosnia and Herzegovina, all annual or occasional reports to the MLF Secretariat or to the ExCom on the HPMP implementation progress, agreed and approved plans, programmes, activities and projects.

NOU will-Ministry of Foreign Trade and Economic Relations will submit, trough the UNIDO, to the Multilateral Fund Secretariat annual Progress Reports of a status of the HPMP implementation, with the copies to both Entities' Ministries of Environment and to the Government of District Brcko.

The above mentioned reports will be prepared on the truly information collected and reports received from the main domestic stakeholders responsible for implementation of the HPMP, such as: National Custom Authority, Importers and Distributors of HCFCs; End-users in manufacturing and service sub-sectors, Beneficiaries of the approved and implementing investment conversion projects and other stake holders who may be involved in the HPMP implementation

The NOU is responsible to coordinate in cooperation with UNIDO the preparation and implementation of all particular projects, and report to the Multilateral Fund, through the UNIDO on the status of their implementation.

Monitoring of HPMP development and verification of the achievement of the performance targets, specified in the Plan, will be assigned to independent local company/consultants. Annual report of Monitoring and Verification Audit will be submitted to the NOU and UNIDO.

5. COST CALCULATIONS OF THE HPMP IMPLEMENTATION AND HCFC PHASE-OUT IN BOSNIA AND HERZEGOVINA

The cost of the planned activities and projects implementation expenses are estimated on the basis of previously implemented Country Programme and National ODS Phase-out Plan (NOPP) and information collected from some producers of non-HCFC technology production equipment.

It is necessary to emphasize, that in these Costs calculations were taken in to consideration all requirements and relevant Decisions related to funding the phase-out of HCFC consumption in the Article 5 countries that were adopted by the Executive Committee of the Multilateral Fund and the requirements of the "**GUIDE FOR THE PREPARATION OF HCFC PHASE-OUT MANAGEMENT PLANS" issued by the Secretariat of the Multilateral Fund in July 2010.**

Also, after discussions by the NOU Manager of Bosnia and Herzegovina with the Ozone Secretariat and with the representatives of the Secretariat of the Multilateral Funds done at the 23rd MOP, Bali, Indonesia, the following basses for calculation of **Starting Points for HCFC-141b** phase-out (as National amount or for any of particular conversion project using a conversion technology from HCFC-141b conversion to non-HCFC and low GWP of converted blowing agent to be used in the production of polyurethane rigid foam) and calculation of threshold for eligible receiving financial assistance from the Multilateral Fund are to be applied in the calculation of HCFC-141-b phase-out (consumed / imported both: as pure HCFC-141b and HCFC-141b blended with Polyol):

Starting point (M tone) = Base line consumption of pure HCFC-141b (average 2009-2010 as reported under Art. 7 of the MP) + **Average consumption of HCFC-141b blended in Polyol** (2007-2009)

The bases of HCFC-141b consumption for calculation of a **National Starting Point (NSP)** for **gradual reduction and phase-out of consumption of HCFC-141b** is shown in the Table 30 billow.

Table 30. Bases of consumption of HCFC-141b for calculation of Starting Point for HCFC-141b phase-out

Consumption of HCFC-141b (M tone)	***Year***			
	2007	***2008***	***2009***	***2010***
Pure HCFC-141b (as reported under Art. 7)	25.000	44.476	**27.000**	**0**
Base-line consumption (2009-2010)			**13.500**	
HCFC-141b imported in pre-blended Polyol	**32.000**	**15.035**	**26.070**	54.600
Average consumption (2007-2009) of HCFC-141b in pre-blended Polyol	**24.368**			
National Starting Point	**13.500 + 24.368 = 37.868**			

INVESTMENT CONVERSION PROJECTS OF THE GOVERNMENT OF BOSNIA AND HERZEGOVINA

APPENDIX 1: INVESTMENT PROJECTS COST

Project 1: ALTERNATIVA - CONVERSION FROM HCFC-141B TO C-PENTANE IN THE MANUFACTURE OF POLYURETHANE FOAM INSULATED SANDWICH PANELS

PROJECT COVER SHEET

COUNTRY: **Bosnia and Herzegovina (BiH)**

IMPLEMENTING AGENCY: **UNIDO**

PROJECT TITLE: **Alternativa -** Conversion from HCFC-141b to c-pentane in the Manufacture of polyurethane foam insulated Sandwich Panels

PROJECT IN CURRENT BUSINESS PLAN	Yes
SECTOR	Foams
SUB-SECTOR	Rigid Foams
HCFCs USE IN SECTOR (Base-line+Average conumpt. 2007 -2009)	37.87 MT of HCFC-141b
HCFC USE AT ENTERPRISES (Aveg. 2007 -2009)	43.46 MT of HCFC-141b
PROJECT IMPACT	43.46 MT (4.78 ODP tones) of HCFC-141b
PROJECT DURATION	24 months
TOTAL PROJECT COST:	
Incremental Capital Cost	US$ 451,000
Contingency	US$ 45,100
Incremental Operating Cost	US$ 67,797
Total Project Cost	US$ 563,897
LOCAL OWNERSHIP	100%
EXPORT COMPONENT	All to A5 countries only
REQUESTED GRANT	**US$** 398,091
COST-EFFECTIVENESS	US$ 9.16 / kg
IMPLEMENTING AGENCY SUPPORT COST (7.5%)	US$ 29,857
TOTAL COST OF PROJECT TO MULTILATERAL FUND	US$ 427,948
STATUS OF COUNTERPARTS FUNDING	
PROJECT MONITORING MILESTONES	Included
NATIONAL COORDINATING/ MONITORING AGENCY	National Ozone Unit-Ministry of Foreign Trade and Economic Relations

Project summary
This Project will phase out the consumption of HCFC-141b in the manufacture of polyurethane foam insulated sandwich panels in Alternativa, the main producer of sandwich panels in BIH. The chosen technology is cyclopentane based system, which is a definitive alternative under the Montreal Protocol and additionally has a positive impact on climate, in compliance with Decision XIX/6.

Impact of project on Country's Montreal Protocol Obligations
This Project will phase out 40.7 ton of HCFC-141b, which will help BIH to achieve its 2013 freeze and 2015 10% reduction targets. This project is fundamental for Bosnia and Herzegovina to be able to comply with its reduction goals.

PROJECT OBJECTIVE

The objective of this Project is to phase out the use of HCFC-141b as blowing agent in the production of rigid polyurethane foam in the manufacture of Sandwich Panels at Alternativa Co.

This Project is in line with the policies of Decision XIX/6 from 2007 related with the elimination or those ODSs with highest ODP and to select alternatives that minimize its climate impact.

This Project will contribute to the achievement of 2013 freeze and 2015 10% reduction targets and it is fundamental for BOSNIA AND HERZEGOVINA to comply with the Montreal Protocol obligations.

COMPANY AND SECTOR BACKGROUND

There is only one currently operating manufactoring company – producer of polyurethane rigid foam and sandwich insulation panels and pri-blended Polyol System in Bosnia and Herzegovina, using HCFC-141b as a foam blowing agent. This is the manufactoring company "ALTERNATIVA" from Hrasnica, Sarajevo.

The other consumers of the HCFC-141b in manufacture sector are some small and medium size enterprises, producers and assemblers of commercial refrigeration appliences, such as: cold chambers, cold stores, water cooling chillers, refrigeration trucs cold chambers AND cold shaws.

ALTERNATIVA D.O.O is a 100% BIH ownership company and located in Hrasnica-Sarajevo. It was established in 1997 for trading metals.

Since 2001, the company manufactures roof and cladding panels for the construction industry. The polyurethane insulated sandwich panel production and small system house operation started in 2005. The sandwich panels are produced in sizes of 1.2 m in width, up to 12 m in length and thicknesses from 3 cm to 20 cm. All production is for BiH.

In ALTERNATIVA works 55 people in the industrial plant, management, sales and technical service personal, in a facility of 3,000 m^2. Eight of the personnel is directly involved in the sandwich panel production. Currently, the company has an operating production capacity of sandwich panels150 -280 m^2/day.

Company details:

Name of Company: "ALTERNATIVA D.O.O" Hrasnica - Sarajevo
Address: Put Famosa 38, 71212 Hrasnica-Sarajevo
Contact details of person in charge: Mr. Salih Lemeš, Director General
Phone: 387 33 475 850, Fax: 387 33 475 860, E-mail: info@alternativa.ba
Year of establishment of the company: 1997
Year of establishment of line using HCFC: 2005

Products using HCFC: Polyol blended system, rigid polyurethane foam construction sandwich panels and insulation rigid polyurethane panels for refrigeration appliances
National and other A5 country ownership share: 100 % National - BiH ownership company
Assistance received from Multilateral Fund: No
LOCAL OWNERSHIP OF THE COMPANY: 100 % (BiH private company)
EXPORT COMPONENT: No
Today, Alternativa's product portfolio includes roof panels, wall panels, and refrigeration insulation panels. The production details in the last 6 years with forecast for the years 2011 and 2012 can be seen in the next tables.

Illustration 1. General view of production line at Alternativa.

1. Foam production profile of the company ALTERNATIVA

Table 30. Foam production profile and unit consumption of HCFC-141b by products type

Product type		*Foam thickness* (cm)	*Unit volume* (m^3/m^2)	*Density* (kg/m^3)	*Unit weight/* (kg/m^2)	*Unit consumption of HCFC-141b/m^2* (kg)
Roof panels	KP 50	5	0.05	45	2.25	0.30
	KP 60	6	0.06	45	3.00	0.36
	KP 80	8	0.08	45	3.60	0.48
	KP 100	10	0.10	45	4.50	0.60
	KP 120	12	0.12	45	5.30	0.72
	KP 160	16	0.16	45	7.20	0.96
	KP 200	20	0.20	45	8.90	1.20
Wall panels	ZP 30	3	0,03	45	1.58	0.18
	ZP 50	5	0.05	45	2.25	0.30
	ZP 60	6	0.06	45	3,00	0.36
	ZP 80	8	0.08	45	3.60	0.48
	ZP 100	10	0.10	45	4.50	0.60
	ZP 120	12	0.12	45	5.30	0.72
	ZP 160	16	0.16	45	7.20	0.96
	ZP 200	20	0.20	45	8.90	1.20
Refrig. insulat. panels	FPP 80	8	0.08	45	3.60	0.48
	FPP 100	10	0.10	45	4.50	0.60
	FPP 120	12	0.12	45	5.30	0.72
	FPP 140	14	0.14	45	6.30	0.84

	FPP 160	16	0.16	45	8.10	0.96
	FPP 180	18	0.18	45	9.10	1.08
	FPP 200	20	0.20	45	9.00	1.20

2. Annual produced quantities of foam products by years for 2005 – 2010 and forecasting for 2011 - 2012

Table 31. Production of roof panels by years

Product type		Foam thickness	Produced quantities by years (m^2)							
		(cm)	2005	2006	2007	2008	2009	2010	2011*	2012*
Roof panels	KP 50	5	0	256	12,450	16,688	14,732	20,524	22,800	24,600
	KP 60	6	15,980	342	10,350	9,431	8,151	8,733	9,500	11,400
	KP 80	8	15,120	35,501	15,050	17,204	18,601	13,737	15,048	16,470
	KP 100	10	4,250	9,231	24,820	16,214	16,017	15,019	16,560	18,000
	KP 120	12	0	0	0	2,364	2,677	2,088	100	150
	KP 160	16	0	0	0	0	0	0	0	0
	KP 200	20	0	0	0	0	0	0	0	0
TOTAL			**35.350**	**45,330**	**62,670**	**61,901**	**60,178**	**60,101**	**64,008**	**70,620**

NOTE: * forecasting

Table 32. Production of wall panels by years

Product type		Foam thickness	Produced quantities by years (m^2)							
		(cm)	2005	2006	2007	2008	2009	2010	2011*	2012*
Wall panels	ZP 30	3	0	0	0	0	0	0	2,500	3,200
	ZP 50	5	0	488	0	0	0	6,313	5,450	5,640
	ZP 60	6	1,740	3,849	5,929	11,286	6,478	2,480	2,750	2,980
	ZP 80	8	4,653	2,673	13,047	9,638	15,666	10,500	11,080	11,420
	ZP 100	10	2,257	3,912	7,815	5,369	1,984	5,518	6,100	6,620
	ZP 120	12	0	0	0	3,820	324	285	350	390
	ZP 160	16	0	0	0	0	0	0	0	0
	ZP 200	20	0	0	0	0	0	0	0	0
TOTAL			**8,650**	**10,922**	**26,719**	**30,113**	**24,452**	**25,596**	**28,230**	**30,250**

NOTE: * forecasting

Table 33. Production of refrigeration insulation panels by years

Product type		Foam thickness	Produced quantities by years (m^2)							
		(cm)	2005	2006	2007	2008	2009	2010	2011*	2012*
Refrig. insulat. panels	FPP 80	8	0	0	0	0	0	0	0	0
	FPP 100	10	0	0	0	0	0	0	0	0
	FPP 120	12	427	0	978	0	0	0	500	580
	FPP 140	14	0	0	0	0	322	315	700	850
	FPP 160	16	0	0	1,097	749	1,065	896	1,200	1,600
	FPP 180	18	0	259	0	1,957	1,200	820	800	500
	FPP 200	20	0	0	80	0	0	0	0	0
TOTAL			**427**	**259**	**2,155**	**2,706**	**2,587**	**2,031**	**3,200**	**3,530**

NOTE: * forecasting

3. Production of PU rigid foam by products and years

Table 34. Production of foam in roof panels by years

Product type		Foam thickness	Total production of PU foam (kg)							
		(cm)	2005	2006	2007	2008	2009	2010	2011*	2012*
Roof panels	KP 50	5	0	512	24,900	33,376	29,464	41,048	45,600	49,200
	KP 60	6	38,352	820	24,840	22,634	19,562	20,959	22,800	27,360
	KP 80	8	48,384	113,603	48,160	55,052	59,523	43,959	48,153	52,704
	KP 100	10	17,000	36,924	99,280	64,856	64,068	60,076	66,240	72,000
	KP 120	12	0	0	0	11,347	12,850	9,992	480	720
	KP 160	16	0	0	0	0	0	0	0	0
	KP 200	20	0	0	0	0	0	0	0	0
TOTAL			**103,736**	**151,859**	**197,180**	**187,265**	**185,467**	**176,034**	**183,273**	**201,984**

NOTE: * forecasting

Table 35. Production of foam in wall panels by years

Product type		Foam thickness	Total production of PU foam (kg)							
		(cm)	2005	2006	2007	2008	2009	2010	2011*	2012*
Wall panels	ZP 30	3	0	0	0	0	0	0	3,000	3,840
	ZP 50	5	0	976	0	0	0	12,626	10,900	11,280
	ZP 60	6	4,176	9,237	14,230	27,086	15,547	5,952	6,600	7,152
	ZP 80	8	14,890	8,553	41,750	30,841	50,131	33,600	35,456	36,544
	ZP 100	10	9,028	15,648	31,260	21,476	7,936	22,072	24,400	26,480
	ZP 120	12	0	0	0	18,336	1,555	1,368	1,680	1,872
	ZP 160	16	0	0	0	0	0	0	0	0
	ZP 200	20	0	0	0	0	0	0	0	0
TOTAL			**28,094**	**34,414**	**87,240**	**97,739**	**75,169**	**75,618**	**82,036**	**87,168**

NOTE: * forecasting

Table 36. Production of foam in refrigeration insulation panels by years

Product type		Foam thickness	Total production of PU foam (kg)							
		(cm)	2005	2006	2007	2008	2009	2010	2011*	2012*
Refrig. insulat. panels	FPP 80	8	0	0	0	0	0	0	0	0
	FPP 100	10	0	0	0	0	0	0	0	0
	FPP 120	12	2,050	0	4,694	0	0	0	2,400	2,784
	FPP 140	14	0	0	0	0	1,803	1,764	3,920	4,760
	FPP 160	16	0	0	7,020	4,793	6,816	5,790	7,680	10,240
	FPP 180	18	0	1,864	0	14,090	8,640	5,904	5,760	3,600
	FPP 200	20	0	0	640	0	0	0	0	0
TOTAL			**2,050**	**1,864**	**12,354**	**18,883**	**17,259**	**13,458**	**19,760**	**21,384**

NOTE: * forecasting

4. Consumption of HCFC-141b by products and years: 2005-2010 and forecasting for 2011-2012.

Table 37. Production of roof panels by years

Product type		*Foam thickness*	**TOTAL CONSUMPTION of HCFC–141b in production process**							
		(cm)	*2005*	*2006*	*2007*	*2008*	*2009*	*2010*	*2011**	*2012**
Roof panels	KP 50	5	0	75	3730	4999	4412	6148	6830	7370
	KP 60	6	5812	124	3766	3430	2964	3175	3456	4147
	KP 80	8	7117	16713	7085	8100	8756	6467	7086	7752
	KP 100	10	2546	5530	14873	9715	9595	8998	9921	10785
	KP 120	12	0	0	0	1416	1605	1220	60	90
	KP 160	16	0	0	0	0	0	0	0	0
	KP 200	20	0	0	0	0	0	0	0	0
TOTAL			**15,475**	**22,442**	**29,454**	**27,660**	**27,332**	**26,008**	**27,353**	**30,144**

NOTE: * forecasting

Table 38. Production of wall panels by years

Product type		*Foam thickness*	**TOTAL CONSUMPTION of HCFC–141b in production process**							
		(cm)	*2005*	*2006*	*2007*	*2008*	*2009*	*2010*	*2011**	*2012**
Wall panels	ZP 30	3	0	0	0	0	0	0	449	575
	ZP 50	5	0	145	0	0	0	1889	1632	1690
	ZP 60	6	633	1399	2157	4104	2356	900	999	1082
	ZP 80	8	2189	1258	6141	4536	7376	5943	5217	5375
	ZP 100	10	1352	2343	4682	3216	1190	3306	3655	3965
	ZP 120	12	0	0	0	2779	235	207	254	282
	ZP 160	16	0	0	0	0	0	0	0	0
	ZP 200	20	0	0	0	0	0	0	0	0
TOTAL			**4,174**	**5,145**	**12,980**	**14,635**	**11,157**	**12,245**	**12,206**	**12,969**

NOTE: * forecasting

Table 39. Production of refrigeration insulation panels by years

Product type		*Foam thickness*	**TOTAL CONSUMPTION of HCFC–141b in production process**							
		(cm)	*2005*	*2006*	*2007*	*2008*	*2009*	*2010*	*2011**	*2012**
Refrig. insulat. panels	FPP 80	8	0	0	0	0	0	0	0	0
	FPP 100	10	0	0	0	0	0	0	0	0
	FPP 120	12	310	0	712	0	0	0	363	421
	FPP 140	14	0	0	0	0	269	261	584	708
	FPP 160	16	0	0	1055	721	1025	869	1155	1540
	FPP 180	18	0	278	0	2095	1284	877	856	535
	FPP 200	20	0	96	0	0	0	0	0	0
TOTAL			**310**	**374**	**1,767**	**2,816**	**2,578**	**2,007**	**2,958**	**3,204**

NOTE: * forecasting

SUMMARY

Table 40. Summary of various products production and consumption of HCFC-141b in the period 2005-2010 and forecasting for 2011-2012

Products/ Consumption of HCFC-141b	***Produced quantities by years (m^2)***							
	2005	***2006***	***2007***	***2008***	***2009***	***2010***	***2011****	***2012****
Wall panels	8,650	10,922	26,719	30,113	24,452	25,596	28,230	30,250
Roof panels	35,350	45,330	62,670	61,901	60,178	58,049	64,008	70,620
Refrigeration insulation panels	427	259	2,155	2,706	2,587	1,415	3,200	3,530
Total quantity of produced panels (m^2)	44,427	56,511	91,544	94,720	87,217	85,060	95,438	104,400
Total production of PU foam (tone)	134	188	297	304	278	251	285	310
Total Consumption of HCFC–141b in manufacturing process (kg)	19,959	27,961	**44,201**	**45,111**	**41,067**	40,260	42,517	46,317
Consumption of pure HCFC-141b	0	15.000	25.000	21.000	**0**	**0**		
Consumption of HCFC-141b in pre-blended Polyol	19,959	12,961	19,201	34,111	41,067	40,260		
Base-line consumption (average of 2009-2010)					**0**			
Total average consumption (2007-2009)			**43,459**					

NOTE: * forecasting

It is important to be noted that Alternativa is the major HCFC-141b consumer in BIH and its conversion is essential for the country to fulfill its environmental goals.

1. CURRENT PROCESS DESCRIPTION AND CONSUMPTION OF HCFC

Raw material reception is made in the company central warehouse, where they are stocked. Alternativa usually keep a minimal stock of 8,000 kg of each component, but regularly this stock is 30,000 kg. From each received batch a sample is taken for quality test in the polyurethane section before it is used.

Sandwich panel production line is utilizing SAIP 210 liter/min foaming machine and 2 + 2 Manni press with two tables.

Illustration 2.: SAIP foaming machine and preparation before injection.

Starting with a roll-forming unit the pre-coated steel sheet (0.4 – 0.65) mm is formed up the required length 12.5 m and of 1.2 m wide.

After forming the steel sheets, the upper and lower sheet metals are conveyed and assembled manually into a panel on 2 + 2 Manni press. Plastic separators are inserted to ensure the correct panel thickness of from 3 cm to 20 cm..

After assembly of the sheet metals from the both ends of the press, the empty panels are taxied into a 2 + 2 press, and simultaneously two already cured panels are moved out from the both ends of the press.

Foam is injected using a high pressure SAIP foam dispenser with an output of up to 210 liters/min, e.g.240 kg/min, and a mixing head pressure of 130-150 bar.

Machine tanks of polyol and MDI have 250 l capacity each.

The de-molding time ranges between 15-20 minutes to one hour and 20 minutes depending on the panel thickness.

Presently PU steel sandwich panels a two-component PU polyol / MDI system is used with HCFC 141b blowing agent (30 parts by weight of polyol). Polyol is presently purchased as pre-blended. However, from time to time it has been purchased also as a bulk chemical.

The foaming machine is equipped with two day tanks, each with a capacity of 250 liters, which are filled from the bulk tanks.

Illustration 3. Bulk tanks for polyol and MDI

The core density of the rigid PU foams produced depends on the exact product and ranges between 39 and 45 kg/m³. However, average liquid density is 45 kg/m^3.

Currently Alternativa has following production equipment:

Item/ Stavka	*Description of foaming equipment, accessories and other production equipment in the Foam Plant*	*No of units*	*Type and producer*	*Year of installation*
Foaming equipment and installations /	High pressure foaming machine, capacity 210 l/min single mixing head and pre-mixing unit	1	SAIP (Italy) SPB-200	2005
	Dayly use tanks for Polyol (250 lit) & Isocianate (250 lit) with own pumping facilities	2	SAIP (Italy) SPB-200	2005
	Control panel	1	Code-System (BiH)	2005
Storage of R-141b and supply system	Tank for bulk storage of R-141b, capacity 200 lit	4	Croatia	2005
	Installation for R-141b supply to Polyol pre-mixing unit	1	Alternativa (BiH)	2005
	Pre-mixing unit for blanding of Polyol with R-141b	1	Croatia	2005
Electric energy supply facilities	Transformer station and electric installation 15/0,4 KV; 63 MWA	1	Končar (Croatia)	1998
Hydraulic press and accessories	Hydraulic press with muwable and adjustable moulding for fPU foam panels - lenght: 12.5 m - width: 1.2 m - vertical adjustment up to 55 cm - movable banks for panels poring (2+2)	1	Manni (Italy) PMC-350T	2005
Storage facilities for foam components	Tank for Polyol capacity 20 m3	1	Croatia	2005
	Auxiliary tank for Polyol 7m3	4	Croatia	2005
	Tank for isocyanates capacity 20 m3	1	Croatia	2005
	Auxiliary tank for isocyanates 7m3	2	Croatia	2005
	Auxiliary tank for isocyanates 15m3	2	Croatia	2005
Other equipment and accessories for manufacturing of panels	Production line for roof panels sheet plates profiling (5 + 1)	1	SINTECH (Finland) TRS37/1000	2005
	Production line for roof panels sheet plates profiling (3 + 1)	1	Yunsig (Taiwan) YS-914	2007
	Production line for wall panels sheet plates profiling	1	Metal-Produkt (Serbia) MSPPL-1	2005
	Panels sheets cutting machine	1	Fecker Kirfer (Germany) B-13	2005
	Plate sheets profilling banks	4	Alternativa (BiH)	2005
	Pneumatic machine for sheets cutting	1	Alternativa (BiH)	2005
	Compresor 10 bars	1	SP-29-2 Boge (Germany)	2005

ALTERNATIVE TECHNOLOGIES

In the TEAP- FTOC recommendations there are various technologies to phase out the use of HCFC-141b in the manufacture of polyurethane insulated sandwich panels. Several of these technologies have been used in Article 5 countries, especially those based in Hydrocarbons. In the following table some available technologies can be seen.

Technology	ODP	GWP	Flammability	Thermical conductivity (mW/m.K) (25°	Boiling point (°C)	Cost of blowing agent	Capital cost
HCFC-141b	0.11	713	No	9.7	31.9	Medium	Low
Cyclopentane	0	< 25	Yes	11.0 (10°C)	49	Medium	High
Isopentane	0	< 25	Yes	13.0 (10°C)	28	Medium	High
HFC-245fa	0	1030	No	12.05	15.3	High	Low
HFC-365mfc	0	794	No	10.6	40.2	High	Low
HFC-134a	0	1430	No	13.7	-27	High	Low
Methyl formate	0	< 20	No	10.7	31.5	Medium	Low

HYDROCARBONS

This technology is been developed in the last 20 years and it is the most used in the rigid polyurethane foam sector. The common formulations are those that use cyclo-pentane (C_5H_{10}), "pure" grade (95%) or technical (75%). Due its flammability some special measures have to be taken for its handling, these measures have already been widely identified and currently there are no limitations for use beyond the initial costs of plant adaptation. These adjustments are related to the installation of a storage tank for cyclopentane, a premix station since the blowing agent should be added to polyol in the plant, changes in polyurethane injection equipment and adaptations locative in the plant to prevent electric shock that could cause sparks, all accompanied by training and appropriate technical assistance. These changes make this technology suitable for SMEs.

Substitution for this blowing agent involves changes in the polyurethane foam obtained. These changes are associated with increased foam density and thermal conductivity. However, new formulations adjusted to hydrocarbons have led that these changes, particularly in regard to thermal conductivity, are dwindling.

Currently hydrocarbons (cyclo-pentane or mixtures of cyclo-pentane/iso-pentane) are the most widely used blowing agents in the manufacture of polyurethane insulated sandwich panels worldwide and are the industry standard in the around the region.

HYDROFLUOROCARBONS (HFC)

HFCs were developed as substitutes for HCFCs, among these include HFC-134a, HFC-245fa, HFC-365mfc, HFC-152a and HFC-365mfc/HFC-227ea mixtures.

The HFC-134a is a gas at room temperature so its operation involves changes in the injection process, in addition, has a low solubility in polyol formulations and thermal conductivity of the foam can be increased between 10 and 20%.

The HFC-245fa and HFC 365mfc are liquid at room temperature, making it easily adaptable to polyurethane injection process; due to the boiling point of HFC-245fa (15.3°C) it may be necessary to work with pressurized equipment. The thermal conductivity of the injected foam with HFC is equivalent to those foamed with HCFC-141b and smaller than those injected with hydrocarbons.

While the main parameters of the polyurethane foam injected with HFC are comparable to those achieved with the use of HCFC-141b, two issues are against HFCs: their high GWP, and operating cost, which is extremely sensitive in these markets.

CO2 (WATER)

This technology has been tested with limited success, mainly in the commercial refrigeration sector, where the insulation is not a key factor. This technology is based on the reaction of isocyanate and water, so extra care has to be taken in formulating the system.

This technology involves an increase in molded density, a decrease in their isolation ability and lower dimensional stability due to the high diffusion of CO_2 through polyurethane matrix, so this alternative has not been a widely used technology in the domestic refrigeration sector.

OTHER TECHNOLOGIES

There are a number of technologies being developed to eliminate the use of HCFCs, such as methyl formate, methylal and the unsaturated HFCs (HFO). Some of these are being tested, or have been, in demonstration projects funded by the Montreal Protocol to determine which applications can be used and conversion costs involved in the adaptation of technology. Aging tests of the foam and its performance in the long term are essential to determine its future use, particularly as alternatives for small and medium industries.

The market availability of these technologies is currently limited and it is estimated that the costs, especially HFO, make them not applicable in these cost-sensitive markets.

TECHNOLOGY SELECTION

To implement the project in Alternativa cyclo-pentane was chosen as the option to eliminate the use of HCFC-141b, the choice of the blowing agent was based on:

- It is a definite alternative to HCFC-141b by counting with 0 ODP and negligible GWP, which meets the guidelines of Decision XIX/6.

- It is a proven technology widely used in the sector.

- It is the standard for the rigid polyurethane foam sector in the world and in the region is the selected alternative to eliminate the use of HCFCs in multiple companies.

The selection of pentane technology has the main advantage that pentane is a natural substance with far lower GWP than HCFC-141b and any other HFC-based alternatives. In European countries as well as in many developing counties there are already discontinuous production lines for the manufacturing of PU steel sandwich panels with pentane as blowing agent. Selection of pentane technology will result in additional investment costs. However, the company owner decided to convert to pentane technology in order to avoid any transitional substances.

PROJECT DESCRIPTION

The project of conversion in Alternativa has the following aspects:

a) Storage and mixing of cyclo-pentane.

Given the volumes that Alternativa handles, it requires the construction of an underground tank for storage of cyclo-pentane with the adaptations necessary for loading and operation. This tank should have all the monitoring systems to prevent leakage of the blowing agent and meet international standards for these kinds of constructions.

To mix the polyol with cyclo-pentane, it is required to provide a premix station that will feed the daily work tank of foaming machine. It includes connections between the premix station and the foaming machines.

b) Retrofit of polyurethane foaming machine

For the existing SAIP SPB 200 dosing unit, the most feasible and safe solution is to replace the polyol dosing group with a new module carrying one 300 liter tank and with one high pressure dosing pump. The new module will have the master panel for the retrofitted unit.

Existing mixing head together with relevant hydraulics unit will be kept. Nitrogen purging valve for existing mixing head will be provided in order to flush panel's cavity with nitrogen before foam injection.

Isocyanate high pressure piping, rigid and flexible, will be maintained, while the polyol line will be entirely replaced with new ones. The old isocyanate part of foaming machine will work as a slave for the new polyol dosing group installation.

Flow transducer equipment will be installed on the existing SAIP SPB 200 dosing unit, isocyanate side, to enhance the control level and make it aligned with the new penta-polyol module.

c) Ventilation

The ventilation system needs to be dimensioned according to International Standards related to the classification of hazardous area.

Therefore, it is foreseen to provide:

- one double fan ventilation group, common to premixing unit and dosing unit areas, in total comprising two anti-sparking fans each 4,000 m3/h, back-up connected and with one safety pressure gauge
- one single fan ventilation group for the Manni 2+2 press area with anti-sparking fan of 15,000 m3/h, back-up connected and with one safety pressure gauge.

d) Safety and gas monitoring system

It must be installed a comprehensive system for early detection of leaks and a central control panel where the whole process of foam injection is managed. Gas detectors at storage, premix and injection point, along with the closing of the injection sites, are required. A ventilation system that ensures the replacement of air in critical process areas have to be installed. All metal structures have to be grounded, the equipment and the plant have to be adapted to prevent electric shocks and acquire an inerting system for press prior to foam lay-down by means of lance is a must. Changes to Manni press and panel assembly tables have to be made to ensure they can operate seamlessly with the new blowing agent.

The gas detection sensors (6 units) will be placed inside the ventilation enclosure of pentane-polyol premixing unit (1), in the hydrocarbon storage area (1), in the dosing unit area (1) and under the press (3) in order to continuously detect the atmosphere. The detector units will be connected to the above described gas monitoring and safety system.

e) Technical assistance, testing and commissioning

The project will include the costs of technical assistance, testing and commissioning of production lines with cyclopentane.

f) Safety Audit

There must be a safety audit once the conversion is made. It will follow the methodology proposed for these cases (UNEP/Ozl.pro/ExCom/25/54).

PROJECT COSTS

Incremental Capital Cost

The Incremental Capital Costs (ICC) are estimated to US$ 496,100, which includes 10% contingency, the detail can be found in Annex 1.

Incremental Operating Cost

The Incremental Operating Costs (IOC) are calculated to the amount of US$ **72, 576** for one year operation. The details of the calculations are in Annex 2 of the Project Document.

Cost Effectiveness Calculation

In accordance with Decision 60/44, the value of cost-effectiveness applicable to the project is USD 9.79/kg, given the choice of a low global warming potential alternative in Alternativa, which is part of the guidelines Decision XIX/6.

Multilateral Fund Grant

The total of resources requested to the Multilateral Fund for ICC of this Project are calculated using the maximum of thresholds for HCFCs phase out as follows:

USD 9.79/metric kg for phase-out of HCFC-141b consumption (as a Starting point of HCFC-141b -**average consumption for 2007-2009).**

Therefore totaling up to USD$ 398,091. The BiH's government has provided a formal letter of endorsement to the project.

Monitoring Description for the Project Implementation

The project will be implemented by UNIDO with the support of the National Ozone Unit - Ministry of Foreign Trade and Economic Relations. The implementation schedule can be seen in the following table.

Bimester / **Activity**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Project approval												
Submitting the document for signature												
Signature of project document												
Equipment specifications												
Equipment procurement												
Equipment installation												
Training												
Testing												
Start production without HCFC												
Project completed												
Project closure												

Milestones for monitoring the project (after project approval):

TASK	Month
(a) Project document submitted to the company	3
(b) Project document signature	4
(c) Bids prepared and requested	5
(d) Contracts Awarded	6
(e) Equipment Delivered	12
(f) Training Testing and Trial Runs	18
(g) Commissioning	20
(h) Project closure	24

Project Impact

Converting Alternativa is essential to eliminate BiH's dependence on HCFCs and achieve compliance with its commitments in 2013 and 2015. The project will phase-out the use of 4.47 ODP tons and will avoid the emission of 28,588 tons $CO_{2\ eq}$ (calculation in Annex 4). Cyclo-pentane is a final alternative with zero ODP and low GWP.

If cyclo-pentane is compared with HFC-245fa, the conversion to cyclo-pentane involves avoiding emissions by 5,770 tons of $CO_{2\ eq}$, which shows that cyclo-pentane is the alternative that best meets the guidelines of Decision XIX/6 to choose an alternative with least impact on climate.

From the point of view of sandwich panels manufactured by Alternativa, it is expected an increase in energy consumption of buildings, but it can be compensated with the latest generation of systems specifically formulated to uses hydrocarbons as blowing agent, this is one of the recommendations that will be made to the local supplier of the polyurethane systems; with this kind of systems a foam with similar conditions to those of HCFC-141b from the point of energy efficiency is obtained.

From the point of view of energy consumption of the process, it is estimated that there won't be an increase in the consumption of Alternativa, although there is additional equipment (the premix station, the gas monitoring system, the nitrogen generator, etc..), there will be a substitution old injection machines and engines with machines with more efficient energy consumption, although this may increase the company's initial investment.

Annex 1. CALCULATION OF INCREMENTAL CAPITAL COST

Table 41. Calculation of Incremental Capital Cost for ALTERNATIVA Project

Pos	Production area	USD
1	Pentane underground storage facility	32,000
2	Premixing unit facility	85,000
3	Retrofit of SAIP SPB 200	130,000
4	Modification of existing Manni 2+2 press and assembly tables	25,000
	Plant Safety	
5	Exhaust ventilation at the foaming area	8,000
6	Exhaust ventilation from around and underneath the press and provision of enclosure around the entire press	25,000
7	Gas detection system for the press area, pre-mixer, foaming machine and pentane storage	18,000
8	Safety management system and connection to the gas detection system	25,000
9	Fire protection & sprinklers	12,000
10	Antistatic floor	5,000
11	Electrical grounding, lightning protection and other electrical safeguarding of all relevant equipment	20,000
12	Nitrogen system	8,000
13	Standby electric generator	8,000
	General	
14	Safety Audit	15,000
15	Technology transfer	30,000
16	Trials and commissioning	5,000
	Sub-total	451,000
17	Contingency 10%	45,100
	Total	**496,100**

Annex 2. CALCULATION OF INCREMENTAL OPERATING COSTS

Estimates of incremental operating costs take into account the real value of the polyurethane system used by Alternativa..

In BiH, Cyclo-pentane is not available; the estimated value of USD 1,99/kg is based on the costs of the substance in other countries in the region with similar conditions to BiH and information provided by the country polyurethane suppliers. A 14% increase in polyol prices is expected due to use of hydrocarbons specific and improved formulations.

Table 42. Calculation of Incremental Operating Cost in ALTERNATIVA Project

Foaming Technology	HCFC-141b	Cyclo-pentane	HFC	Water
Blowing agents	1.9	1.99	10	na
Polyols (without blowing agent)	2.14	2.45	2.45	2.22
MDI	2.96	2.96	2.96	2.96

	HCFC-141b system		**Cyclo-pentane system**		HFC-245fa system		Water system foam	
Item	Parts (kg)	Price (US$)	**Parts (kg)**	**Price (US$)**	Parts (kg)	Price (US$)	Parts (kg)	Price (US$)
Polyols (without blowing agent)	100	214	**100**	**245**	100	245	100	222
HCFC-141b	30	57						
Cyclo-pentane			**12**	**23.88**				
HFC-245fa					25	250		
MDI	121.5	359.64	**135**	**399.6**	132.5	392.2	155	458.8
Subtotal	251.5	630.64	**247**	**668.48**	257.5	887.2	255	680.8
Foam usage	1		**1**		1		1.1	
Foaming Price (US$/kg)	2.51		**2.71**		3.45		2.94	
Ratio of HCFC-141b in the row material	0.119		**0.049**					
Unit IOC (US$/kg of HCFC-141b)			**1.67**		7.86		3.60	

Thus the total IOC =Unit IOC (US$/kg) x Consumption HCFC-141b (average 2007-2009) = 1.67 x 43,459 = US$ 72, 576

Annex 3. ENVIRONMENTAL ASSESSMENT

The environmental assessment was developed taking into account the ODP and GWP of the substance to be replaced (HCFC-141b) and the selected alternative (Cyclo-pentane). It is estimated that there will be not any substantial deterioration in the thermal conductivity of polyurethane foam, as new hydrocarbons formulations are equivalent to those base on HCFC offered in BiH.

The ODP and GWP values used for the calculation are shown in the table below.

Blowing agent	ODP	GWP
HC-Cyclopentane	0.00	11
HCFC-141b	0.11	713

The calculations are presented in the following table 43

Table 43. Calculation of Environmental Impact (emission of CO_2 equivalents)

Before the conversion

Blowing agent	Annual consumption /Average 2007-2009/ (M tone)	ODP	GWP	ODP tone	Tone $CO_{2\ eq}$/year
HCFC-141b	43.46	0.11	713.00	4.78	30,987

After the conversion

Blowing agent	Annual consumption (M tone)	ODP	GWP	ODP tone	Tone $CO_{2\ eq}$/year
Cyclo-pentane	16.2	0.00	25.00	0.00	405
HFC-245fa	33.75	0.00	1,030.00	0.00	34,763

Environmental impact

Blowing agent comparison	ODP tone phased out	Tone $CO_{2\ eq}$/year
HCFC-141b vs Cyclo-pentane	4.78	-30,582
HCFC-141b vs HFC-245fa	4.78	5,770

From these results it is observed that the project will have a positive impact on the environment by preventing the annual emission of 4.78 ODP M tone and 34,763 M tone CO_2 equivalet

Annex 4. BASELINE EQUIPMENT INFORMATION AND DISPOSAL PLAN

Item	Foaming machine
Brand	SAIP
Model	SPB 200
Type	High pressure
Manufacture year	2005
Application	Sandwich panels
Flow rate (g/s)	4,000
Mixing heads	1
Proposed action	Retrofit
Disposal plan	N/A

Annex 5. ALTERNATIVA'S PRODUCT PORTFOLIO

Table 44. Production Portfolio in ALTERNATIVA

Product type		***Foam thickness*** *(cm)*	***Unit volume*** *(m^3/m^2)*	***Density*** *(kg/m^3)*	***Unit weight/*** *(kg/m^2)*	***Unit consumption of HCFC-141b/m^2*** *(kg)*
Roof panels	KP 50	5	0.05	45	2.25	0.30
	KP 60	6	0.06	45	3.00	0.36
	KP 80	8	0.08	45	3.60	0.48
	KP 100	10	0.10	45	4.50	0.60
	KP 120	12	0.12	45	5.30	0.72
	KP 160	16	0.16	45	7.20	0.96
	KP 200	20	0.20	45	8.90	1.20
Wall panels	ZP 30	3	0,03	45	1.58	0.18
	ZP 50	5	0.05	45	2.25	0.30
	ZP 60	6	0.06	45	3,00	0.36
	ZP 80	8	0.08	45	3.60	0.48
	ZP 100	10	0.10	45	4.50	0.60
	ZP 120	12	0.12	45	5.30	0.72
	ZP 160	16	0.16	45	7.20	0.96
	ZP 200	20	0.20	45	8.90	1.20
Refrig. insulat. panels	FPP 80	8	0.08	45	3.60	0.48
	FPP 100	10	0.10	45	4.50	0.60
	FPP 120	12	0.12	45	5.30	0.72
	FPP 140	14	0.14	45	6.30	0.84
	FPP 160	16	0.16	45	8.10	0.96
	FPP 180	18	0.18	45	9.10	1.08
	FPP 200	20	0.20	45	9.00	1.20

Project 2: HCFC CONVERSION IN REFRIGERATION MANUFACTURING SECTOR: "UMBRELLA PROJECT FOR 6 SMEs"

PROJECT COVER SHEET

COUNTRY: **Bosnia and Herzegovina (BiH)**

IMPLEMENTING AGENCY: **UNIDO**

PROJECT TITLE: **"UMBRELLA project for 6 SMEs"** - Conversion from HCFC-141b to Methyl formate blowing agent and from refrigerant HCFC-22 to non-HCFCs in 6 SMEs-manufacturers of refrigeration commercial appliances

PROJECT IN CURRENT BUSINESS PLAN	Yes
SECTOR	Refrigeration
SUB-SECTOR	Commercial Refrigeration Manufacturing
STARTING POINT for HCFCs CONSUMPTION AT REFRIGERATION MANUFACTURING SUB-SECTOR	27.98 Mt of HCFCs
HCFC CONSUMPTION AT 6 SM ENTERPRISES	13.40 Mt of HCFC-141b (Average cons. 2007-09) 14.58 Mt of HCFC-22 (Base-line 2009-2010)
PROJECT IMPACT	27.98 Mt of HCFC-141b and HCFC-22 (2.276 ODP tones)
PROJECT DURATION	24 months
TOTAL PROJECT COST:	
Incremental Capital Cost	US$ 320,200
Contingency	US$ 32,020
Total Project Cost	US$ 352,220
LOCAL OWNERSHIP	100%
EXPORT COMPONENT	All to A5 countries only
REQUESTED GRANT	**US$** 352,220
COST-EFFECTIVENESS	US$ 9.79/kg –for HCFC-141b US$ 15.21/kg- for HCFC-22
IMPLEMENTING AGENCY SUPPORT COST (7.5%)	US$ 26,417
TOTAL COST OF PROJECT TO MULTILATERAL FUND	US$ 378,637
STATUS OF COUNTERPARTS FUNDING	Nill
PROJECT MONITORING MILESTONES	Included
NATIONAL COORDINATING/ MONITORING AGENCY	National Ozone Unit-Ministry of Foreign Trade and Economic Relations

Project summary
This Project will phase out the consumption of HCFC-141b and HCFC-22 in the Commercial Refrigeration Manufacturing Sub-sector in BIH. The chosen conversion technology is: **HCFC-141b** conversion to low GWP and zero ODP of **Methyl formate** based system, and **HCFC-22** conversion to **HFC and HFC blends** which are definitive alternatives under the Montreal Protocol in this sub-sector and additionally has a positive impact on climate, in compliance with Decision XIX/6.

Impact of project on Country's Montreal Protocol Obligation
This Project will phase out 13.40 Mt of HCFC-141b and 14.58 Mt of HCFC-22 which will help BIH to achieve its accelerating HCFCs consumption reduction and national targets in implementation of the Stage 1 of the HPMP and the Montreal Protocol commitments

PROJECT OBJECTIVE

The objective of this Project is to phase out the use of HCFC-141b as blowing agent in the production of rigid polyurethane insulation foam and HCFC-22 as refrigerant in the manufacture of refrigeration commercial appliances in 6 Small and Medium size Enterprises (6SMEs) located in different areas of Bosnia and Herzegovina.
This Project is in line with the policies of Decision XIX/6 from 2007 related with the phase-out or those HCFCs with highest ODP and to select those alternatives that minimize its climate impact (low GWP technologies).
This Project will contribute to the achievement of 2013 freeze and reach the planned accelerated HCFC consumption reduction targets of Bosnia and Herzegovina and to comply with the Montreal Protocol obligations up to 2020.

COMPANIES' AND SECTOR BACKGROUND

There are 6 currently operating manufacturing enterprises – small and medium size producers and assemblers of refrigeration commercial appliances using HCFC-141b in pre-blended Polyol as a foam blowing agent and HCFC-22 as refrigerant. These are the following enterprises included in a jont "Umbrella" project as listed billow:

- „ORDAGIC" D.O.O, Srebrenik;
- „SOKO-RKT" D.O.O, Mostar";
- „KUCA LEDA", Mostar";
- „EKO FRIGO", Banja Luka";
- „ELEKTRO FRIGO" Banja Luka and
- „FRIGOKLIMA" Banja Luka

These enterprises have a continues or by order generated production of refrigeration commercial appliances such as: cold chambers, cold stores, refrigeration trucs & cold chambers and small commercial equipment, such as cold shaw cases, cabinets and cupboards.
All of these enterprises were established before 2005 and they started production of refrigeration commercial appliences using of HCFCs before 2007; All of them are 100% BiH private ovned companies.

In the Table 42 billow are listed all relevant details on these enterprises and relevant contact data.

Table 425. Detailes on SMEs and enterprises' establishment data

Name of enterprise	*Address*	*Person in charge*	*Contact details*	*Year of establishment*	*Start year usingHCFCs*	*Products using HCFCs*
ORDAGIC d.o.o Srebrenik	9. Septembra 11 Srebrenik	Mr. Muhamed Ordagic, Director	Tel & Fax.: 387 35 643 440 E-mail: ordagicdoo@bih.net.ba	1996	2004	-cold stores, -cold chambers -cold shaw cases and cupboards -refr.insul.panels
SOKO-RKT D.O.O, Mostar	Rodoč bb, 88000 Mostar	Mr. Cavar Goran, Director	Tel: 387 36 321 146 Fax: 387 36 310 894 E-mail: projektiranje@soko-rkt.com	1963	2003	-cold stores, -cold chambers -cold shaw cases and cupboards -refr. insul.panels
KUCA LEDA Mostar	K.M.V. Humskog bb Mostar	Mr. Miroslav Nogulic,Director	Tel: 387 36 324 103 Fax: 387 36 324 103 E-mail: kucaleda@gmail.com	1981	2004	-cold stores, -cold chambers, -cold shaw cases and cupboards, -refr.insul.panels - cold trucks & - cold containers - refr. ins. panels
EKO FRIGO Banja Luka	Pave Radana 51 Banja Luka	Mr. Zoran Bugarski, Director	Tel: 387 51 323 182 Fax: 387 51 323 182 E-mail: frigouco@inecco.net	1997	2004	-cold stores, -cold chambers, -refriger. for low temperature -biomedical refr. -cold shaw cases and cupboards & -cold cabinets
ELEKTRO FRIGO Banja Luka	B. Potkonjak 15a Banja Luka	Mr. Nenad Djilit, Director	Tel: 387 51 466 166 Fax: 387 51 466 166 E-mail: elektrf@teol.net	2005	2005	-cold stores, -cold chambers, -cold shaw cases and cupboards & -cold cabinets
FRIGOKLIMA Banja Luka	Dunavska 12 Banja Luka	Mr. Sasa Kosic, Director	Tel: 387 51 300 417 Fax: 387 51 300 417 E-mail: frigoklima@teol.net	2005	2005	-cold stores, -cold chambers, -cold shaw cases and cupboards & -cold cabinet

The other consumers of the HCFC-141b in this refrigeration manufacture sub-sector are very small producers, mostly assemblers of air-condition equipment and cooling systems with a very limited quantity of manufactured commercial refrigeration appliences (cold shaw cases or small cold cabinets), with a very little consumption of HCFCs, usually less than 200 kg per annum.

Production Portfolio for 6 SMEs

Currently, these mentioned 6 SMEs cover the production of various commercial refrigeration appliances and some (3) of them produce also refrigeration insulation panels mostly used in their own production process for cold chambers and cold stores.

In the Tables 46 to 51 billow are shown the **Production profiles** for each of these 6 companies with annually production quantities of their basic products for the period 2005-2010 and forecasting of this production for 2011 and 2012.

Production profiles for 6 SMEs

Table 436. "ORDAGIC"

Product	*Quantity of annual production (units)*							
	Production for period 2005-2010						*Forecasting*	
	2005	*2006*	*2007*	*2008*	*2009*	*2010*	*2011*	*2012*
Cold food chambers and stores	38	44	86	72	66	63	60	60
Cold vertical shaw-cases	245	156	244	315	342	384	340	360
Cold cup-boards	180	185	190	210	290	234	240	230
Cold horisontal shaw-cases	90	95	98	102	112	96	90	90
Cold shaw-cases for milk products	50	52	60	63	44	54	50	50
Other refrig. units	32	35	40	44	28	43	40	40
Refrigeration insul. panels 4-10 cm tickness (m^2)	0	0	280	620	950	1080	1200	1500

Table 447. "SOKO-RKT"

Product	*Quantity of annual production (units)*							
	Production for period 2005-2010						*Forecasting*	
	2005	*2006*	*2007*	*2008*	*2009*	*2010*	*2011*	*2012*
Cold food chambers and stores (0^0C)	58	46	40	45	36	42	40	40
Cold food chambers and stores (-18^0C)	38	44	36	32	36	33	30	25
Cold vertical shaw-cases	645	456	240	225	142	284	220	200
Cold cup-boards	280	185	190	210	290	234	240	230
Cold horisontal shaw-cases	84	66	70	88	85	80	70	60
Freezers	120	186	220	144	125	108	100	90
Other refrig. units	54	46	55	36	40	46	40	40
Refrigeration insul. panels 4-12 cm tickness (m^2)	650	800	920	850	720	660	600	600

Table 458. "KUCA LEDA"

Product	*Quantity of annual production (units)*							
	Production for period 2005-2010						*Forecasting*	
	2005	*2006*	*2007*	*2008*	*2009*	*2010*	*2011*	*2012*
Cold shaw-cases (horizontal)	86	80	98	107	112	103	100	100
Cold cup-board (vertical)	90	94	84	97	90	81	85	70
Cold reach-in cabinets	33	62	88	83	94	92	80	80
Cold chambers	23	31	30	37	44	45	40	45
Refrigeration trucks and containers	22	34	65	86	98	92	100	120
Refrigeration panels (tickness 3-10 cm) –m^2	0	0	80	125	144	168	200	240

Table 469. **EKOFRIGO**

Product	*Quantity of annual production (units)*							
	Production for period 2005-2010						*Forecasting*	
	2005	*2006*	*2007*	*2008*	*2009*	*2010*	*2011*	*2012*
Cold shaw-cases (horizontal)	70	87	123	154	170	154	150	160
Cold cup-board (vertical)	56	80	109	168	160	143	150	150
Cold cup-boards	44	78	120	86	88	68	70	70
Cold chambers	12	43	44	48	50	65	65	70

Table 50. **ELEKTRO FRIGO**

Product	*Quantity of annual production (units)*							
	Production for period 2005-2010						*Forecasting*	
	2005	*2006*	*2007*	*2008*	*2009*	*2010*	*2011*	*2012*
Cold shaw-cases (horizontal)	50	88	103	150	140	128	140	140
Cold cup-board (vertical)	36	70	100	138	164	133	140	150
Cold cup-boards	28	48	87	98	70	54	60	70
Cold chambers	14	50	54	38	50	62	60	60

Table 51. **FRIGOKLIMA**

Product	*Quantity of annual production (units)*							
	Production for period 2005-2010						*Forecasting*	
	2005	*2006*	*2007*	*2008*	*2009*	*2010*	*2011*	*2012*
Cold shaw-cases (horizontal)	50	75	90	128	154	114	120	120
Cold cup-board (vertical)	56	74	96	120	143	140	140	150
Cold cup-boards	16	38	70	87	80	65	70	70
Cold chambers	0	0	26	44	32	50	50	50

CURRENT PROCESS DESCRIPTION AND CONSUMPTION OF HCFCs

Use of HCFC technology and annual consumption of HCFCs

In the manufacturing of refrigeration commercial appliances at the all of 6 SMEs are using the same HCFC technology as described billow:

- **HCFC-141b** as a blowing agent (purchased as mixed / pre-blended with Polyol) is used in production of polyurethane rigid insulation foam for small commercial appliances (by all of 6 SMEs) and / or in production of refrigeration insulation panels for installation of their own refrigeration facilities (cold chambers and cold food stores) of the enterprises "ORDAGIC", "SOKO-RKT" and "KUCA LEDA".

Foam imported components (Isocyanate and ready made pre-blended Polyol) all manufacturing companies are purchasing from local market (from domestic importers-trading companies) or some of them, like "ORDAGIC" and sometimes also "SOKO-RKT" were

indirectly imported from abroad, mostly (through Croatia) from the origin manufacturers and traders in China, and sometimes also from Hungary.
"POLIOLCHEM" company from Tuzla (Nort-East BiH) was the producer of Polyol and Polyol pre-blended system house (mixed with 30 % of HCFC-141b) and one of suppliers' for local manufacturing companies (including 6 SMEs manufacturers), but since 2010 they stopped their production of these chemicals, and all national needs for these substances are depending last years to the import from abroad.
In the Table 52 billow is shown overview of actual consumption of HCFC-141b by these 6 SMEs for the period 2005-2010 and forecasting of the consumption for 2011-2012.

- **HCFC-22** refrigerant is used by these companies for charging of refrigeration commercial appliances in the most of their products, due to low price of this substance at the World market (compared with refrigerants R-404a, 600a and other HFC blends). Commercial refrigeration appliances charged with this refrigerant are still very required in Bosnia and Herzegovina.

In the Table 52 billow is shown an actual consumption of HCFC-22 by these 6 SMEs in manufacturing and servicing activities for the period 2005-2010 and forecasting of the consumption for 2011-2012.

Table 52. Annual consumption of HCFC-141b (in pre-blended Polyol) in manufacturing activities at 6 SMEs

	Year	*Annual consumption of HCFC-141b pre-mixed in Polyol (M tones), by years*						
		ORDAGIC	*SOKO-RKT*	*KUCA LEDA*	*EKO FRIGO*	*ELEKTRO FRIGO*	*FRIGO KLIMA*	*Total 6 SMEs*
Actual consumption	2005	3.88	3.20	0.78	0.90	0.82	0.80	10.38
	2006	3.28	2.85	0.93	0.94	0.85	0.70	10.20
	2007	**4.19**	**3.91**	**1.20**	**1.28**	**1.17**	**1.05**	**12.80**
	2008	**5.35**	**4.22**	**1.32**	**1.26**	**1.19**	**1.06**	**14.40**
	2009	**4.74**	**3.93**	**1.30**	**1.15**	**0.96**	**0.92**	**13.00**
	2010	4.62	3.15	1.51	1.12	0.92	0.88	12.20
Average consumption (2007-2009)		**4.76**	**4.02**	**1.27**	**1.23**	**1.11**	**1.01**	**13.40**
Forecasting	2011	4.80	3.50	1.40	1.20	1.00	1.00	12.90
	2012	4.90	3.40	1.45	1.20	1.00	1.00	12.95

Table 53. Annual consumption of HCFC-22 at 6 SMEs

	Year	*Annual consumption (M tones), by years*												
		ORDAGIC		*SOKO-RKT*		*KUCA LEDA*		*EKO FRIGO*		*ELEKTRO FRIGO*		*FRIGO KLIMA*		*Total 6 SMEs (manuf.)*
		Man.	*Serv*	*Man.*	*Serv*	*Man*	*Serv*	*Man.*	*Serv*	*Man.*	*Serv*	*Man*	*Serv*	*Manuf.*
Actual consumption	2005	2.94	0.75	4.80	0.45	0.88	0.11	1.25	0.30	1.35	0.30	1.15	0.20	**13.80**
	2006	3.80	0.86	5.20	0.44	0.98	0.15	1.16	0.32	1.20	0.25	1.20	0.30	**14.80**
	2007	4.76	1.05	4.40	0.53	1.65	0.18	1.35	0.44	1.22	0.25	1.20	0.30	**14.58**
	2008	6.28	1.35	5.10	0.45	1.72	0.22	1.48	0.56	1.10	0.43	1.22	0.35	**16.90**
	2009	**5.89**	1.22	**4.12**	0.60	**1.41**	0.25	**1.32**	0.38	**1.20**	0.42	**1.32**	0.35	**15.26**
	2010	**5.20**	1.15	**3.80**	0.56	**1.35**	0.20	**1.25**	0.40	**1.24**	0.30	**1.06**	0.32	**13.90**
Base-line consumption in manufacturing (average for 2009-2010)		**5.55**		**3.96**		**1.38**		**1.29**		**1.22**		**1.19**		**14.58**
Forecasting	2011	4.20		3.60		1.10		1.30		1.22		1.25		**11.90**
	2012	3.80		3.20		0.98		1.30		1.26		1.20		**10.76**

Summary consumption of HCFCs in commercial refrigeration sub-sector

In the Table 54 billow are shown the summary quantities of HCFCs consumption by the main manufacturers of refrigeration appliances in this Commercial Refrigeration sub-sector of Bosnia and Herzegovina.

Table 54. Summary HCFCs consumption of at 6 SMEs, by years

Substance		*Consumption of substances, by years (M tone /ODP t)*							
		Period 2005-2010						Forecasting 2011-2012	
		2005	*2006*	***2007***	***2008***	***2009***	***2010***	***2011***	***2012***
HCFC-22									
In manufacture		13.80	14.80	14.58	16.90	**15.26**	**13.90**	11.90	10.76
In servicing		2.11	2.32	2.75	3.36	3.22	2.93		
HCFC-141b *(in pre-blended Polyol)*		10.38	10.20	**12.80**	**14.40**	**13.00**	12.20	12.90	12.95
Total HCFCs in manufacturing		**24.18**	**25.00**	**27.38**	**31.30**	**28.26**	**26.10**	22.80	23.71
Average consumption in manufacturing (in M t / ODP t)	**HCFC-22 (base-line 2009-2010)**					**14.58 / 0.802**			
	HCFC-141b (average 2007-2010			**13.40 / 1.474**					
	Grand total Starting point for 6 SMEs	**27.98 / 2.276**							

Production equipment used in HCFC manufacturing technologies

In the Table 55 billow is specified the equipment used in production process of insulation foam and commercial refrigeration appliances at 6 SMEs.

Table 55. Production equipment used in 6 SMEs-manufacturers of commercial refrigeration appliances

Item	Description	Production equipment used by the enterprises in refrigeration and foam production					
		ORDAGIC	SOKO-RKT	KUCA LEDA	EKO FRIGO	ELEKTRO FRIGO	FRIGOKLIMA
1	Foaming machine	High pressure Model: - RC-30-GE, GUSMER, Spain	High pressure Models: -ED-2-50DS (1set) -ED-2-90DS (1set) Group-PEROS, Italy	Foam spraying machine, Model: SOLTEC IP/25, TEC MAC Italy	Hand-pouring foam	Hand-pouring foam	Hand-pouring foam
2	Moulds and plugs for foaming	SAIP, Italy	6 -sets own construction	2 sets-own construction			
3	Refrigerant charging machine	Models 1001 and 5001, Ariazone, FYRM	2pcs-Canon, Italy	KENOMAC Model GPP, Italy	Models 1001 and 5001, Ariazone, FYRM	Canon, Italy	Model 1001 Ariazone, FYRM
4	Vacuum pump	A-101 Ariazone, FYRM	2 Pcs-Canon, Italy	A-101 Ariazone, FYRM	A-101 Ariazone, FYRM		
5	Leak detector	Italy					

NOTE: Equipment marked in blue is the equipment granted by MLF through the NOPP programme for Bosnia and Herzegovina and implemented CFCs conversion to HCFCs projects (implemented during the period 2002-2004)

SELECTION OF CONVERSION TECHNOLOGY

In the table 54 billow are shown possible alternatives for conversion of HCFC-141b blowing agent in the production of polyurethane rigid insulation foam in commercial refrigeration appliances and small refrigeration insulation panels.

Table 56: Alternatives for conversion of HCFC-141b in rigid foam production technology in commercial refrigeration sub-sector

Technology	ODP	GWP	Flammability	Thermical conductivity (mW/m.K) (25°C)	Boiling point (°C)	Cost of blowing agent	Capital cost
HCFC-141b	0.11	713	No	9.7	31.9	Medium	Low
Methyl formate	**0**	**< 20**	**No**	**10.7**	**31.5**	**Medium**	**Low**
Cyclopentane	0	< 25	Yes	13.0 (10°C	28.0	Medium	High
HFC-365mfc	0	794	No	10.6	40.2	High	Low

To implement the project **"UMBRELLA project for 6 SMEs"** – the conversion from HCFC-141b to Methyl formate (ecomate®) blowing agent for production of rigid polyurethane foam and refrigerant HCFC-22 to HFC-134a and HFC blends in 6 SMEs-manufacturers of refrigeration commercial appliances were chosen as the most convenient option of the technology with much advantage comparing with the others possible technologies (for use of Cyclo-pentane or HCFC-365mfc) to eliminate the use of these HCFCs based on:

- Conversion of HCFC-141b to Methyl formate blowing agent is a definite technology by counting with zero ODP and low GWP, and low capital cost which meets the guidelines of Decision XIX/6 and Executive Committee of the Multilateral Fund recommendations;
- It is a proven technology widely used in this sub-sector;
- It is the standard for the rigid polyurethane foam sector in the world and in the region is the selected alternative to eliminate the use of HCFC-141b in production of polyurethane rigid insulation foam in small and medium size manufacturing enterprises;
- Low Incremental Capital Cost (ICC) and medium cost of Methyl formate blowing agent and relatively medium Incremental Operating Cost;
- Due to no- flammability of this agent, there is no need to take any special security measures for installed equipment and plants installed facilities.

This technology has been tested with good success, mainly in the commercial refrigeration manufacturing sub-sector and production rigid polyurethane foam in small and medium size commercial refrigeration manufactures.

PROJECT COSTS

Cost Effectiveness calculation

In accordance with Decision 60/44, the value of cost-effectiveness applicable to the phase-out of HCFC-141b in insulations of rigid polyurethane foam production is up to maximum **threshold value of USD 9.79/kg.**

This conclusion and taking into consideration that in this Project for "6 SMEs" was selected low Global Warming Potential (GWP) blowing agent (CO_2 + water) as an alternative for currently used HCFC-22 refrigerant and given **threshold for HCFC-22 phase-out in the value of US$ 15.21 /kg** which is part of the Guidelines for preparation of HPMPs /**The GUIDE For Preparation of HPMPs, MLF Secretariat, July 2010 -**Eligible incremental costs of HCFC phase-out projects (decisions 60/44(f), 61/47)/

Incremental Capital Cost (ICC)

The Incremental Capital Cost (ICC) for this project is estimated to the maximal amount of **US$ 352,948** which includes 10% contingency.
The details of a distribution of this amount to cover necessary costs for supply and installation of the investment equipment for this Project can be found in Annex 1 of the Project Document.

The total requesting amount for MLF Grant for ICC of this Project is calculated using the maximum of thresholds for HCFCs phase out as follows:

- **USD 9.79/metric kg** for HCFC-141b (blended in Polyol) phase-out (Starting point of consumption: **average consummation for 2007-2009**) and
- **US$ 15.21/metric kg** for HCFC-22 phase-out (Starting point of consumption: ***bas-line*-average consumption 2009-2010**)

In accordance with the surveyed data on HCFCs consumption at "6 SMEs" (see Table 11 above) amounting for:

- phase-out of **13.40 metric tone of HCFC-141b** and
- phase-out of **14.58 metric tone of HCFC-22,**

as well taking into consideration the above used thresholds, the allowed ICC for this Project can be calculated as follows:

13.40 x 9.79 + 14.58 x 15.21=131,186 + 221,762 = <u>US$ 352.948</u>

In the Table 55 billow is specified all necessary investment equipment and services for the Project with estimated cost eligible for an assistance of the Multilateral Fund.

Table 57. Calculation of Incremental Capital Cost –investment equipment and services

Item	*Description of equipment, accessories and other services to be supplied by international and local contractors*	*Number of units / sets*	*Estimated unit price (US$)*	*Estimated cost to be covered by the MLF support (US$)*
1	Retrofitting of foaming machine, capacity of foam pouring: 50-60 kg/min with premixing unit, control panel with programmable foam pouring controller and accessories	2	53,000	106,000
2	Retrofitting of spray foaming machine, capacity of foam pouring: 25-30 kg/min	1	40,000	40,000
3	Mobile multifunctional automatic unit for recovery, evacuation and charging, operating with HFC-134a and HFC blends refrigerants (unit on wheels)	6	5,000	30,000
4	Hand set of recovery & charging machines for refrigerants HFC-134a and HFC blends refrigerants	6	1,600	9,600
5	Vacuum pump	12	500	6,000
6	Set of valves and hoses, suitable for HFC-134a and HFC blends	24	300	7,200
7	Electronic balance (weighing machine)	6	600	3,600
8	Recovery cylinders for HFCs and blends	18	200	3,600
9	Digital vacuum gauge	6	400	2,400
10	Refrigerants electronic identifiers (to identify and check HCFCs, HFCs and HFC blends supply)	6	1,500	9,000
11	Electronic leakage detector	12	500	6,000
12	Electronic balance (weighing machine)	6	300	1,800
13	Redesign of molding tools and start-up materials for commercial refrigeration insulation foam applications in 3 SMS manufacturers	lump-sum		45,000
14	Transport of equipment to site location, assembling, commissioning, technology transfer and on-job training for 6 SMEs	lump-sum		50,000
	Sub-total			**320,200**
	Contingency (10%)			**32,020**
	TOTAL			**352,220**

Incremental Operational Cost

The Incremental Operational Cost (IOC) for the whole Project for 6 SMEs is estimated with taking into consideration of the following assumptions:

- Recommendations of the MLF Secretariat Guide for HPMPs preparation and IOC for projects in the Commercial Refrigeration Sub-sector at the value of US$ 3.80 / metric kg of HCFCs consumption to be phase-out at the 6 SMEs-manufacturing enterprises;

In this line, the IOC for this project, with totally 27,980 kg of HCFCs (13.400 kg of HCFC-141b and 14,580 kg of HCFC-22) to be phase-out is estimated to total value (27,730 M kg x 3.8 $/kg = US$ 102,600) of **US$ 106,324.**

Multilateral Fund Grant

Resources requested to the Multilateral Fund are up to the maximum threshold values used in calculation of the Investment Capital Costs for this project.

The total requesting amount for MLF Grant for this project is in the value up to **US$ 352,220,** having into consideration the total estimated ICC of the Project (see Table 56 billow).

The BiH's Government has provided a formal letter of endorsement to the project included in the submitted HPMP BiH Project Document for consideration at the 66 Meeting of the Execution Committee of the Multilateral Fund.

MONITORING DESCRIPTION FOR PROJECT IMPLEMENTATION

The project will be implemented by UNIDO with the support and closed cooperation of the National Ozone Unit - Ministry of Foreign Trade and Economic Relations of Bosnia and Herzegovina.
The project's implementation schedule is shown in the Table 55 billow.

Project implementation plan

Activity Description	Project implementation period (in months)											
	2	4	6	8	10	12	14	16	18	20	22	24
Project approval												
Signature of project document												
Specifications for Capital equipment												
Procurement of equipment												
Installation of equipment and												
Training												
Testing production with no HCFCs												
Project Taking-over												
Project closure												

APPENDIX 2:

ESTIMATED COST OF THE HPMP-STAGE 1 IMPLEMENTATION

HPMP-Stage 1 (2012-2020)

Table 478. Estimation of the cost for the implementation of the HPMP-Stage 1 covering MLF Grant (taking into consideration HPMP Guidelines – funding up to 2020)

Activity/ Project	*Proposed period for implementation*	*Estimated Cost (US$)*
HCFC-phase-out investment projects and conversion interventions		
Project 1: Conversion of HCFC-141b to non-HCFC technology (using n-pentane as blowing agent) in the foam manufacturing industry "ALTERNATIVA" Hrasnica, Sarajevo	2012-2014	**398,090**
Project 2: "UMBRELLA" project for conversion of R-141b to Methyl formate blowing agent and HCFC-22 to HFCs and HCFC blends in 6 SMS refrigeration manufactories	2012-2015	**352,220**
Total Investment projects		***750,310***
Policy and Legislation		
Establishment Legislative Acts and HCFC Phase-out Policy	2012-2013	20,000
Sub-total Policy and Legislation		***20,000***
Training activities and certifications		
Project: (2) Training workshops for custom officers, custom clearance and meritime agences & HCFC importers	2013-2016	40,000
Project: Training workshops and certifiction for service technicians and mechanics	2013	50,000
Project: Training workshops for custom officers, custom clearance and meritime agences & importers	2020	20,000
Project: Training workshops and certification of refrigeration service technicians and mechanics	2016-2017	40,000
Project: Certification of refrigeration service workshops	2016-2017	20,000
Support of education and training activities in vocational scools and at the universities	2016-2020	30,000
Sub-total Trainings		***200,000***
Awareness raising		
Promotion activities-seminars	2014-2018	
Establisment and support of activities of a Refrigeration & Air-condition Assiciation (RAA)	2012-2013	
Technical seminars and workshops	2013-2015	
Establish Code of Good Practice in Refrigeration and Air–condition Sectors	2013	
Promotion activities on Radio, TV and written media	2014-2020	
Establishment of NOU Web site	2012	
Sub-total Awareness raising		***Lump sum: 60,000***
Total non-investment activities		**280.000**
GRAND TOTAL Stage 1		**1,030,310**

APPENDIX 3:

ESTIMATED COST OF THE HPMP-STAGE 2 IMPLEMENTATION

HPMP-STAGE 2 (2021-2030)

Table 489. Frame estimation of the cost for the implementation of the HPMP-Stage 2

Activity/ Project	*Proposed period for implementation*	*Estimated Cost (US$)*
Policy and non-investment activities		
Awareness raising		
Promotion seminars for HCFCs end users	2021	
Publishing brochures and pamphlets	2021-2022	
Promotion activities on Radio, TV & written media	2022-2030	
Sub-total for Awareness raising		***60,000***
Other interventions and Legislative measures		
Set-up a regulations for re-usable refrigerant cylinders	Up-to: June 2021	
Ban of import of equipment containing HCFCs	Up-to: January 2022	
Ban of import non-refillable HCFCs containers	Up-to: January 2022	
Sub-total Other interventions and measures		***40,000***
***Project*: Development of Recovering / Recycling schema**	2021-2022	160,000
Sub-total Recovering / Recycling schema		***160,000***
GRAND TOTAL COSTS -STAGE 2		**260,000**

APPENDIX 4:

SUMMARY OF ESTIMATED COST FOR THE IMPLEMENTATION OF STAGE 1 AND STAGE 2 OF THE HPMP OF BOSNIA AND HERZEGOVINA

and

FRAMEWORK PLAN FOR ANNUAL FUNDINGS OF THE IMPLEMENTATION ACTIVITIES –FOR OF THE HPMP - Stage 1

Table 60. Estimated Cost of the HPMP implementation

HPMP-Stage	Estimated Cost (US$)	Period of implementation
Stage 1	**1,030,310**	**2012-2020**
Stage 2 (frame estimation)	**260,000**	**2021-2030**
GRAND TOTAL	**1,290,310**	**2012-2030**

Plan for annual funding of activities of the implementation of HPMP-Stage 1

Table 49. Estimated Cost by years for funding of the implementation of HPMP –Stage 1

Year	*Total Cost for funding (US$)*	*Investment Capital and Operational Cost (US$)*	*Operational non-Investment Cost (US$)*
2012	**506,000**	450,000	56,000
2013	**255,000**	210,000	45,000
2014	**118,310**	90.310	28,000
2015	**30,000**	0	30,000
2016	**31,000**	0	31,000
2017	**29,000**	0	29,000
2018	**24,000**	0	24,000
2019	**14,000**	0	14,000
2020	**23,000**	0	23,000
Total	**1,030,310**	**750,310**	**280,000**