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**TECHNICAL SEMINAR ON ASPECTS OF
GREENHOUSE GAS EMISSIONS IN
KAZAKHSTAN**

22-24 FEBRUARY, 1999

ALMATY, REPUBLIC OF KAZAKHSTAN

**ТЕХНИЧЕСКИЙ СЕМИНАР ПО ВОПРОСАМ
ВЫБРОСОВ ПАРНИКОВЫХ ГАЗОВ В
РЕСПУБЛИКЕ КАЗАХСТАН**

22-24 ФЕВРАЛЯ 1999 Г.

Г. АЛМАТЫ, РЕСПУБЛИКА КАЗАХСТАН

Состояние исследований по оценке и прогнозированию выбросов парниковых газов в Казахстане

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Исследования по оценке и прогнозированию выбросов парниковых газов в Казахстане с 1994 года проводятся в лаборатории исследования изменений климата КазНИИМОСК в рамках программы US Country Studies и при поддержке USAID. В результате выполненной работы были получены следующие результаты:

- составлен национальный кадастр выбросов и поглотителей ПГ за 1990 г. в соответствии с принятой методологией, разработанной Межправительственной группой экспертов по изменению климата (МГЭИК);

- рассчитаны прогнозы эмиссий парниковых газов на период до 2020 года для базового сценария и по сценариям, учитывающим проведение мероприятий, приводящих к сокращению выбросов ПГ в секторе производства энергии.

В последнее время произведено также уточнение инвентаризации за 1990 и рассчитаны выбросы за 1994 год по уточненной методологии. Также уточнены прогнозы выбросов по базовому сценарию с учетом обновленной стратегии развития энергетики Казахстана.

По результатам уточненной инвентаризации нетто-эмиссии всех парниковых газов в Казахстане (с учетом поглощения) в 1990 году составили около 266 млн т CO_2 -эквивалента, а в 1994 году – около 213 млн т CO_2 -эквивалента. Таким образом, общие эмиссии ПГ в Казахстане за этот период сократились более чем на 20 % базового уровня. В 1990 году эмиссии ПГ в Казахстане составили более 15 т на душу населения, из них около 13 т составляет CO_2 . Инвентаризация выбросов ПГ за 1990 и 1994 годы может быть уточнена с учетом дополнительных данных о потребленном топливе и обновленной методологии МГЭИК. При этом сжигание топлива в Казахстане привело к общей эмиссии диоксида углерода, равной 226 млн т, и 178 млн т в 1990 и в 1994 годах, соответственно. Энергетика является основным источником выбросов CO_2 , которые составляют почти половину всех эмиссий от сжигания ископаемого топлива, и в абсолютном выражении в 1990 году достигали 93 млн т, в 1994 году – 74 млн т.

Были построены три варианта базового прогноза выбросов CO_2 : прогноз, построенный методом экспертных оценок; прогноз, основанный на использовании прогноза потребления основных типов топлива в Казахстане до 2010 г., данный в научно-исследовательском институте экономики и рыночных отношений (НИИЭРО) (в настоящее время - Институт экономических исследований), и методики МГЭИК по расчету эмиссий CO_2 ; и прогноз, основанный на результатах расчета с использованием модели энергетического планирования ENPER, разработанной Аргоннской

национальной лабораторией США по заказу МАГАТЭ. С ее помощью также были произведены оценки вариантов сокращения выбросов ПГ.

Как показал анализ результатов моделирования, снижение эмиссий CO_2 к 1998 году по базовому сценарию составит около 40 % от уровня 1990 года. Прогноз выбросов CO_2 показывает, что в случае, если никаких мер по сокращению предприниматься не будет, эмиссии достигнут уровня 1990 года к 2011 году, и превысят этот уровень на 37 % к 2020 году. Модернизация ТЭЦ может сократить до 1,609 млн т эмиссий CO_2 в 2000 году и около 2,330 млн т - в 2020, что составляет около 2 % уровня базового сценария ежегодно. Потенциал сценариев "ГЭС" (развитие малой гидроэнергетики) и ВЭС (развитие ветроэнергетики) равен 0,2 и 2,6 % в 2000 и 2020 годах, соответственно. Общий ежегодный потенциал всех мер сокращения по интегрированному сценарию равен 2,9 % в 2000 году и 11,1 % - в 2020.

Максимально возможное, накопленное за период с 2000 по 2020 год, снижение выбросов CO_2 за счет реализации всех рассмотренных мероприятий в секторе производства энергии, составляет около 158 млн тонн. По модельным оценкам расходы на проведение всех мероприятий около 5 млрд долларов США. При этом ввод малых ГЭС и модернизация ТЭЦ являются наиболее эффективными в стоимостном отношении и наиболее осуществимыми мерами. Развитие атомной энергетики - наиболее дорогостоящая мера, но она имеет наибольший потенциал сокращения эмиссий CO_2 . Оценка стоимости сокращения выбросов проведенная с помощью модели носит скорее качественный характер, и служит на данном этапе лишь для сравнения различных вариантов сокращения.

Основными дальнейшими направлениями работы по совершенствованию базовых сценариев выбросов CO_2 являются уточнение прогнозов развития экономики в целом и ключевых отраслей, ответственных за большую часть выбросов ПГ, совершенствование уровня моделирования энергосектора путем дальнейшей деагрегации.

В области оценки сценариев сокращения выбросов следующим шагом будет углубленная оценка мер и технологий, относящихся к энергосбережению и увеличению доли природного газа в энергобалансе и более точная количественная оценка стоимости единицы сокращения ПГ.

State of Research in Assessment and Forecasting of the Greenhouse Gases Emissions in Kazakhstan

Speaker: O.V. Pilifosova - Head of Laboratory for the Climate Change Research,
KazNIIMOSK

Second Speaker: D.Yu. Danchuk - Official of the KazNIIMOSK

Since 1994 the studies in assessment and forecasting of the greenhouse gases (GHG) emissions in Kazakhstan are being carried out in the Laboratory for the Climate Change Research of the KazNIIMOSK in the framework of the US Country Studies Program and with the support of the USAID. In consequence of the work performed the following results have been obtained:

- the national cadastre of the GHG emissions and absorbents has been compiled for 1990 in conformity with the adopted methodology developed by the Intergovernmental Climate Change Experts Group (ICCEG);
- the greenhouse emissions forecasts have been calculated for the period up to 2020 for the base scenario and by the scenarios considering realization of the actions causing the reduction of the GHG emissions in the power generation sector.

In recent years the inventory over 1990 has been made and the emissions over 1994 have been calculated according to the refined methodology. Along with it the emissions forecasts were refined by the base scenario considering the improved strategy for development of the power sector in Kazakhstan.

According to the results of the refined inventory, the net emissions of all greenhouse gases in Kazakhstan (with allowance made for the absorption) account for about 266 mln t of CO₂-equivalent, and in 1994 they amount to about 213 mln. t of CO₂-equivalent. Hence the total GHG emissions in Kazakhstan over this period were reduced more than by 20% of the base level. In 1990 the GHG emissions in Kazakhstan came to more than 15 t per capita, and among this amount CO₂ makes up about 13 t. The GHG emissions inventory over 1990 and 1994 may be refined taking into consideration supplementary data concerning the fuels consumed and the refined ICCEG methodology. Therewith the fuel combustion in Kazakhstan caused the total carbon dioxide emissions equal to 226 mln.t and 178 mln.t in 1990 and 1994 respectively. The power sector is the main source of CO₂ emissions from the fossil fuels combustion, and in absolute terms, in 1990 they reached 93 mln. t, in 1994 - 74 mln.t.

Three versions of the base CO₂ emissions forecasts were developed: the forecast made up by the method of expert assessments; the forecast based on the prediction of consumption of the main fuel types in Kazakhstan up to 2010 presented by The Research Institute for Economics and Market Relations (RIEMR) (at present - The Institute of Economic Research) and the ICCEG procedure for the CO₂ emissions calculation; and the forecast based on the results of computation using the ENPEP power planning model developed by the US Argonne National Laboratory to order of the IAEA. By application of this model the versions of reducing the GHG emissions were also assessed

The analysis of the modeling results has shown that reduction in the CO₂ emissions by 1998 under the base scenario will amount to about 40% of the 1990 level. The CO₂ emissions forecast indicates that in case when no actions be undertaken as to their reduction the emissions will reach the level of 1990 by 2011, and they will exceed this level by 37% in 2020. Modernization of the heating and power plants (HPPs) may reduce the CO₂ emissions by 1.609 mln. t in 2000 and about 2.330 mln. t - in 2020, which amount for about 2% of the base scenario level yearly. The potential of the «HEP» scenarios (development of small hydroelectric plants) and the WPS (development of the wind-power stations) is equal to 0.2 and 2.6% in 2000 and 2020 respectively. The aggregate annual potential of all measures for the emissions reduction by the integrated scenario is equal to 2.9% in 2000 and 11.1% in 2020.

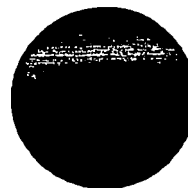
The maximum possible, accumulated over the period from 2000 to 2020, reduction of the CO₂ emissions due to realization of all discussed actions in the sector of the energy generation comes to about 158 mln. tons. According to the model estimates the expenses on putting the planned measures into effect total about \$5 billion. Therewith the commissioning of the small HEPs and modernization of the HPPs are considered as more effective in respect of the costs and as the most practicable actions. Development of the nuclear power is the most expensive action, but it has the greatest potential in the CO₂ emissions reduction. Assessment of the costs connected with the emissions reduction made by using the model is rather of the qualitative nature and, as for now, serves only for comparing diverse versions of the emission reductions.

The main further trends of activities in improving the base scenarios for the CO₂ emissions are as follows: the refining of the forecasts for development of the economy as a whole and also of the key industries responsible for the most part of the GHG emissions, the improving of the modeling level of the power sector through the subsequent disaggregation.

In the area of assessment of the emissions reduction scenarios the following step of activities will involve a fundamental estimation of the measures and technologies dealing with the energy saving and with increase of the natural gas share in the energy balance, and more precise quantitative assessment of the cost of unit of the GHG reduction.

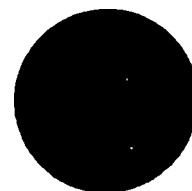
U.S. Greenhouse Gas Emissions Inventory and Projections

Stephanie Benkovic
United States Environmental
Protection Agency



Part I: Emission Estimates

Emission Factor * Activity Level

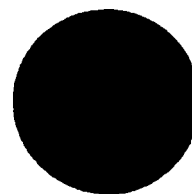


Range of Options for Emission Estimates under IPCC

- Lowest Tier -- default emission factors
- Higher Tiers -- (significantly more accurate)
 - direct measurements, when possible, and
 - disaggregated, specific emissions factors

Key Sources of U.S. CO₂ Emissions/Sequestration

- Fossil fuel combustion (99%) for:
 - energy, heating, industry, transport, industrial processes
- Cement and Lime Manufacture
- Other Industrial Processes
- Land Use Change and Forestry

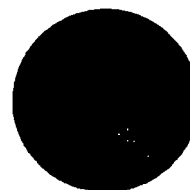


Non-CO₂ Emissions Can Be Estimated Accurately

- CH₄ from Underground Coal Mining: use mine-specific ventilation and recovery measurements (accuracy < ±10%)
- CH₄ from Enteric Fermentation: use country or state-specific emissions factors specific to cattle type and age (accuracy < ±20%)
- N₂O from Adipic Acid Production: use plant specific measurements or monitoring (accuracy < ±5%)
- CH₄ and N₂O from agricultural soils, natural gas systems, and rice cultivation need work to improve methods

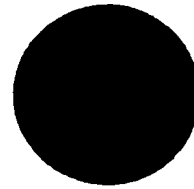
Key Sources of U.S. Methane (CH₄) Emissions

- Landfills -33%
- Domesticated Livestock (Enteric Fermentation) - 19%
- Natural Gas and Oil Systems - 19%
- Coal Mining - 17%
- Livestock Manure - 9%
- Other - 1%



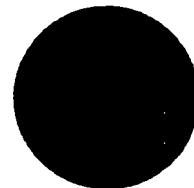
Key Sources of U.S. Nitrous Oxide (N₂O) Emissions

- Agricultural Soil Management - 68%
- Fossil Fuel Combustion - 18%
- Adipic Acid Production - 5%
- Nitric Acid Production - 4%
- Manure Management - 3%
- Other Sources - 2%



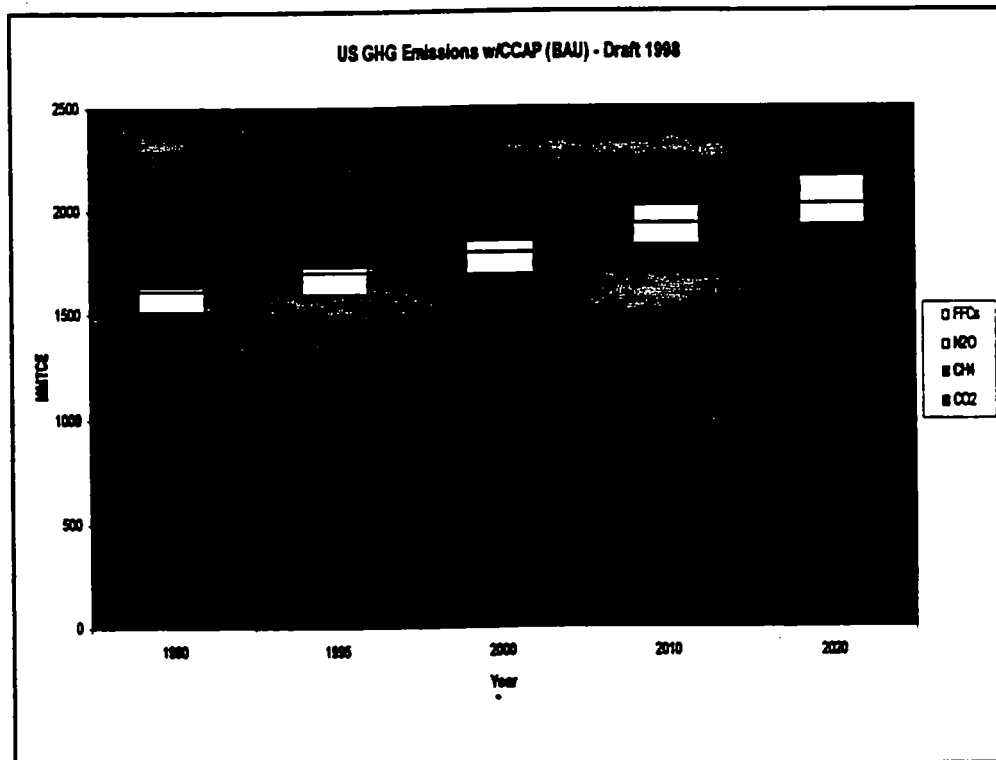
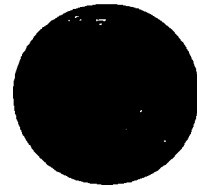
N₂O From Agricultural Soils

- IPCC Expert Panel to revise Guidelines (USDA/USEPA):
 - Involved top researchers in field
 - Surveyed latest available literature
 - Created methodologies for additional sources
 - US 1990 estimate rose from 17 to 62 MMTCE
- Future Improvements:
 - Other sources? Irrigation, drainage
 - More study of indirect emissions
 - Measurements/sampling

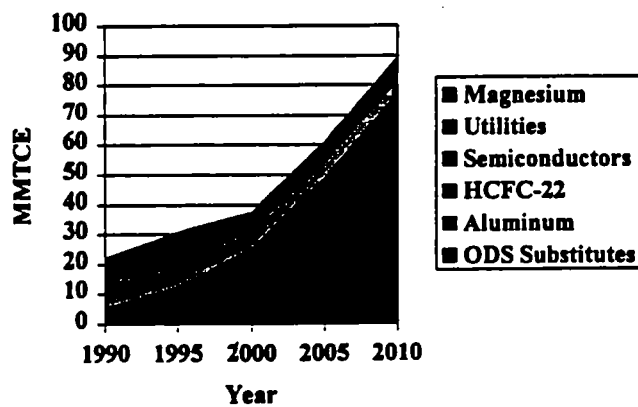


US GHG Emission Projections

- Projections assume that Climate Change Action Plan (CCAP) program funding will be proportional to 1993 funding levels.
- CO₂ projections are gross emissions - no conclusive decision on measurement of changes in carbon stocks/carbon sequestration

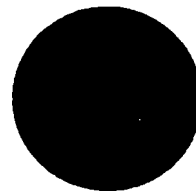


Fully Fluorinated Compounds US Emissions Trends (by source)



100 Year Global Warming Potentials (illustrative list)

- Methane 21
- Nitrous Oxide 310
- HFC-23 11,700
- CF_4 6,500
- C_2F_6 9,200
- SF_6 23,900



МАКРОЭКОНОМИЧЕСКИЕ СЦЕНАРИИ РАЗВИТИЯ КАЗАХСТАНСКОЙ ЭКОНОМИКИ НА ПЕРСПЕКТИВУ

К настоящему моменту можно констатировать, что Республика Казахстан вышла на новый этап своего экономического развития.

Основанием для этого служит то, что основные задачи макроэкономической политики 1998 года, несмотря на финансовый кризис в странах Юго-Восточной Азии, России и ряде других стран, практически реализованы. В результате последовательно проводимой в течение 1996-1998 г.г. жесткой монетарной политики, доминантой которой были снижение уровня инфляции и поддержание низкого бюджетного дефицита, в республике удалось достичь макроэкономической стабилизации, что расценивается как создание реальных предпосылок для оживления реального сектора экономики.

С другой стороны, резкое ухудшение мировой конъюнктуры в связи с финансовым кризисом в странах Юго-Восточной Азии и Российской Федерации серьезно осложнило экономическую ситуацию в Казахстане, привело к существенным потерям из-за снижения мировых цен на группу товаров, которые составляют основу казахстанского экспорта. Согласно данным и предварительной оценке Нацстатгентства РК объем реального ВВП в 1998 году снизился по сравнению с 1997 годом на 2,5%.

В целом макроэкономические показатели развития экономики республики которые приведены в таблице 1.

Таблица 1

Динамика основных макроэкономических показателей
функционирования казахстанской экономики в 1996 - 1998 годах

	1996 г.	1997 г.	1998 г.			
			I	II	III	За год
ВВП в текущих ценах, млрд. тенге	1415,7	1679,6	402,8	419,9	448,4	1744,7
ВВП в % к соответствующему периоду предыдущего года	100,5	102,0	101,9	99,5- 100,6	98,0 - 98,5	93,3- 97,5

При этом в структуре ВВП произошли некоторые изменения в худшую сторону. В течении этого года в структуре ВВП последовательно снижается доля производства товаров - 34-35% против 37,9% в 1997 г. Доля промышленности составит - 23-24% против 21,4%, сельского хозяйства - менее 9% против 11,5%. Одновременно, доля производства услуг возрастет с 55,9% до 65-66%, доля чистых налогов осталась на уровне 5-6%.

Такая структура близка к структуре ВВП многих развитых стран. Это можно было бы рассматривать как успех экономической политики последних

лет, если бы он не был достигнут за счет продолжающегося спада производства в реальном секторе экономики.

Поэтому не достигнута основная цель правительственной программы - прекращение спада производства и начало оживления экономики.

На развитие казахстанской экономики в 1999 и последующих годах будет продолжать оказывать сильное влияние ряд внешних и внутренних факторов, действие которых могут предоставить потенциальную угрозу для экономической безопасности Республики Казахстан. Наиболее важными из них являются:

Сохранение курса проводимой макроэкономической политики, которая направлена на удержание уровня инфляции до нескольких процентов в год и дефицита государственного бюджета в пределах, соответствующих среднемировым стандартам, обеспечение стабильности обменного курса тенге даже в ущерб золотовалютным резервам. Такая политика не учитывает состояние реального сектора экономики, не удовлетворяет требованиям защиты отечественного производителя. Продолжение жесткой финансовой и денежно-кредитной политики ведет к дальнейшему обострению платежного кризиса в республике и в немалой степени способствует спаду производства в реальном секторе экономики.

Снижение мировых цен на группу товаров, которые составляли основу казахстанского экспорта, привело к сокращению экспортных поставок Казахстана. Даже при увеличении или более медленном спаде физических объемов экспорта, экспортоориентированные отрасли промышленности испытывают последствия кризиса, несут убытки из-за сужения рынков сбыта и снижения мировых цен, резко снизилась рентабельность производства экспортоориентированного сектора.

Девальвация валют в ряде стран (в первую очередь в России) при сохранении относительной стабильности тенге за счет сокращения золотовалютного резерва ведет к росту импорта в Казахстан, ухудшает положение внутреннего товаропроизводителя за счет дальнейшего роста конкуренции на внутреннем рынке с импортируемыми товарами.

Рост государственных расходов по обслуживанию внешнего долга страны. Эта проблема усугубляется тем, что не только растут затраты на обслуживание внешнего государственного долга в связи с выплатой основного долга, но и уменьшается экспортный потенциал страны из-за неблагоприятной конъюнктуры мирового рынка.

Социально-экономическое развитие Республики Казахстан в 1999-2003 годах рассматривается в рамках двух наиболее вероятных сценариях, которые направлены на преодоление кризисного состояния экономики республики, создание реальных предпосылок для ее оживления и вывода на траекторию устойчивого роста, что предусмотрено Стратегией развития страны «Казахстан – 2030».

Первый сценарий не предполагает кардинальных изменений в проводимой экономической политике. Это наглядно видно из проектов Индикативного плана на 1999 год и Государственного бюджета на следующий год. Исходя из этих предпосылок были проведены расчеты по оценке условий экономического роста при заданных параметрах денежно-кредитной и бюджетно-налоговой политики на 1998-1999 г.г.

Таблица 2

Расчетные темпы роста ВВП на 1999 год

	1996 год	1997 год	1998 год	1999 год
1	2	3	4	5
ВВП в текущих ценах	1419.90	1679.60	1747,7	1950
Государственные расходы	264.90	318.50	407.00	472,2
Инвестиции – всего,	119.00	115.00	170.00	186,0
в т.ч. государственные	9.50	19.70	25.00	27,9
Государственные расходы и инвестиции.	374.40	413.80	551,8	630,0
Сумма налоговых поступление.	132.90	203.80	276,6	328,4
Норма инвестирования	0.084	0.068	0.09	0,07
Удельный вес налогов в ВВП.	0.094	0.121	0.122	0,155
Мультипликатор инвестиций	3.792	4.059	3.23	3,09
Относительный дефицит бюджета	0.093	0.068	0.073	0,074
Уровень инфляции	0.287	0.138	0.07	0,095
Инфляционный потенциал	0.550	0.280	0.18	0,18
Пороговая инфляция	0.401	0.212	0.072	0,098
Расчетные темпы прироста ВВП	-0.096	-0.053	-0.09	-0,04

В этом случае, как видно из таблицы 2, в 1999 году в лучшем случае наиболее вероятен экономический спад до 4%. В этом случае можно предположить, что экономического роста не будет и Республика Казахстан выходит на траекторию стагнации экономики.

Для разрешения этой ситуации необходимо же сейчас пересмотреть подходы к формированию макроэкономической политики в сторону увеличения совокупного спроса.

Второй сценарий в этой связи предполагает кардинальное разрешение проблемы неплатежей, в том числе путем **дополнительной денежной эмиссии девальвации национальной валюты**, чтобы ликвидировать демонетизацию экономики, привести уровень развития денежного хозяйства в соответствие с потребностями реального сектора экономики.

Денежная эмиссия и другие экстренные меры должны быть дополнены одновременно с нетарифными мерами по защите отечественных товаропроизводителей.

По этому сценарию можно ожидать, что до середины 1999 года экономический спад продолжится, а после расшивки неплатежей возможно снижение темпов экономического спада и, даже, незначительный экономический рост к началу 2000 года. В результате принятия этого сценария, вероятнее всего то, что казахстанская экономика выйдет на траекторию продолжительной стагнации или экономического роста с темпами 2-3% в год.

Длительное сохранение достаточно низких цен на нефть на мировом рынке, по мнению ряда экспертов, продержится до 2000 года. На развитие топливно-энергетического сектора в определенной мере скажется отсутствие реальной договоренности между прикаспийскими странами о статусе Каспийского моря и принципах раздела каспийского шельфа. Затягивание переговоров по этой проблеме в определенной мере скажется на начале работ по освоения каспийского шельфа и строительству сети евразийских магистральных нефтепроводов.

На развитие нефтедобычи в Республике Казахстан, особенно в части увеличения экспортной нефти, сильное влияние окажет развитие геополитической ситуации, в частности политика стран ОПЕК, ослабление санкций ООН против Ирака, а также гармонизация взаимоотношений по взаимопоставкам нефти с Россией.

На развитие экспортного потенциала республики безусловное влияние окажет неблагоприятная конъюнктура цен на мировом рынке на черные и цветные металлы, зерно и ряд других продуктов, которые составляют основу казахстанского экспорта.

В соответствии с этим можно предполагать, что развитие отраслей, связанных с производством экспортной продукции, окажется ниже, чем предусмотрено проектом первого варианта. Более вероятным становится сохранение их производства на уровне 1997 года или уровне, предусмотренных планом текущего года.

В целом по данному сценарию, можно ожидать, что даже при реализации Правительством Республики Казахстан своей Программы действий в полном объеме в рассматриваемом периоде не удастся преодолеть экономический кризис и экономика республики к 2003 г. возможно будет находиться на уровне 1997 —1998 годов.

В соответствии с этим при помощи модели межотраслевого баланса были проведены предварительные расчеты по оценке макроэкономических показателей экономического развития республики на 1999-2003 годы.

Расчеты показали, что в зависимости от темпов инфляции ожидается рост реального ВВП в 2003 г. по отношению к 1998 г. от 1-2% до 8-9% против 21.7%, предусмотренных планом. Более низкие темпы экономического роста обусловлены учетом влияния тех внешних и внутренних факторов, которые не были учтены при подготовке целевых показателей Индикативного плана. Реалистичность данного прогноза определяется тем, что, как показали расчеты, отраслевая структура промышленности за это период не претерпит существенных изменений. Однако при реализации этого сценария имеется возможность усиления позитивного воздействия на экономический рост отдельных факторов и уменьшения негативного влияния других факторов путем

проведения активной государственной политики, усиления роли государственного регулирования экономики.

В этой связи можно считать, что к 2003 году казахстанская экономика окажется на уровне 1998 года или несколько выше.

Расчеты на более длительную перспективу показали, что в зависимости от выбранного варианта развития страны, который определяется макроэкономической политикой, можно с большой долей вероятности предполагать, что за пределами 2003 года развитие казахстанской экономики будет идти незначительными среднегодовыми темпами роста около 2-3% в 2004-2010 и 4-5% в 2011-2020 г.г. Только за пределами 2020 года возможно при благоприятных условиях ускорение темпов экономического роста 7-10% в среднем за год.

В соответствии с выполненными расчетами объем реального ВВП достигнет дореформенного периода не ранее 2015-2020 года. Важно отметить, что преимущественное развитие получают в основном отрасли тяжелой промышленности, которые сохраняют специализацию республики в международном разделении труда. При этом показатели энергоемкости и электроемкости ВВП останутся на достаточно высоком уровне.

Таблица 3

Основные показатели энергопотребления Республики Казахстан.

Показатели	1990	1991	1992	1993	1994	1995	1996	1997
Валовой внутренний продукт (в ценах 1995 г.), млрд. тенге	2782	2373	2036	1598	1141	992,5	972,6	982,3
Электропотребление, млрд. кВт. ч	104,7	101,6	97,0	89,1	79,4	73,4	67,6	57,1
Производство электроэнергии, млрд. кВт. ч	87,4	86,0	82,7	77,4	66,4	66,6	61,9	52,2
Дефицит (-), избыток (+) электроэнергии, млрд. кВт. ч	-17,3	-15,6	-14,3	-11,7	-13,0	-6,8	-5,7	-4,9
Потребление топливно-энергетических ресурсов, млн. т у.т.	100,5	100,2	98,8	95,5	85,0	81,2	76,4	72,5
Удельная электроемкость ВВП, кВт. Ч/тенге	0,038	0,043	0,048	0,056	0,069	0,074	0,070	0,058
Удельная энергоемкость ВВП, т у.т./тыс. тенге	0,036	0,042	0,048	0,06	0,074	0,082	0,078	0,074
Потребление электроэнергии на душу населения, кВт. ч/чел	6271	6069	5760	5241	4698	4395	4230	3600
Валовое потребление первичных ТЭР на душу населения, т.у.т./чел	6,02	5,99	5,84	5,62	5,03	4,86	4,74	4,57

За рассматриваемый период удельная электроемкость ВВП увеличилась более, чем в 1,5 раза, энергоемкость - более, чем в 2 раза. Такой показатель НТП как потребление электроэнергии на душу населения снизился более, чем на 40%. В этой связи важной перспективной проблемой становится проблема энергосбережения, т.к. после 2020 года при неблагоприятных условиях Казахстан по уровню выбросов может достигнуть уровня 1990 г.

The U.S. Experience with Climate Change Economic Analysis

Joe Aldy
President's Council of
Economic Advisers

Three Steps in Climate Change Economic Analysis

- Identify possible policies
- Construct business-as-usual emissions path
- Model various abatement targets

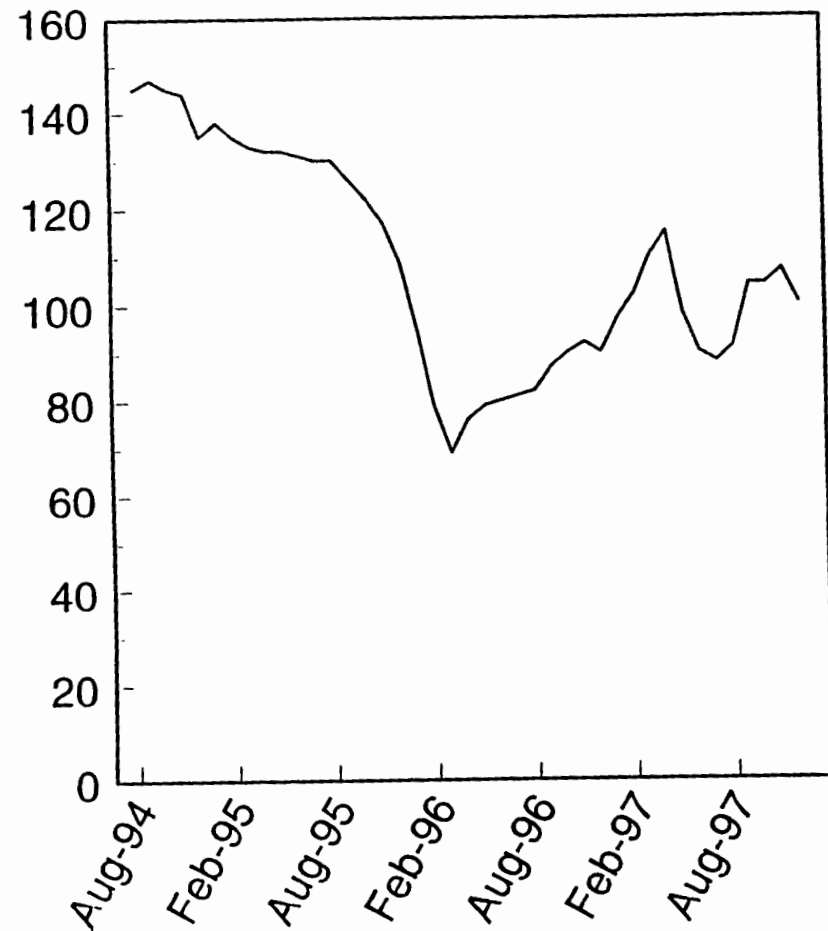
U.S. Experience with Policies

- Voluntary Programs
 - > Green Lights, Energy Star
- Tax credits
 - > Wind and biomass energy
- Tradable Permit Market
 - > Acid Rain/SO₂ Program

Experience with SO₂ Trading

- SO₂ Trading Program Covers 110 Electric Generating Plants
- Cost-savings range from 25 to 43 %
- Tradable Permits Provide Incentives to Achieve Total Reductions at Least Cost

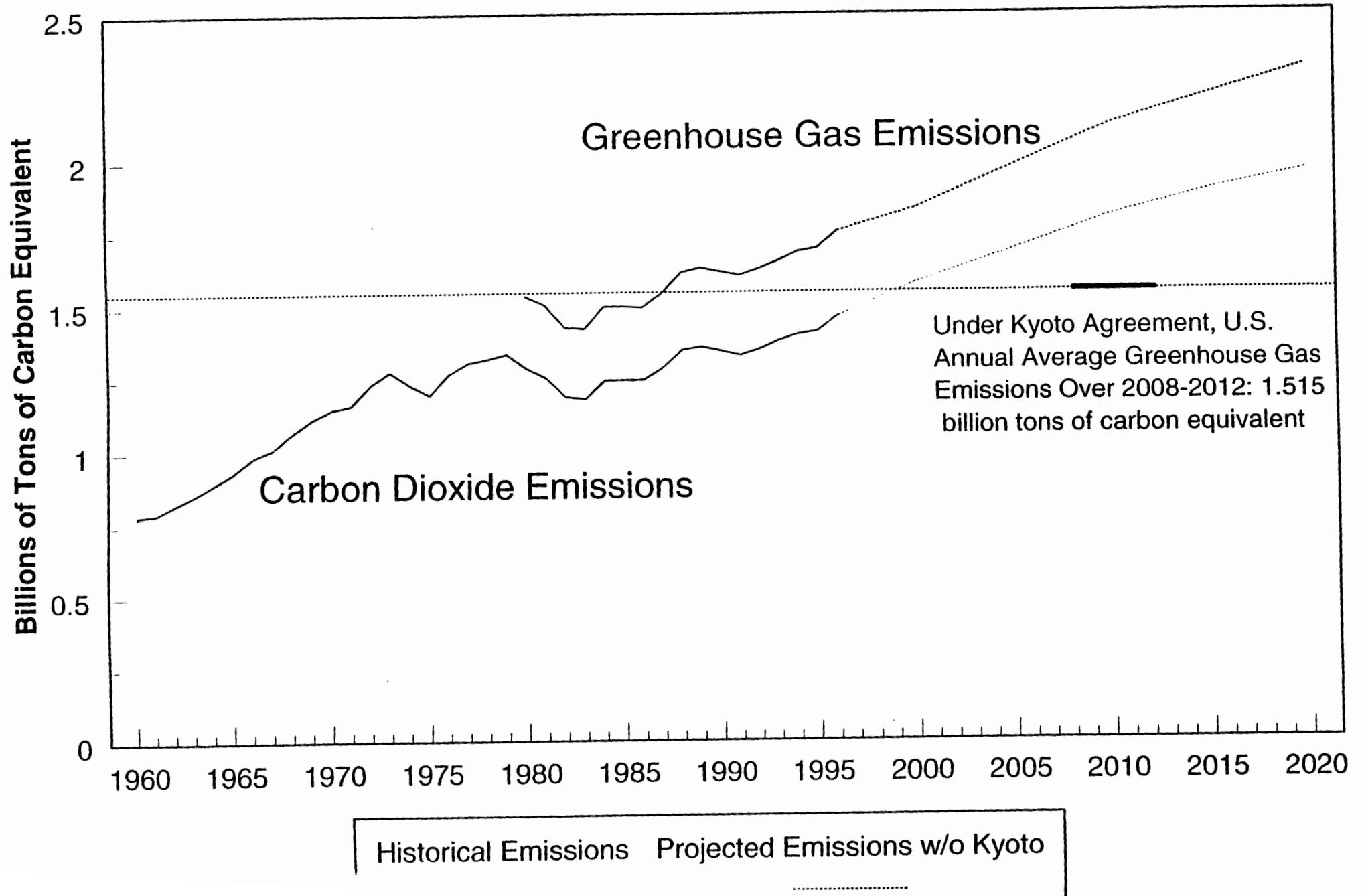
permit price (\$/ton)



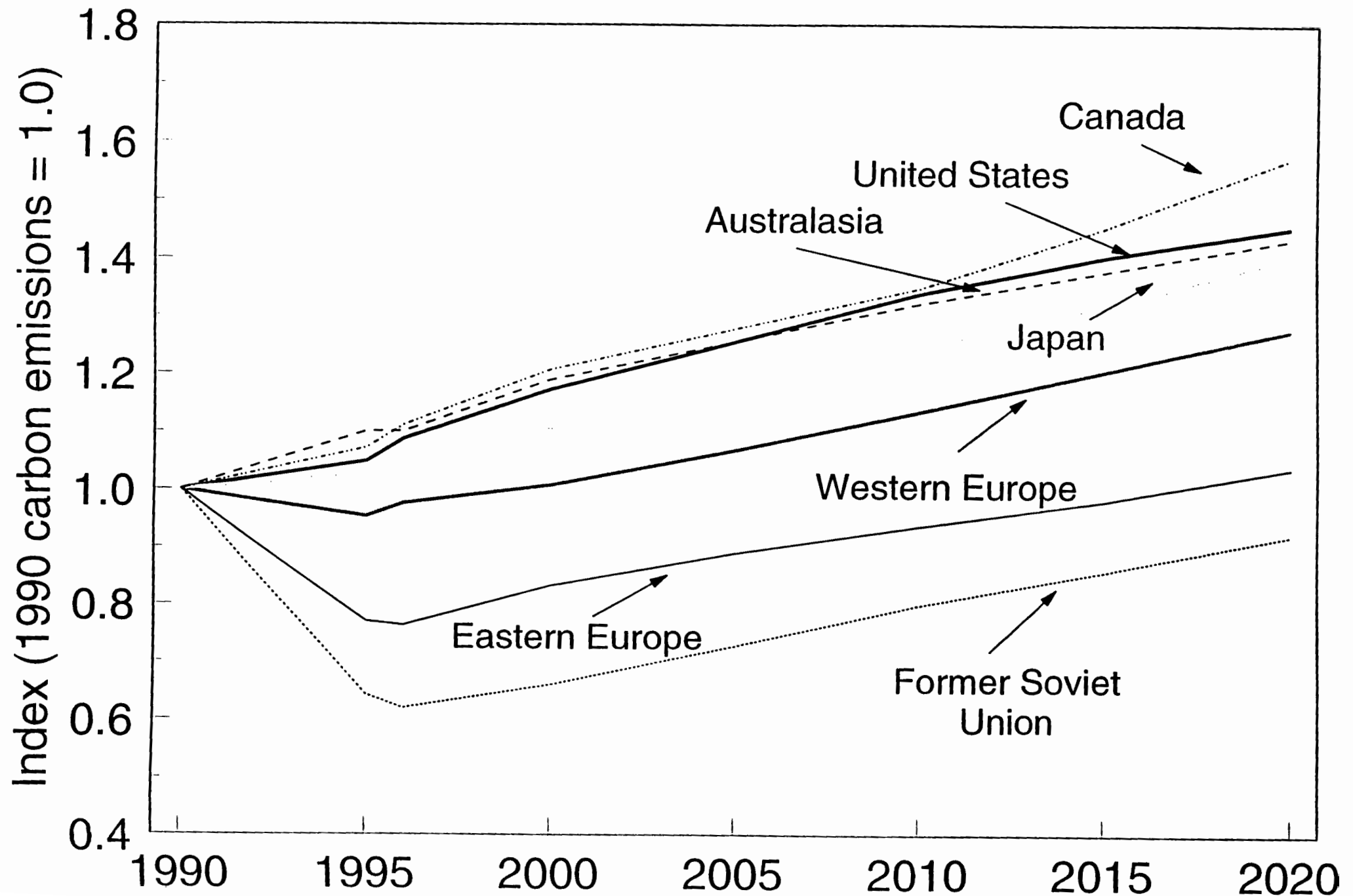
Constructing Business-As-Usual

- Identify current emissions from inventory
- Identify economic and energy assumptions for projecting emissions
- Project economic/energy activities into future without new abatement policies
- Convert business-as-usual economic and energy activities into emissions

U.S. Greenhouse Gas Emissions



Annex Carbon D'ox'ide BAU



Economic Modeling

- Interagency Analytical Team
- Administration Economic Analysis

Interagency Analytical Team

- 3 models used in 1996-1997 to evaluate various emissions targets
 - SGM: long-run model
 - DRI: short-run model
 - Markal-Macro: "bottom-up" model
- Common BAU assumptions
- Various emissions targets assessed

Lessons Learned from IAT

- Models give insights, not exact answers
- The flexibility of the economy is critical
- Timing of reductions is important
- International trading and joint implementation can lower costs
- Non-Annex I participation is important both in terms of costs and benefits

Administration Economic Analysis

- Assessment of Kyoto Protocol
- Review of economic and energy data and literature
- Illustrative modeling analysis

Key Components of Kyoto Protocol

- Binding Targets on Industrial Countries' Emissions
- "When" Flexibility (Timing)
- "What" Flexibility (Gases and Sinks)
- "Where" Flexibility (International)

"When" Flexibility (Timing)

- Timing of First Binding Commitment Period
- Target Specified in Terms of 5-Year Average
- Opportunity for Banking Allowances to Later Commitment Periods
- Opportunity for Banking of CDM Credits Generated between 2000 and 2008

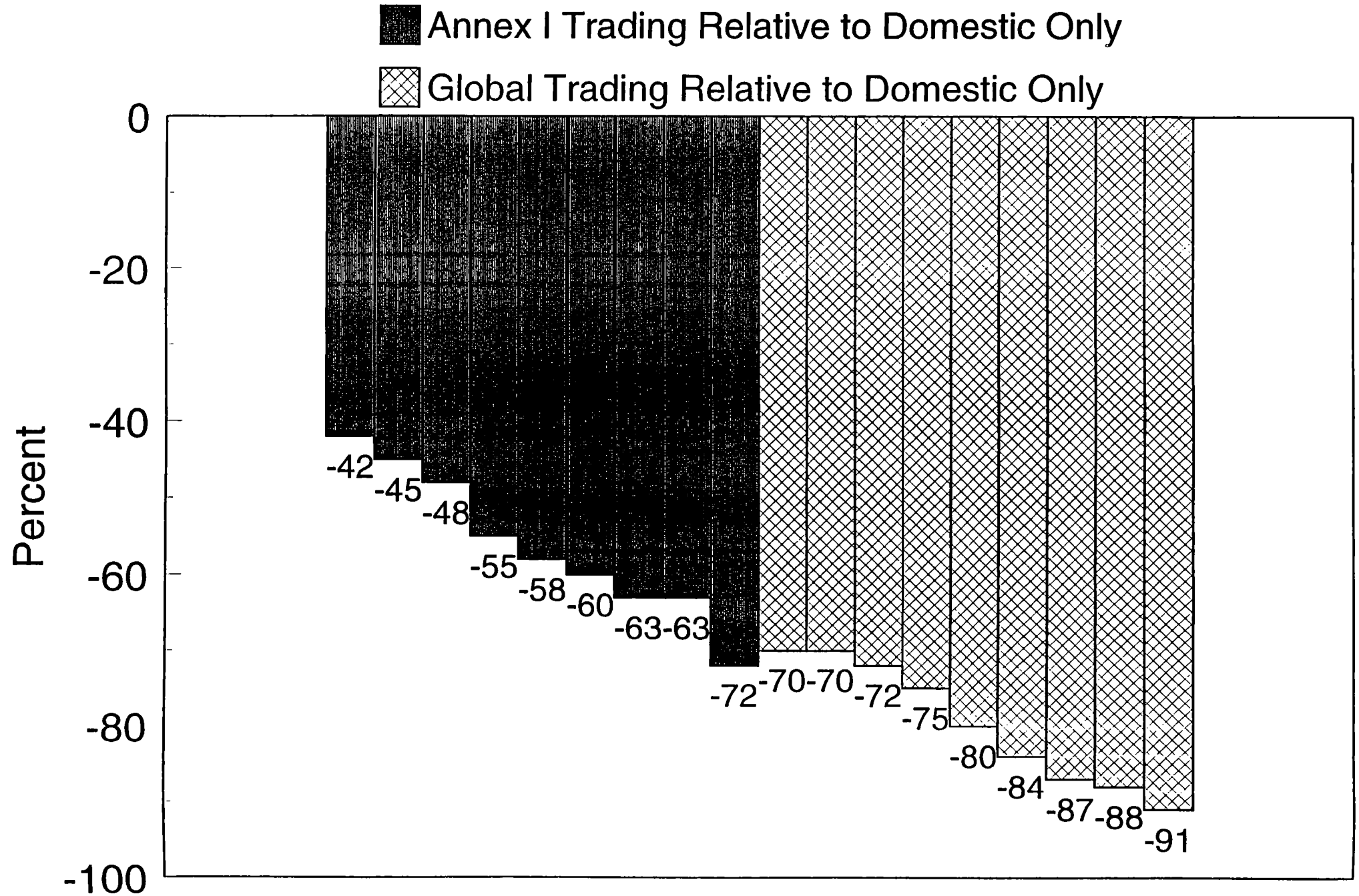
"What" Flexibility (Gases and Sinks)

- Opportunities to Trade Across 6 Kinds of Greenhouse Gases
- Inclusion of Sink Activities

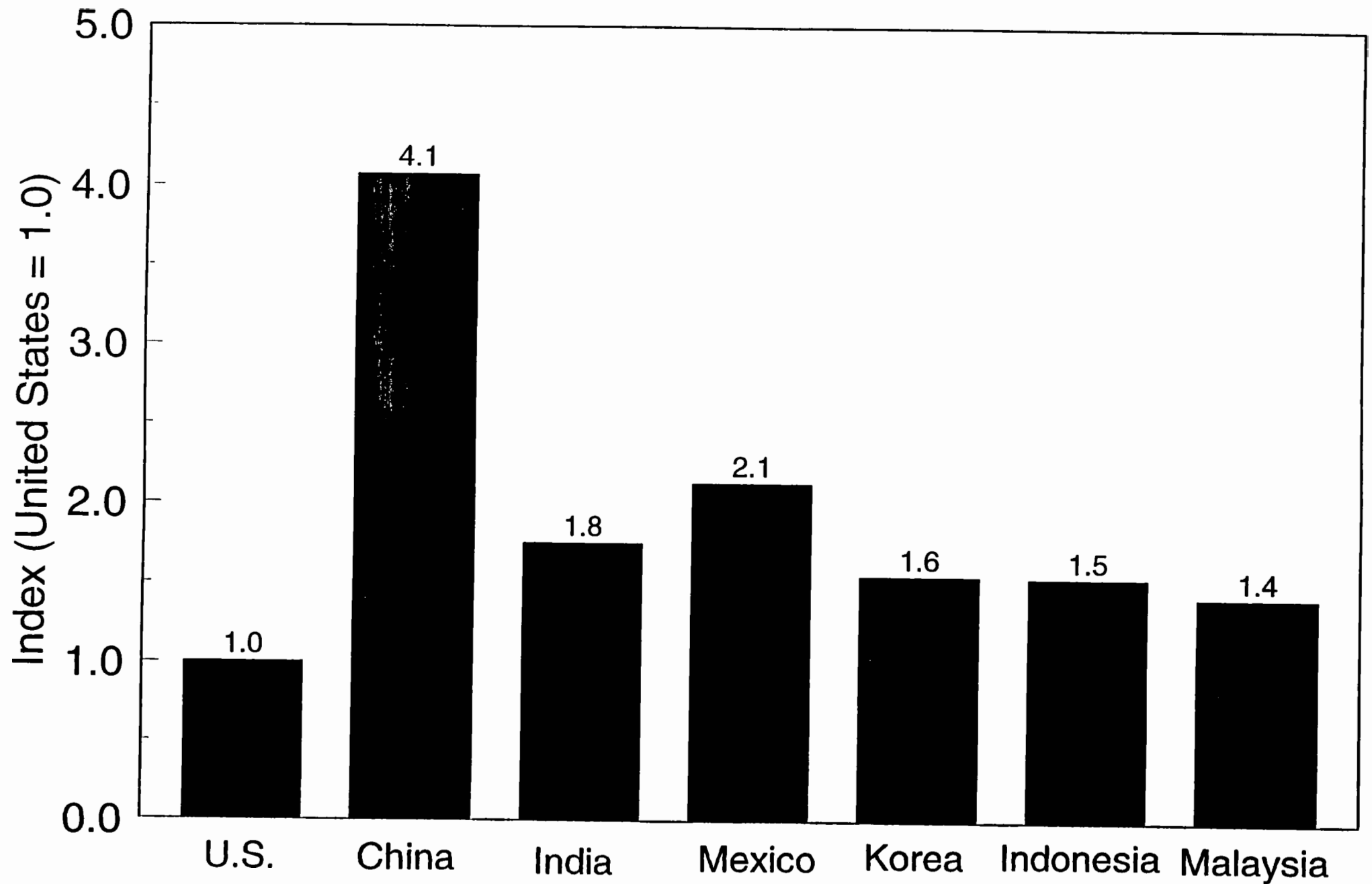
"Where" Flexibility (International)

- International Emissions Trading
- Joint Implementation
- Clean Development Mechanism

Percentage Reductions in Permit Prices Due to International Trading in 9 Economic Models



Countries



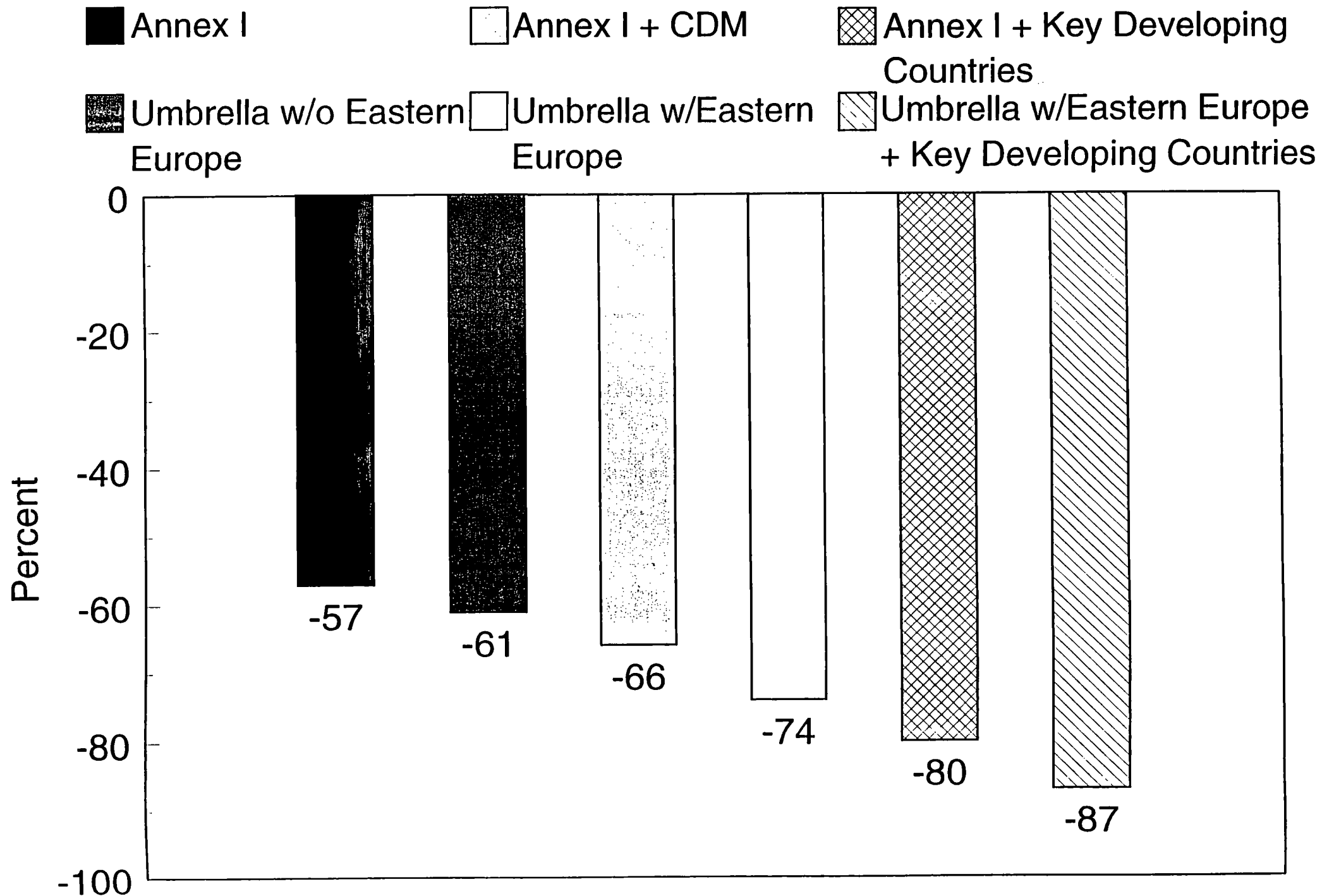
Illustrative Modeling Exercise

- Second Generation Model (SGM)
 - Long-run economic model
 - Detailed description of energy sectors
 - Can model international emissions trading
- Modifications of SGM
 - Includes all 6 greenhouse gases in baselines
 - Includes cost curve for non-carbon dioxide greenhouse gases for United States
 - Includes updated carbon dioxide BAU for United States

Trading Blocs and CDM Activities

- Annex I Trading
- Umbrella Trading: with and without Eastern Europe
- Developing Country Participation through Trading
- Developing Country Participation through CDM

Percentage Reductions in Resource Costs Relative to Do First C Only" Abatement Under Various Trading Scenarios



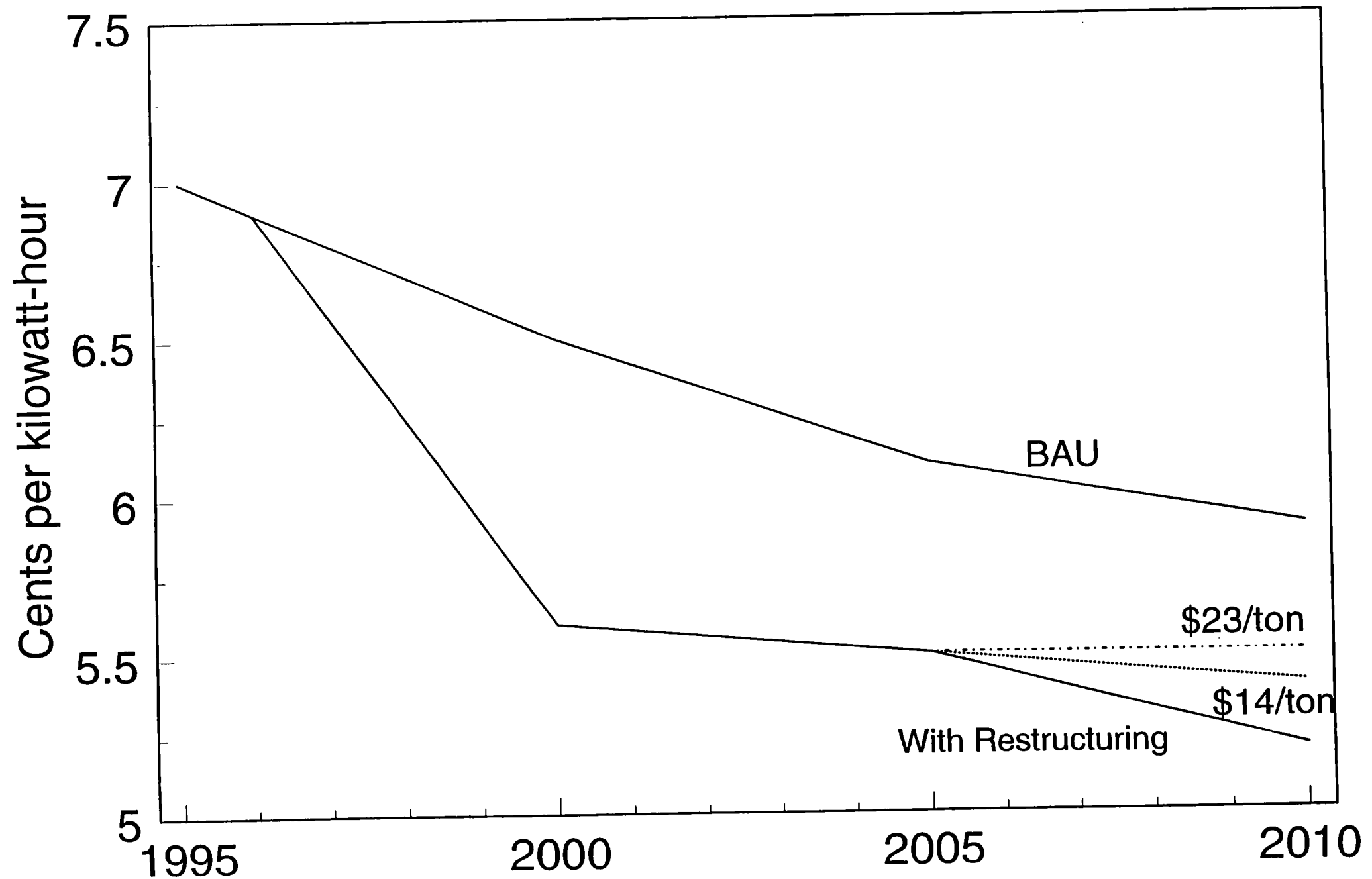
U.S. Permit Prices and Resource Costs Under the Administration's Policies

Trading Scenario	Permit Price	Total Resource Cost	Share of 2010 GDP
Umbrella with Eastern Europe + Key Developing Countries	\$14/ton	\$7 billion per year	0.07%
Annex I + Key Developing Countries	\$23/ton	\$12 billion per year	0.11%

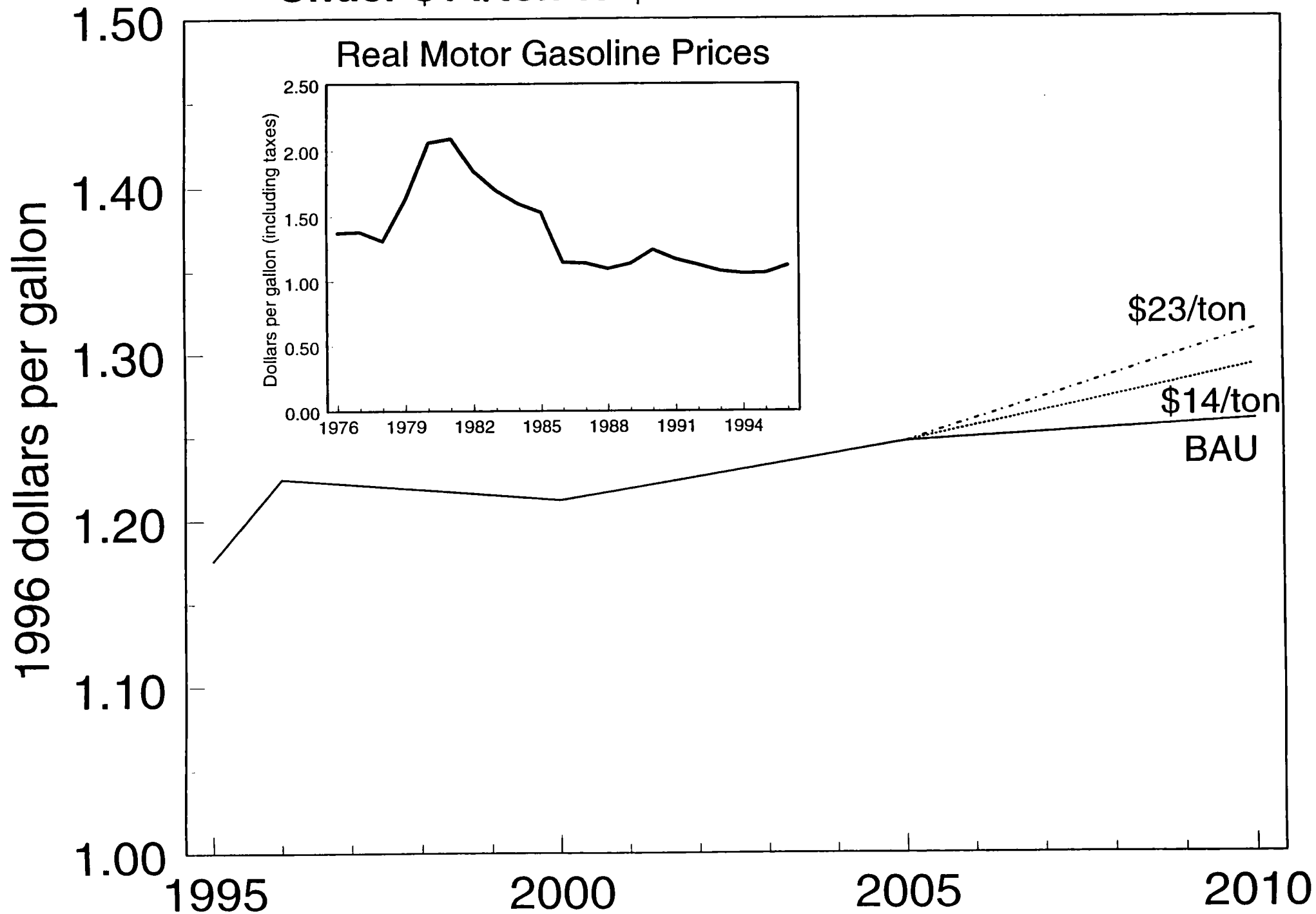
U.S. Energy Prices Under Permit Prices of \$14/ton to \$23/ton

Energy Source	1996 Price	2010 BAU Price	2010, \$14/ton	2010, \$23/ton
Electricity	6.9¢/Kwh	5.9¢/Kwh	6.1¢/Kwh	6.2¢/Kwh
Gasoline	\$1.225/gal	\$1.259/gal	\$1.293/gal	\$1.314/gal
Fuel Oil	\$1.087/gal	\$1.092/gal	\$1.140/gal	\$1.170/gal
Natural Gas	\$4.25/mcf	\$3.80/mcf	\$4.00/mcf	\$4.13/mcf

Average J.S. Electricity Prices Under \$14/ton to \$23/ton Perm Prices, Including the Cost-Savings Associated with Electricity Restructuring



Average U.S. Gasoline Prices Under \$14/ton to \$23/ton Permit Prices



Additional Cost Mitigating Factors

- Potential Benefits of Carbon Sinks
- Electricity Restructuring
- Climate Change Technology Initiative
- Industry Consultations
- Early Action Credit
- Federal Energy Plan
- Ancillary Air Quality Benefits

Toward a National Strategy to Reduce Emissions of Greenhouse Gases in Kazakhstan¹

Outline of a presentation by Victor Loksha (participant from the World Bank) at the Seminar in Almaty, February 22 – 24, 1999, with the participation of the US Expert Team

Since late 1997, the World Bank has been involved in a dialogue with the Kazakh Government on the subject of developing a strategy to reduce emissions of greenhouse gases (GHG). Our goal is to assist Kazakhstan in developing such a strategy in preparation to the Fifth Conference of the Parties (COP-5) to the UN Framework Convention on Climate Change.

We are not alone in this effort, as the attention given to this subject by American Experts clearly indicates. We see our comparative advantage in developing the linkages between the strategy and potential project pipeline. At the end of the study, we should have a clear understanding of what kind of GHG emission reduction projects are feasible and desirable for Kazakhstan, and how the World Bank can help.

Below are some key elements of our approach:

- Energy sector – the major contributor to GHG emissions – will receive most attention.
- Renewable energy is of particular interest (small hydro, wind energy, etc).
- The methodology of incremental cost analysis will be applied to analyze the attractiveness of project proposals.
- Opportunities for technology transfer will be identified, and the role of AIJ/CDM in this context.
- Opportunities and major trade-offs related to the intention of Kazakhstan to have numerical targets of GHG reduction, and potentially join Annex 1, will be analyzed.

The status of the study so far and next steps:

The TOR and funding are available. A foreign consultant has been contracted with (KWI, Austria). The official supervisory group on the Kazakh side has been appointed by the Ministry of Natural Resources and Environmental Protection (based on the decision of the February 19, 1999 session of the Interagency Coordination Committee held in Kokshetau). Final decision on the composition of the Kazakh implementation team is

¹ The National Strategy Studies (NSS) Program of GHG emissions reduction was initiated in September 1997 with financing from the Government of Switzerland and co-financing from Finland and the World Bank. Overall, about 20 countries are expected to be covered. The role of the Bank in these studies is that of an advisor. The Bank helps formulate the Terms of Reference for the NSS studies; provides international expertise as input into the study; and helps finance the studies through bilateral donor funding. The presentation at COP-4 in Buenos Aires, November 9, 1998, on Phase-I NSS reported on the studies funded by the Swiss Government (Czech and Slovak Republics, Russia, Uzbekistan). The Austrian-funded Kazakhstan study will help keep up the momentum of the NSS program in the CIS, while also benefiting from the knowledge of the outcome of the Buenos Aires COP-4 event.

expected shortly. Although the Austrian team will only arrive in Kazakhstan in mid-March, we consider the study to be underway. The expected completion date is October 1, 1999. The first draft of the study is expected to be presented and discussed at a workshop to be held in Almaty or Kokshetau in June, 1999.

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Date:	22.02.99

К ПРОБЛЕМЕ УГЛЕРОДНОГО КРЕДИТА В КАЗАХСТАНЕ.

Рамочная Конвенция ООН и осознание мировой общественностью происходящего глобального изменения климата на планете Земля за счет «парникового эффекта», требует адаптационных мероприятий по устойчивому развитию агро-лесо-пастбищного хозяйства и мониторинга экосистем.

Территория Казахстана занимает площадь 272,5 млн.га, в том числе 182,6 млн.га пастбища, а около 30 млн.га пашни и 17 млн.га 2-5 годичных земель, выведенных из пахотных угодий. Лесопокрытая площадь составляет 10,9 млн.га или около 4% территории. Основные возможности в увеличении поглощения CO_2 существуют на ограниченной ее части между 51 и 57° с.ш., где расположены около 30 млн.га пашни и часть лесов. Низкопродуктивные пастбищные и сенокосные угодья между 45 и 51° с.ш., также обладают некоторым потенциалом поглощения CO_2 .

Почвоведрами и агрохимиками определено, что за 40 лет экстенсивного использования целинных земель Северного Казахстана из 4,3 млрд.тонн запасов органического вещества (гумуса) пахотного слоя 0-25 см утрачено за счет его минерализации, водной и ветровой эрозии около 1 млрд. тонн или 28,3% от исходного содержания. Это означает, что более половины (0,5 млрд.тонн) (содержание углерода в гумусе составляет 57%) углерода окислилось с образованием и последующей эмиссией в атмосферу более 1,5 млрд.тонн CO_2 .

Поэтому восстановление дегумифицированной пашни, улучшение деградированных лесо-пастбищных территорий и адаптация их к возможным изменениям климата тесно связана с регулированием окислительно-восстановительного процесса- сгоранием и образованием гумуса, а следовательно, с выделением и поглощением CO_2 .

Агроландшафтная биологическая система земледелия подразумевает создание бездефицитного баланса гумуса, преобладание восстановительного процесса образования органического вещества над окислительным, поглощение при этом CO_2 и выделение кислорода в атмосферу.

По методике Межгосударственной группы экспертов (МГЭИК) по изменению климата рекомендуется использовать для расчетов осредненное значение количества накапливаемого углерода для пастбищ умеренных широт 70т/га в год. Динамика улучшения солонцовых и малопродуктивных земель, а также сокращение зернового клина за счет вывода деградированной пашни в залежи выглядит следующим образом.

В 1970-1980 гг. залужено 6 млн.га низкопродуктивных земель. В 1980-1990гг. на 6 млн.га пашни за счет интенсификации пашни в почве преобладал восстановительный процесс над окислительным, т.е происходило накопление гумуса. В 1991-1997 гг. из пашни выведено 11 млн.га в т.ч. 5 млн.га земель коренного улучшения, ранее засеваемые однолетними культурами и 6 млн.га

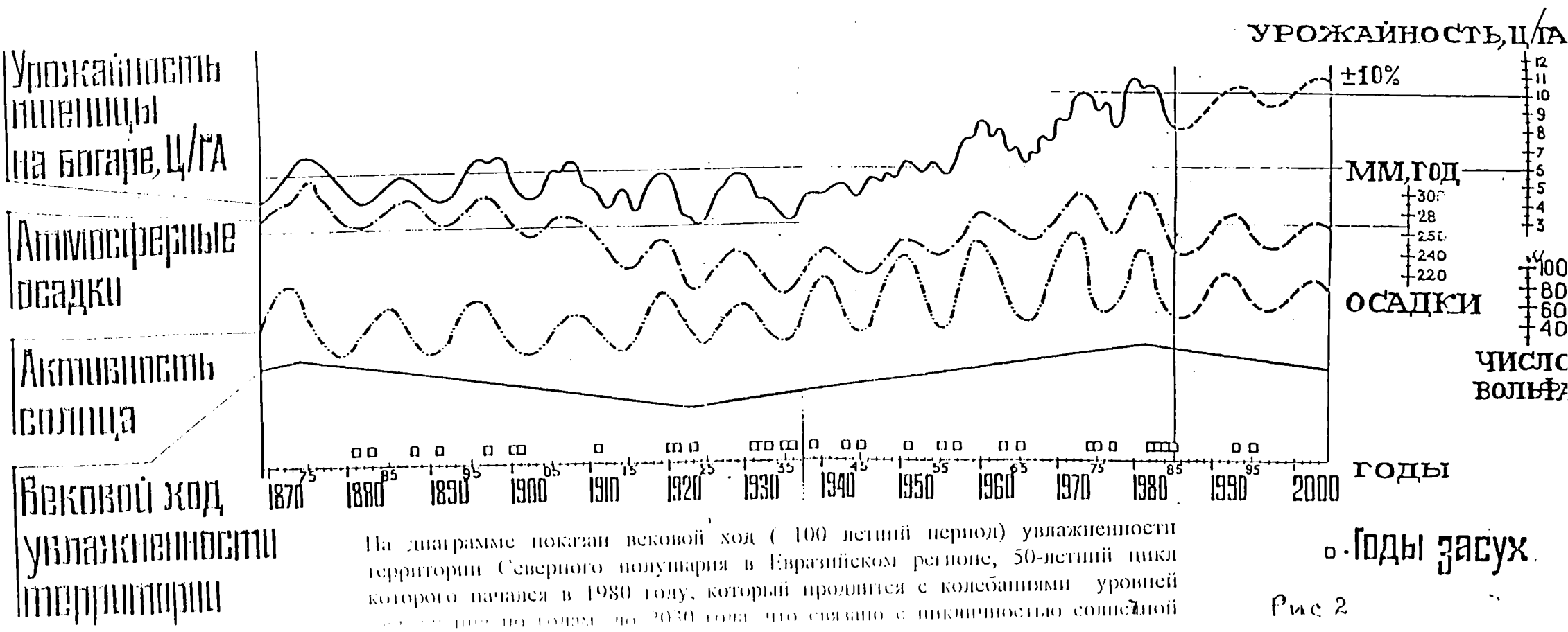
127 - под зерновых культур.

Таким образом, в Казахстане за последние 25 лет из 41 млн.га некогда распаханых земель 17 млн.га находятся под травянистой растительностью за счет которых идут восстановительные процессы и поглощение углерода.

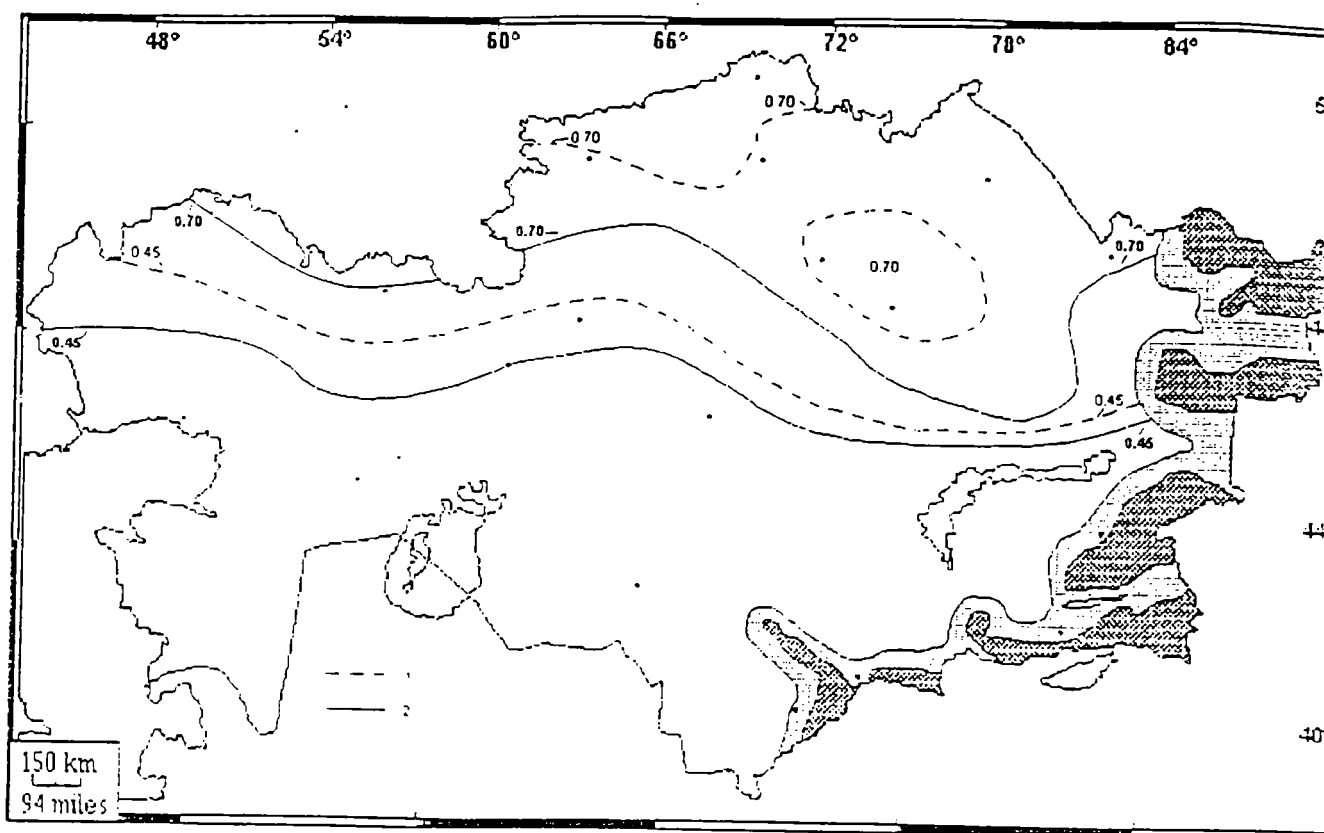
Для расчета углеродного кредита рекомендуется методика Межгосударственной группы экспертов по изменению климата (МГЭИК). Для расчетов используется осредненное значение количества накапливаемого углерода для пастбищ умеренных широт -70 т/га в год.

Динамика урожайности и атмосферных осадков в Казахстане (по скользящим пятилетиям)

Урожайности и атмосферных осадков в Казахстане (по скользящим пятилетиям)



GFDL



UKMO

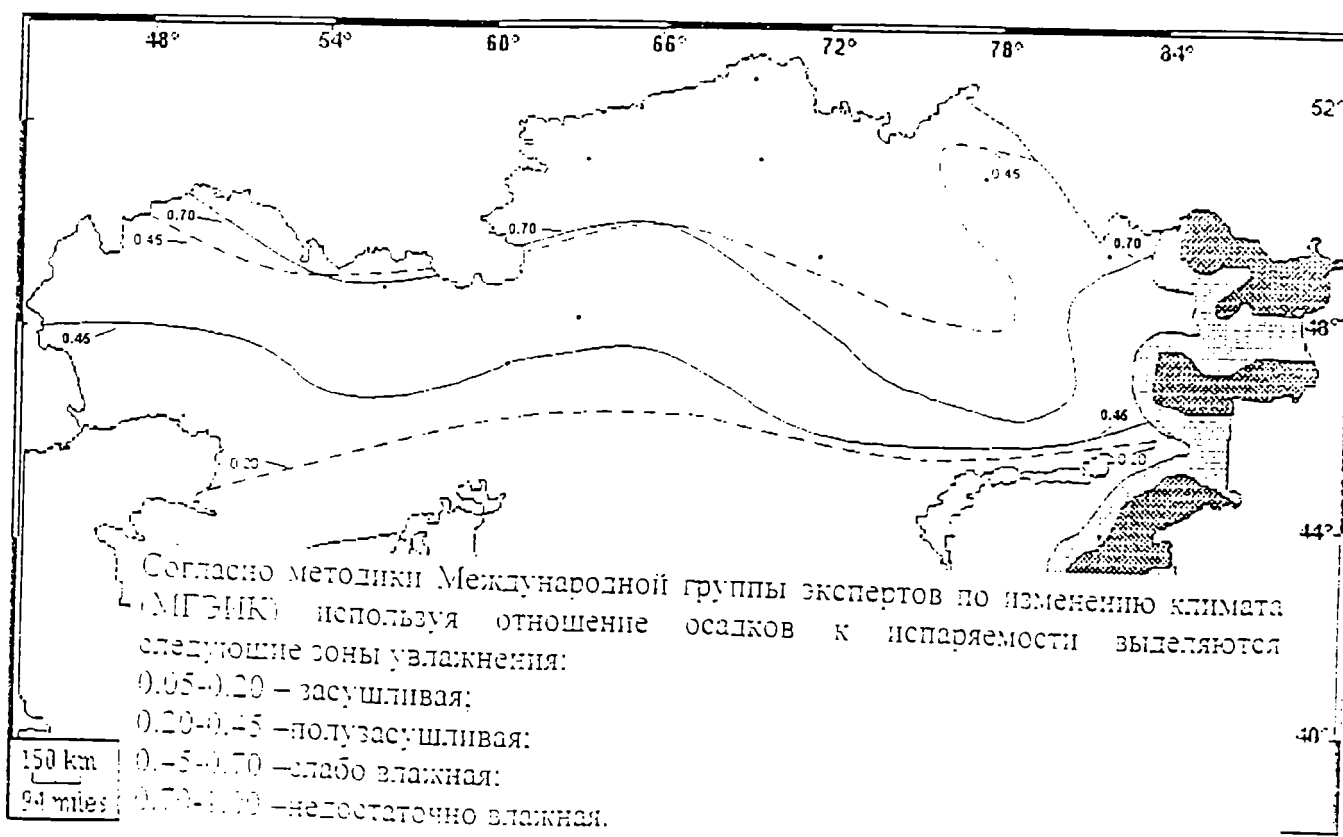


Рис.1 Изменения зон увлажнения по сценариям изменения климата GFDL и UKMO

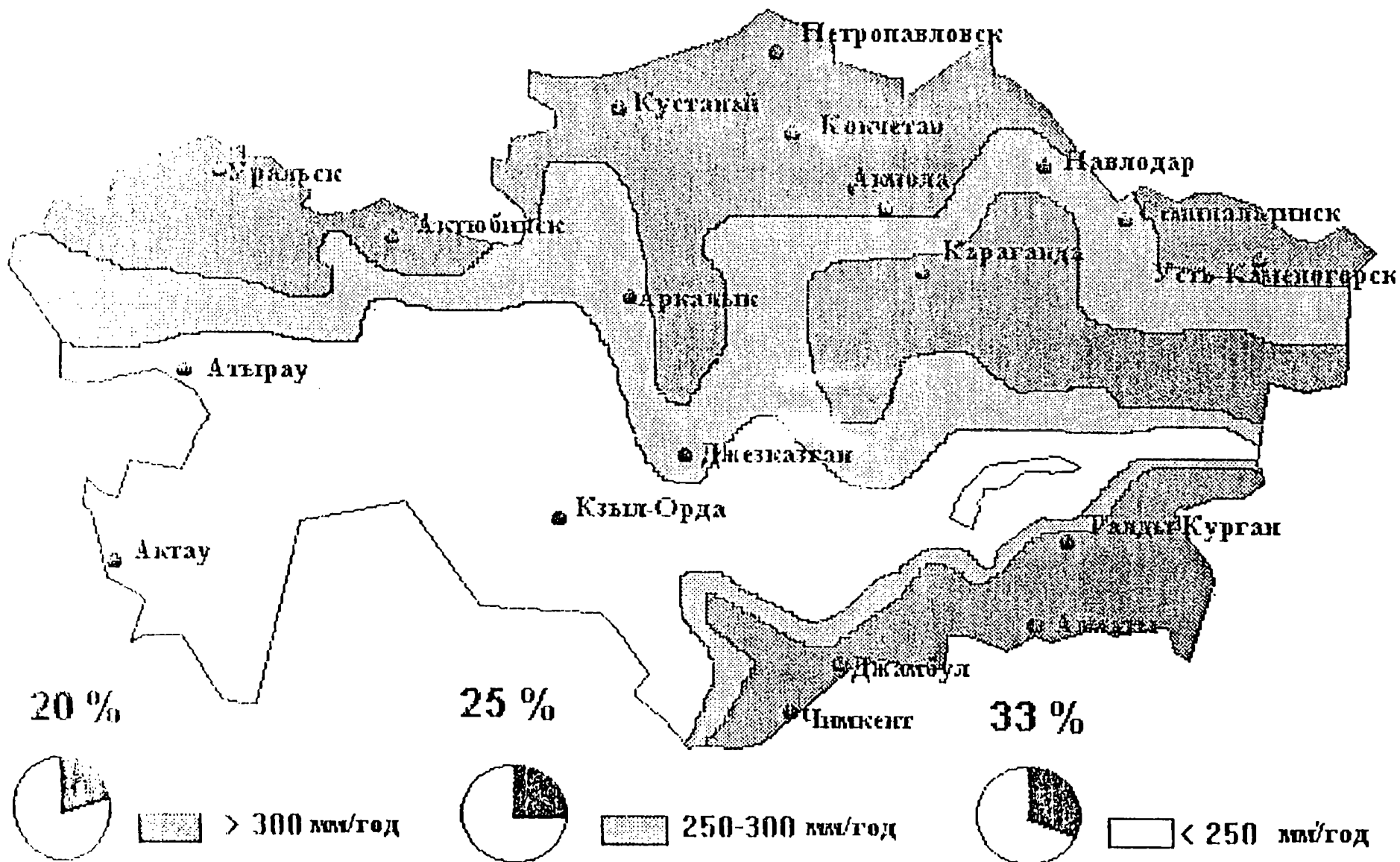
Целесообразно возделывать яровую пшеницу в зонах с увлажнением 0.45 - 1.00 (слабо и недостаточно влажная зоны). При выбранных сценариях произойдет сдвиг зоны возделывания яровой пшеницы в направлении северных широт, что приведет к уменьшению

3. Внесение минеральных удобрений и биологизация земледелия;
4. Посев среднеспелых и среднепоздних сортов яровой пшеницы;
5. Увеличение глубины заделки семян на 1.0-1.5 см во влажный слой почвы;
6. Внесение фосфорных удобрений в рядки при посеве с учетом плодородия агроландшафтов;
7. Прямая и раздельная уборка яровой пшеницы;
8. Изменение сроков посева яровой пшеницы и технологии по агроландшафтам;
9. Общее снегозадержание (механическое) выборочно по агроландшафтам;
10. Посадка леса для поглощения CO₂, сохранения биоразнообразия;
11. Залужение многолетними растениями деградированных земель;
12. Замена яровой пшеницы озимой;
13. Разъяснение фермерам проблем изменения климата через прессу, выпуская красочные буклеты и плакаты;
14. Анализ и распространение долгосрочных сезонных метеорологических прогнозов с целью определения уточненных объемов снегозадержания и экономии горюче-смазочных материалов;
15. Разработка и представление прогнозов появления вредителей и болезней на сельскохозяйственный сезон с целью планирования, заготовки и применения пестицидов;
16. Создание областных и районных консультативных центров для сервисного обслуживания и информирования фермерских и крестьянских хозяйств об имеющемся семенном материале по сортам и группам скороспелости;
17. Поведение местных научно-практических семинаров по методике агробиологических мероприятий по адаптации;
18. Создание по регионам Казахстана центров по сохранению генофонда сортов яровой и озимой пшеницы (Казахский научно-исследовательский институт земледелия им.В.Вильямса –юго-восточный центр, Казахский научно-исследовательский институт зернового хозяйства им.А.И.Бараева –северный центр) последующим созданием Национального центра;
19. Формирование страховых фондов семян в годы с более благоприятными погодными условиями для осуществления посева или пересева в более засушливые годы;
20. Организация страховых фондов продовольствия в благоприятные годы с целью смягчения негативного влияния на нормы питания населения в засушливые годы;
21. Возделывание зерновых культур в зонах с более благоприятными почвенно-климатическими условиями с использованием средств интенсификации и перевод малопродуктивных земель в кормовые угодья, как это предусмотрено Концептуальной программой развития АПК до 2000 года;
22. Выделение средних и долгосрочных кредитов для создания оборотных средств на приобретение техники, новых сортов, горюче-смазочных материалов и пестицидов;
23. Принятие соответствующих постановлений по установлению закупочных цен на зерно как для внутренних потребностей, так и для экспорта;
24. Уточнение и разработка законодательных актов, учитывающих экономические изменения в аграрном секторе республики.

В перспективе адаптация зернового хозяйства более благоприятно будет протекать в 3-х —4-х полных севооборотах с площадью паровых полей 25-33%. Причем, увеличенные объемы чистого пара большую значимость будут иметь для яровой пшеницы в северо-западных районах, а для озимой пшеницы в юго-восточных и на богарных землях. (Рис.5).

РЕСПУБЛИКА КАЗАХСТАН

(Осадки за год, мм, % чистого пара)



Примерная структура хлебной пивы Казахстана следующая:

20 млн. пашни из 30 млн. га отводится под зерновой и зернофуражный клин.

В среднем для расчета возьмем четырехпольный севооборот:

- Паровое поле – 5 млн.га-25%
- Посев пшеницы по пару – 5 млн.га-25%
- Посев пшеницы второй культуры после пара – 5 млн.га-25%
- Посев ячменя и овса третьей культурой после пара 5 млн.га-25%

На указанную площадь требуется:

- Плоскорез-глубококорытитель ПГ-3-5, на 1000 га севооборотной площади $0.65 \text{ штук} \times 5 \text{ млн.га} = 3250 \text{ штук}$.
- Культиватор-плоскорез КПШ-11, на 1000 га требуется $1,44 \text{ штуки} \times 5 \text{ млн.га} = 7200 \text{ штук}$.
- Сеялка зерновая стерневая СЗС – 2,1, на 1000 га требуется $1,0 \times 15 \text{ млн.га} = 15000 \text{ штук}$
- Сеялка зернуковая СЗП – 3,6, на 1000 га требуется $0,96 \text{ штук} \times 5 \text{ млн.га} = 4750 \text{ штук}$.

Расчет потребности в гербицидах сплошного действия на обработку 5 млн.га чистого пара при минимизации агротехнических приемов, приводится ниже:

- Опрыскивание парового поля раундапом или аналогом сплошного действия —15 тыс.тонн;
- Опрыскивание посевов зерновых культур против овсюга и конеотпрысковых сорняков в третьем поле после пара на площади 5 млн.га —5 тыс.тонн;
- Для протравливания семян яровой пшеницы в объеме 1 млн.500 тыс.тонн требуется около 3 тыс. тонн протравителей и для семян фуражных культур в объеме 750 тыс.тонн требуется 1,5 тыс.тонн протравителей.

Примерная потребность ядохимикатов для дезинфекции складских помещений и элеваторов где будет храниться семенное и продовольственное зерно в объемах:

Семян 2,4 млн.тонн-0,5 тонны препарата

Страховых фондов зерна —1,5 млн.тонн —0,3 тонны препарата

Нормы внесения удобрений в зависимости от типа почв и отдаленности зерновой культуры после пара составляют для обыкновенных и южных черноземов –азота 30 кг/га под третью культуру после пара на площади 5 млн.га и 60 кг.д.в. фосфорных удобрений, вносимых в паровое поле на площади –5 млн.га или ежегодно в рядки при посеве –20кг. Р₂O₅ на площади 15 млн.га. Таким образом ежегодная потребность удобрений на общую площадь пара и посевов зерновых культур в 20 млн.га составляет:

- Азотных –450 тыс.тонн

- Фосфорных –300 тыс.тонн

Ежегодная потребность в семенах яровой пшеницы на 10 млн.га –1500 тыс.тонн и фуражных культур на 5 млн.га –750 тыс.тонн о чем нужно заботиться своевременно.

Такова примерная заявка Казахстанской хлебной нивы на производство противорозной техники для возрождения производства зерна в пределах 18-20 млн.тонн в год.

Приведем также расчет возможной окупаемости затрат валовым сбором зерна яровой пшеницы с 10 млн.га, размещаемой по Северо-Казахстанским черноземным почвам.

При урожайности 10 ц/га x10 млн.га x 100\$ за 1 тонну = 1,0 млрд.долл.США

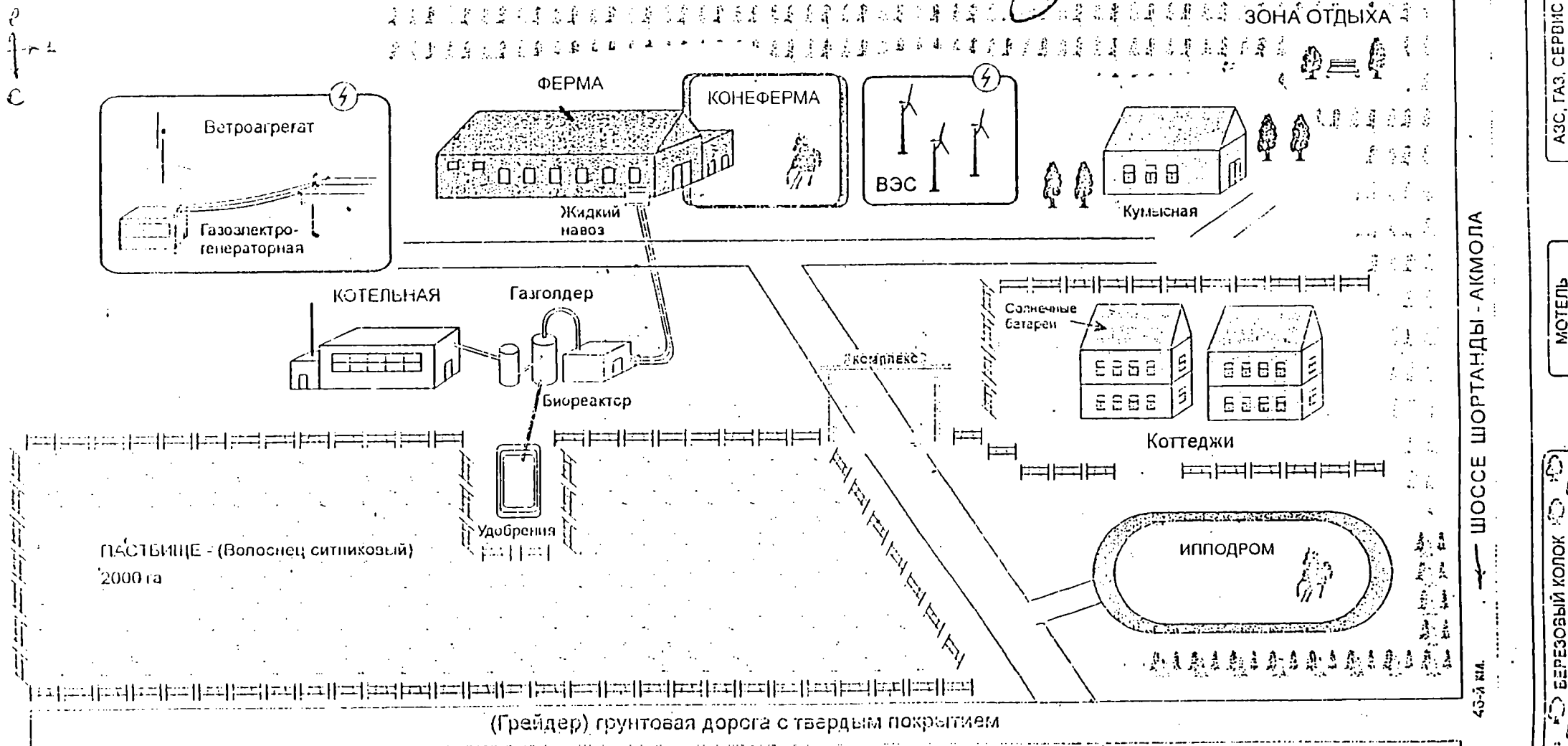
При урожайности 15 ц/га x10 млн.га x 100\$ за 1 тонну = 1,5 млрд.долл.США

При этом на фуражные цели можно использовать около 5 млн.т ячменя и овса.

ШОРТАНДИНСКИЙ ФИТОЛЕСОПАСТБИЩНЫЙ КОМПЛЕКС РАЗВИТИЯ МЯСНОГО СКОТОВОДСТВА И КОНЕВОДСТВА С БЕСПЕРЕБОЙНЫМ АВТОНОМНЫМ ЭЛЕКТРОПИТАНИЕМ

1. КРС - 2000 голов (Герефорды)
2. ЛОШАДЕЙ - 100 конематок
3. Пастбище - 2000 га.

СОСНОВЫЙ БОР, 26 га

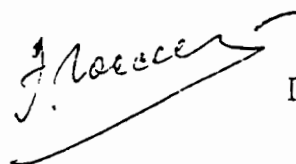


Следует отметить, что приведенные расчеты весьма упрощенные, но загрузка завода «Акмоласельмаш» производством противозероэрозийной техники и увеличение занятости городского и сельского населения очевидны. Кроме того, интенсивная технология возделывания зерновых культур предполагает увеличение производства и применения азотно-фосфорных удобрений, что также даст новый импульс возрождения туковой промышленности республики и снижение безработицы.

Наконец, новый подход (совместное производство) формуляции гербицидов и других средств защиты хлебных злаков от протравливания семян, опрыскивания посевов, дезинфекции зерно- и семенохранилищ существенно повысит общую культуры хлебной нивы и качество зерна.

Для практической реализации планов действий по выполнению Конвенции по изменению климата в тесной связи с требованиями других Конвенций ООН по борьбе с опустыниванием и сохранению биологического разнообразия в аграрном секторе экономики Казахстана предлагается создать в Казахском НИИ зернового хозяйства им. А.И. Бараева центр по эмиссии и поглощению парниковых газов в растениеводстве, лесоводстве и животноводстве, использованию солнечной и ветровой энергии. Работы эти уже начаты совместно с Институтом экологии и устойчивого развития. Калифорнийским университетом США с 1998 года в КазНИИЗХ им. АИ.Бараева начаты исследования по поглощению CO₂ целинной растительностью, а в перспективе наблюдения будут проводиться на лесном массиве и выделения метана жвачными животными. План фито-лесо-пастбищного комплекса прилагается (рис 4).

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Ervin Gossen
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ON THE PROBLEM OF CARBON CREDIT IN KAZAKHSTAN

The UN Framework Convention and apprehension of global climate changes by the world community due to the greenhouse effect necessitate monitoring ecosystems and carrying out adaptation activities on the sustainable development of agriculture, forestry, and pastures.

The area of Kazakhstan is 272,5 million hectares, including 182.6 million ha of pastures, about 30 million ha of arable lands, and 17 million ha of 2-5 year lands taken out of service. Forests cover 10.9 million ha, or about 4% of the territory of the RK. Main resources of absorbing CO₂ are located on the restricted area between 51° and 57° of north with 30 million of arable lands and forests. Low productive pastures and hayfields located between 45° and 51° of north are also of some significance for absorbing CO₂.

Soil scientists and agrochemists found out that during 40 years of extensive use of virgin lands in Northern Kazakhstan there were disabled 1 billion tons of humus from the layer of 0-25 cm (28.3 %) out of 4.3 billion tons of its resources in arable lands due to mineralization, wind, and water erosion. It means, that more than half (0.5 billion tons) of carbon has been oxidized (content of carbon in humus is 57%) and discharged into the atmosphere (1.5 billion tons of CO₂).

Thus, regeneration of humus in arable lands, improvement of disabled forestry and pastures, and their adaptation to possible climate changes is closely connected with regulation of oxidation and regeneration processes, burning and regeneration of humus, and consequently, with CO₂ emission and generation.

Agrolandscape biological system of farming implies generating a non-deficit humus balance and prevalence of recovery processes over oxidation, absorption of CO₂, and emission of oxygen to the atmosphere.

The Interstate Group of Experts on Climate Change recommends using averaged value for estimating the quantities of accumulated carbon in pastures of temperate zones equal to 70 tons/ha per year. Dynamics of improvement of saline and low productive lands, as well as shrinkage of grain production lands due to expansion of sick lands and their transformation to waste lands looks as follows:

In 1970-1980 there were disabled about 6 million ha of low productive lands. In 1980-1990's, regeneration processes prevailed over oxidation on 6 million ha of arable lands due to intensification, i.e. humus accumulation in the soil. In 1991-1997 about 11 million ha of arable lands were taken out of service, including 5 million ha used in the past for annual crops, and 6 million ha for grain crops.

Thus, in Kazakhstan, in the past 25 years, there were abandoned 17 million out of 41 million ha of cultivated lands. Processes of regrassing, regeneration and absorption of carbon are underway on these lands.

For calculating a carbon credit it is recommended to use techniques of the Interstate Group of Experts on Climate Changes based on the averaged value of carbon accumulation quantities for pastures of midlatitudes equal to 70 tons/ha per year.

high?

Approximate balance of emissions and absorption of CO₂ in the agroecosystem of Kazakhsatan is given below:

- 182.6 million ha of pastures x 70 tons/ha per year = 12 billion 782 million tons of CO₂;
- 17 million ha of lea lands x 70 tons/ha per year = 1 billion 190 million tons of CO₂;
- 10,9 million ha of area covered by forests = 988.0 thou. tons of CO₂;
- 30 million ha of extensively used arable lands and mineralization of organic substances produce x 5 tons/ha per year = 150 million tons of CO₂.

Thus, annual absorption of CO₂ by grass and forest areas is equal to 14 billion 972 million 988 thou tons of CO₂, and emissions of arable lands = 150 million tons. If we subtract this volume from the total value, we receive the annual volume of carbon credit for Kazakhstan from the agroecosystem equal to 13 billion 722 million 988 thou tons of CO₂.

It must be noted that after the year 2004, with the beginning of intensive technologies and application of biological methods providing humus balance in the soil of arable lands, there will start a reduction of emissions down to 0. Afterwards, recovery processes will prevail over oxidation.

Similar processes will take place in case of improving disabled pastures, agricultural afforestation, fire protection of forests, and expansion of areas with forests.

Reclamation of 42 million ha of virgin and lea lands on the Eurasian continent of Russia and Kazakhstan influenced thermal and water balance of the area. It is safe to assume that it resulted in the significant rise of air temperature of this area as compared to neighboring pastures and forests.

The diagram shows a secular period of humidification of the Eurasian region of the Northern Hemisphere. The 50 year cycle of the period started in 1980 and will last up to 2030 with annual fluctuations in the levels of humidity caused by cyclic solar activities (Fig. 1, 2).

Due to the expected climate changes, one of the limiting conditions for the sustainable grain farming is connected with general decrease of humidity, change of thermic regimes, and acceleration of droughts on the north-western and south-eastern territories of Kazakhstan. The diversity of soil and climatic microzones, their bioclimatic resources, and genetic potential of local types of selected crops provide with main methods of adaptation of grain farming, and reduce negative effects of global climate changes.

According to the methodology of the International Group of Experts on Climate Change, using the ratio of precipitation to evaporation, the following zones of humidification are distinguished:

- 0.05-0.20 – arid zone;
- 0.20-0.45 – semi arid zone;
- 0.45-0.70 – weakly moistened zone;
- 0.70-1.00 – insufficiently moistened zone.

Possible climate change will demand the application of adaptation measures listed below:

1. To expand fallow lands up to 20-25% and minimize soil cultivation;
2. To plant windbreak rows for snow accumulation and wind erosion prevention;
3. To apply mineral fertilizers and introduce biological methods of farming;
4. To plant middle-ripening and mid-late types of spring wheat;
5. To sow seeds deeper in the damp layer of soil for 1.0-1.5 cm;
6. To apply phosphorus fertilizers to rows during sowing, considering land productivity and agrolandscapes;
7. To carry out straight-combine and swath harvesting of winter wheat;
8. To change timing for planting winter wheat and technology for landscapes;
9. To carry out snow retention (mechanical) depending on the agrolandscapes;
10. Afforestation for absorption of CO₂ and preserving biodiversity;
11. To regrass disabled lands by perennial plants;
12. To replace spring wheat by winter wheat;
13. To explain to farmers problems connected with climate change through mass media by publishing colored booklets and posters;
14. Analysis and circulation of long-term seasonal meteorological forecasts for defining more precise volumes of snow for retention and saving fuel and oil;
15. To develop pest control schedules and forecasts for planning, application, and storing pesticides during the farming season;
16. To establish oblast and rayon consulting centers for servicing and informing farmers and peasants on available seeds according to types and groups of early ripening;
17. To conduct local scientific and practical seminars on methods of agrobiological activities of adaptation;
18. To establish centers for preserving a genetic fund of winter and spring wheat (Kazakh William's Research Institute of Agriculture –south-eastern center, and Kazakh Baraev's Research Institute of Grain Farming – northern center) with establishing a national center in the future.
19. To establish insurance funds in normal years for sowing or resowing in dry years;
20. To establish insurance funds on food products during the normal years for mitigation of negative effects of dry years on rates of food consumption of the population;
21. To farm in the zones with favorable soil and climatic conditions applying intensive technologies, and transfer low productive lands to forage lands as it was stipulated by the Conceptual Program of Developing Agricultural and Industrial Complex up to the year 2000;
22. To provide mid-and long-term credits to create current assets for purchasing equipment, new types of seeds, fuel, lubricants, and pesticides;
23. To adopt appropriate resolutions on establishing purchase prices on grain for export and internal market;

24. To amend and develop legislative acts considering economic changes of the agricultural sector of Kazakhstan.

In future, the adjustment of grain farming will go more favorably in 3-4 full crop rotations with the fallow area of 25-33%.

Therewith, the increased amounts of bare fallow will be very important for spring wheat in the northern and western regions. For winter wheat, they will be very important in the southern and eastern regions and non-irrigated areas.

Given specific conditions, natural soil humidification of the grain belt of Kazakhstan and economic level of farmers, we recommend a crop rotation with the use of fallow lands.

Model structure of arable lands of Kazakhstan is as follows:

20 million out of 30 million ha are used for the production of grain and grain forage.

On an average, we take four-field system for calculations.

1. Fallow field – 5 million ha, 25%.
2. Wheat sowing on fallow field – 5 million ha, 25%.
3. Sowing of wheat as a second crop on fallow field – 5 million ha, 25%.
4. Sowing of oat and barley as a third crop on fallow field – 5 million ha, 25%.

The specified area requires:

1. Mould boardless chisel plow, PG-3-5. For 1000 ha – 0.65 units.
For 5 million ha – 3250 units.
2. Scuffle cultivator KPSH-11. For 1000 ha – 1.44 units.
For 5 million ha – 72000 units.
3. Stubble grain drill SZS-2.1. For 1000 ha – 1.0 units.
For 15 million ha – 15000 units.
4. Manure distributor SZP-3.6. For 1000 ha – 0.96 units.
For 5 million ha – 4750 units.

These are the requirements for anti-erosion equipment to revive the grain production on the arable lands of Kazakhstan within 18-20 million tons per year.

Here is the calculation of possible returns from the harvesting of spring wheat from the area of 10 million ha of the North Kazakhstan chernozem lands.

Yields of 10 centners/ha x 10 million ha \$100 per 1 ton = U.S.\$1.0 billion.

Yields of 15 centners/ha x 10 million ha \$100 per 1 ton = U.S.\$1.5 billion.

Therewith, about 5 million tons of barley and oat can be used for fodder purposes.

It is necessary to note that the above calculations are very simplified. However, the increased employment of urban and rural population and the workload of the factory “Akmolselmash” by the manufacturing of anti-erosion equipment are apparent. Besides, the intensive technology of cultivating crops supposes the increase of

production and use of nitrogen and phosphorus fertilizers. This will give impulse to the revival of fertilizer industry and the decrease of unemployment in the republic.

At last, new approach (joint production) to the formulation of herbicides and other means protecting bread grains from seed treatment, crops spraying and disinfection of seed and grain storages will considerably increase the general culture of arable lands and quality of grains.

The calculation of demand for non-selective herbicides to treat 5 million ha of bare fallow with minimized agrotechnical methods is given below.

- Spraying of fallow field with “round-up” or similar non-selective herbicide – 15 thousand tons.
- Spraying of crops against wild oats and suckering weeds on third former fallow field with the area of 5 million ha – 5 thousand tons.
- Treatment of seeds of spring wheat amounting to 1,500,000 tons, it is necessary to have about 3,000 tons of seed treaters. For the seeds of fodder crops amounting to 750,000 tons, it is necessary to have 1,500 tons of seed treaters.

The approximate demand for toxic materials to disinfect storehouses and elevators, where seed and forage grain will be stored:

2.4 million tons of seeds – 0.5 tons of preparation;

1.5 million tons of insurance grain fund – 0.3 tons of preparation.

Standards of fertilizing depending on types of soil and remoteness of crop on former fallow field are as follows:

For common and false chernozem – 30 kg/ha of nitrogen for third crop on former fallow field of 5 million ha and 60 kg of active substance of phosphorus fertilizers applied to fallow field of 5 million ha. Or 20 kg of phosphorus are applied annually to sowing rows.

Thus, total demand for fertilizers for the total area of fallow and crops of 20 million ha is:

Nitrogen fertilizers – 450,000 tons.

Phosphorus fertilizers – 300,000 tons.

Annual demand for spring wheat seeds is 1,500,000 tons for 10 million ha. Annual demand for forage crops is 750,000 tons for 5 million ha. It is necessary to take care of that in good time.

To realize action plans aimed at the implementation of the Convention on Climate Change, which are closely connected with other UN Conventions on Desertification and Maintenance of Biological Diversity in the agricultural sector of economy, we propose to create a center on emission and absorption of GHG in crop production, forestry and animal husbandry, use of solar and wind energy in the Kazakh Baraev’s Research Institute of Grain Farming. This work has already begun in cooperation with the Institute of Ecology and Sustainable Development. Since 1998, the California University in the Kazakh Baraev’s Research Institute of Grain Farming

started studies on absorption of CO₂ by wild vegetation. In future, scholars will observe a forest area and study methane emissions by ruminant animals. The plan of phyto, forest and pasture complex is attached. (Figure 4).

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REPUBLIC OF KAZAKHSTAN

(Precipitation per year, mm,
% of bare fallow)

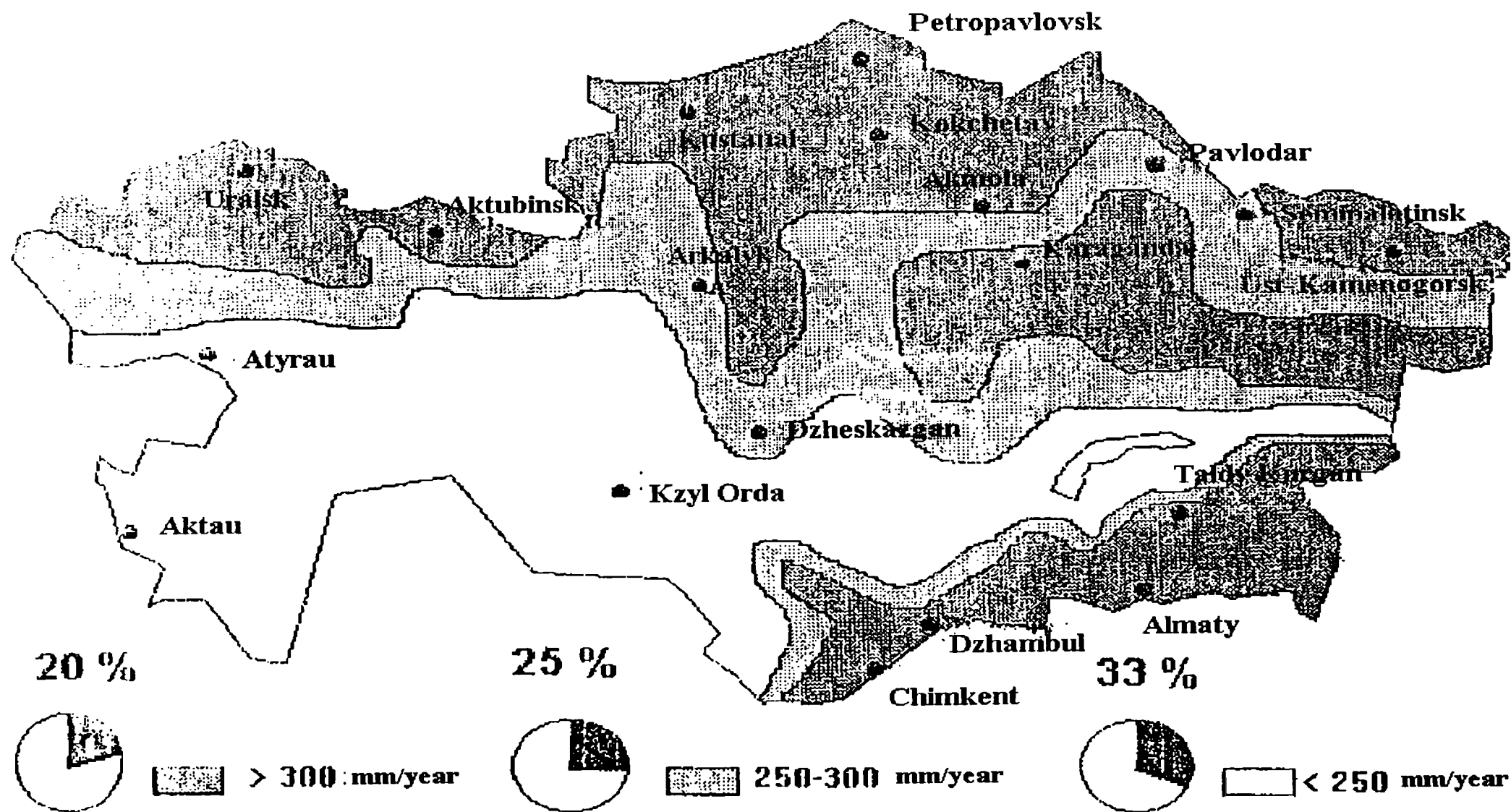


Figure 3.

«Направления развития электроэнергетики»

Электроэнергетика является ядром топливно-энергетического комплекса (ТЭК) страны, надежно обеспечивая на базе единой энергетической системы потребности экономики самым технологичным и экологически чистым энергоносителем. Именно в электроэнергетике реализуется взаимозаменяемость и конкуренция большинства видов топлива и топливных баз между собой, а также с ядерной, гидроэнергией и нетрадиционными видами энергии. Поэтому развитие электроэнергетики должно осуществляться в русле единой энергетической политики государства.

Главной задачей развития топливно-энергетического комплекса является эффективное, надежное и безопасное (в экологическом и технологическом плане) снабжение всех отраслей экономики Республики топливом и энергией, углеводородным сырьем для технологических нужд, и осуществление рационального экспорта топливных ресурсов и энергии.

Уровни развития отраслей ТЭК в значительной степени влияют на развитие экономики Республики. Обеспечение энергетической независимости и безопасности страны возможно только в условиях устойчивого энергоснабжения экономики, что, в свою очередь, обеспечивает основу экономической безопасности страны в целом.

Проблемы, находящиеся в сфере ТЭКа, могут быть решены путем реализации Энергетической стратегии.

Главной целью Энергетической стратегии Казахстана является определение путей и формирование условий наиболее эффективного использования энергетических ресурсов и производственного потенциала ТЭК для подъема жизненного уровня населения и социально-экономического развития страны.

Вторая цель Энергетической стратегии – обеспечить достойную роль энергии как фактора роста производительности труда и средства повышения качества жизни населения.

Важные цели Энергетической стратегии:

- существенно снизить техногенную нагрузку ТЭК на окружающую среду;
- сохранить и укрепить энергетическую независимость и безопасность Республики, использовать энергетические системы как важнейшее средство интеграции регионов и стран-соседей.

Высшим приоритетом Энергетической стратегии должно являться повышение эффективности энергопотребления и энергосбережение.

Рационализация энергопользования может предотвратить неоправданный рост спроса на энергоносители, что позволит добиться экономического эффекта, многократно окупающего затраты на энергосбережение.

Энергосбережение позволит также значительно уменьшить вредные выбросы в атмосферу.

Региональная энергетическая политика должна учитывать принципиальные различия условий энергоснабжения и структуры топливно-энергетического баланса таких зон страны, как Северная, Южная и Западная. При этом она должна сочетать естественное стремление регионов к самообеспечению конечными энергоносителями с сохранением единства ТЭК

Казахстана как важнейшего фактора хозяйственной и политической интеграции страны – путем дальнейшего развития единых энергетических систем, совершенствования действующих и создания новых межрегиональных топливно-энергетических связей.

Новая техническая политика в области энергетики должна ориентироваться на:

- коренное повышение экономической и энергетической эффективности всех стадий добычи, преобразования, распределения и использования энергетических ресурсов;
- отказ от чрезмерной централизации энергоснабжения и эффективную деконцентрацию источников энергии с приближением их к потребителям энергии;
- экологическую и аварийную безопасность источников энергии и надежность энергоснабжения потребителей;
- использование и разработку качественно новых технологий и технических средств для устойчивого развития энергетики: экологически чистых угольных электростанций, эффективных технологий использования новых источников энергии, добычи и переработки углеводородного сырья и т.д.

Главным средством достижения целей и реализации приоритетов Энергетической стратегии является формирование энергетического рынка.

Главная цель функционирования и развития электроэнергетической отрасли - надежное и устойчивое обеспечение всех внутренних потребностей Республики Казахстан в электроэнергии по приемлемым ценам; на этой основе - обеспечение энергетической независимости и энергетической безопасности страны, надежной энергетической базы для устойчивого экономического роста.

Сложность решения этой задачи в настоящий период времени связана со значительной неопределенностью темпов и структуры развития экономики страны, проблемой неплатежей, старением оборудования и задержками инвестиционного процесса.

Технологической основой электроэнергетики страны является Единая энергетическая система (ЕЭС), которая остается высшей формой организации производства, передачи и распределения электрической энергии и мощности независимо от форм собственности в энергетике и способов формирования оптового и региональных рынков электроэнергии.

Для достижения цели надежного и устойчивого обеспечения всех внутренних потребностей Республики Казахстан в электроэнергии в рассматриваемый период необходимо решить ряд задач, существо и приоритетность которых определены на основе анализа существующего состояния электроэнергетики Казахстана и рассмотрения возможных вариантов ее развития.

Существующее состояние электроэнергетики Казахстана характеризуется:

- высокой концентрацией энергопроизводящих мощностей - до 4000 МВт на одной электростанции;
- расположением крупных электростанций преимущественно вблизи топливных месторождений;
- высокой долей комбинированного способа производства электроэнергии и теплоты для производственных и коммунальных нужд; установленная электрическая мощность ТЭЦ, работающих в основном по тепловому графику,

составляет более 38% от мощности всех электростанций страны; при этом покрывается около 40% теплопотребления и около 46% электропотребления.

- недостаточной (около 12%) долей гидростанций в балансе электрических мощностей республики;

- развитой схемой линий электропередачи, где в качестве системообразующих связей выступают ВЛ напряжением 500 и 1150 кВ;

- системой релейной защиты и противоаварийной автоматики, обеспечивающей устойчивость Единой энергетической системы в аварийных и послеаварийных ситуациях;

- единой, вертикально организованной, системой оперативного диспетчерского управления, осуществляемого Центральным диспетчерским управлением, региональными диспетчерскими центрами, диспетчерскими центрами потребителей электроэнергии.

Наличие информации, полученной из различных отраслевых источников, позволило осуществить анализ и прогноз объемов добычи, потребления и потенциального экспорта энергоресурсов в Республике, а также долю потребления энергоресурсов электроэнергетикой.

Суммарная добыча первичных энергоресурсов в Казахстане в 1990г. составила 119,4 млн.т.н.э. При этом:

- Твердого топлива добыто 58,9 млн.т.н.э. (49,3 % от общей величины первичных энергоресурсов),
 - нефти – 25,8 млн.т.н.э. (21,6 %),
 - газа – 6,16 млн.т.н.э. (5,2%),
 - ядерного топлива – 27,9 млн.т.н.э. (23,4%).
 - на долю возобновляемых энергоресурсов пришлось 0,63 млн.т.н.э. (0,5%).
- Потреблено, соответственно, 49,3; 18,95; 11,56; 0,58; 0,63 млн. т.н.э., всего – 81,02 млн.т.н.э.

На тепловых электростанциях в 1990 году потреблялось:

- 41,5 % от общего потребления твердого топлива (20,47 млн.т.н.э.)
- 40,9% от общего потребления газа (4,73 млн.т.н.э.)
- 11,6 % от общего потребления нефти (2,19 млн.т.н.э.)

Суммарное производство электроэнергии в 1990г. составило 87,38 млрд.кВт.ч., на тепловых электростанциях произведено 91 %, на гидравлических - 8,4 %, на атомной - 0,6 % электроэнергии.

В 1995 году на тепловых электростанциях потреблялось:

- 75,5 % от общего потребления твердого топлива (18,81 млн.т.н.э.)
- 34% от общего потребления газа (3,18 млн.т.н.э.)
- 8 % от общего потребления нефти (1,55 млн.т.н.э.)

Суммарное производство электроэнергии в 1995г. составило 66,98 млрд.кВт.ч., на тепловых электростанциях произведено 87,1%, на гидравлических - 12,4 %, на атомной - 0,5 % электроэнергии.

В целом добыча энергоресурсов (нефти, угля, газа, ядерного топлива) в Казахстане может возрасти в 2,5-2,8 раза к 2030 году.

Доля Казахстана в суммарном мировом производстве первичных энергоресурсов в этом случае может увеличиться с 1,6% в 1990 году до 3,2% в 2030 году.

Анализ имеющейся информации показывает, что собственная суммарная потребность в первичных энергетических ресурсах может возрасти к 2030 году

в 1,4 - 1,55 раза по отношению к 1990 году. Доля Казахстана в суммарном мировом потреблении первичных энергоресурсов к 2030 году сохраниться на уровне 1990 года (в пределах 0,9%).

Анализ существующего состояния электроэнергетики, тенденций перспективного развития электроэнергетики разных стран, прогнозная оценка перспектив развития топливно-энергетического комплекса Казахстана показывают, что приоритетными задачами, решение которых необходимо осуществлять в период до 2015 года, являются:

В отношении генерирующих мощностей -

- восстановление выработки электроэнергии на действующих электростанциях путем их реабилитации и реконструкции, что является наиболее дешевым и быстрым решением;
- поддержание мощностей электростанций на проектном уровне путем своевременного ввода оборудования новых поколений взамен подлежащих демонтажу из-за истечения нормативного срока службы;
- ввод новых мощностей на действующих электростанциях, задел для которых осуществлен до 1998 г., и строительство новых газовых (в первую очередь электростанции в районе Актюбинска) и гидроэлектростанций (на Юге Республики) для удовлетворения внутренних потребностей, для улучшения структуры генерирующих мощностей, создания специальных пиковых и резервных мощностей;
- более широкое вовлечение в баланс топлива электростанций природного газа, в том числе попутного газа нефтяных месторождений;
- освоение экономически конкурентоспособных возобновляемых энергоресурсов.

Динамика процесса будет определяться фактором спроса на электроэнергию и программами технического перевооружения собственников энергетических объектов, учитывающих экологические требования, действующие в Республике Казахстан. При разработке технологических нормативов для вновь сооружаемых котельных агрегатов, и/или подлежащих глубокой модернизации на действующих ТЭС, необходимо основываться на мировом опыте технического нормирования, достигнутом уровне развития техники, экологических особенностях Казахстана, состоянии и перспективах становления экономики республики. Нормативы, помимо всего прочего, должны оказывать благоприятное воздействие на инвестиционный климат в Республике Казахстан.

Целесообразно максимально сохранить комбинированную выработку электроэнергии и тепла на действующих ТЭЦ и ориентировать перспективное развитие теплоснабжения на внедрение этой технологии там, где это экономически будет оправдано, учитывая ее высокую энергоэффективность, энергосберегающий потенциал.

Компактные автоматизированные теплоисточники с к.п.д. 90% найдут широкое применение вне зон теплофикации, где находится половина потребителей тепла.

В целом, в зависимости от сценариев развития, в структуре потребления электроэнергии на перспективу, в соответствии с социальной направленностью развития экономики, внедрением новых технологий в энергоемких отраслях, можно прогнозировать тенденцию к снижению доли потребления электроэнергии промышленностью с 66,7 % в 1990 году до порядка 62% к 2015

году. В тоже время произойдет увеличение доли потребления электроэнергии в социально направленной сфере с 17,4% в 1990 году до порядка 25 % к 2015 году.

При увеличении производства электроэнергии к 2015 г. в 1,3 раза к уровню 1995 года, в соответствии с рекомендуемым восстановлением и развитием электростанций, абсолютная величина газа, используемого для выработки электроэнергии и тепла на электростанциях, возрастет в 1,7 раза; потребление угля и мазута сохранится практически на уровне 1995 г., что объясняется возможностью улучшения технических характеристик заменяемого оборудования и снижением удельных расходов топлива.

К 2015 г. произойдут изменения не только в структуре потребляемого топлива на ТЭС, но и в структуре производства электроэнергии. Возможно увеличение производства электроэнергии на газовых электростанциях на 8 млрд.кВт.ч, угольных - на 10 млрд.кВт.ч, гидроэлектростанций на 1 млрд.кВт.ч.

Структура выработки электроэнергии различными типами электростанций в относительных единицах на уровне 2015 г. оценочно можно выразить следующими показателями:

- ТЭС на угле - 66,8%
- ТЭС на газе - 21,2%
- ГЭС - 11,2%
- АЭС - 0,6%
- ВЭС - 0,2%

Суммарное производство электроэнергии на базе возобновляемых источников энергии (включая гидроисточники) в Казахстане составляло 8,3 млрд. кВтч в 1995 г., и увеличится до 9,8 млрд.кВтч в 2015 г.

В структуре потребляемого топлива на тепловых электростанциях на уровне 2015 г., оценочно, доля угля снизится с 80 % до 73 %, доля мазута снизится с 6,6% до 6,%, а доля газа увеличится с 13,4% до 21%.

Trends of Power Industry Development (Theses to the Seminar)
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KEGOC

Power industry is the core of fuel and energy complex of the country. Basing on the single energy system, it provides the needs of economy with the energy carrier, which is ecologically clean and adaptable to streamlined production.

It is the power industry, where interchangeability and competition among most types and bases of fuel, and with nuclear, hydro and alternative types of energy, materialize. Therefore, the development of power industry should be carried out in the channel of single energy policy of the country.

The main objective of developing the fuel and energy complex is the efficient, reliable and safe (in terms of ecology and technology) supply of fuel, energy and hydrocarbon raw materials for technological needs to all sectors of economy. The objective includes rational export of fuel resources and energy.

Levels of development for each sector of the fuel and energy complex affect the development of the Republic's economy to a considerable extent. Energy independence and safety of the country are possible only under the conditions of sustainable energy supply to the economy. This in its turn provides for the basis of economic safety of the country as a whole.

Problems pertaining to the fuel and energy complex can be solved by the realization of the Energy Strategy.

Major goal of the Energy Strategy of Kazakhstan is to determine ways and to form conditions for the most efficient use of energy resources and production potential of the fuel and energy complex. The purposes of that are the increase of living level of population and social and economic development of the country.

Second goal of the Energy Strategy is provide for the deserving role of energy as a factor of productivity growth and a means of increasing the living quality of population.

Important targets of the Energy Strategy:

- Considerably decrease the man-caused load of the fuel and energy complex on environment;
- Conserve and strengthen energy independence and safety of the Republic, use energy systems as the most important means for integration of regions and neighboring countries.

The highest priority of the Energy Strategy should be the increased efficiency of energy consumption and saving.

Rationalization of the energy use can prevent unjustified grow of demand on energy carriers, that will allow achieving economic effect, which multiply pays its costs on energy saving.

Energy saving will also allow considerably decreasing pollutant emissions.

Regional energy policy should consider fundamental differences in conditions of energy supply and structure of fuel and energy balance of such zones of the country, as the North, South and Western zones. Therewith, it should combine natural aspiration for self-provision with final energy carriers, maintaining the unity of fuel and energy complex of Kazakhstan as the most important factor of economic and political integration of the country. This should be made by further development of single energy systems, improvement of the existing and creation of new interregional fuel and energy links.

New technical policy in power industry should be oriented at the following:

- Fundamental increase of economic and energy efficiency of all stages – extraction, conversion, distribution and use of energy resources.
- Rejection of excessive centralization of energy supply, efficient deconcentration of energy sources with drawing them closer to energy consumers.
- Ecological and emergency safety of energy sources, reliability of energy supply for consumers;
- Use and development of new technologies and technical means for sustainable development of power industry: ecologically clean coal power plants, efficient technologies of using new energy sources, extraction and processing of hydrocarbon raw materials, etc.

Major means of achieving the goals and realizing the priorities of the Energy Strategy is the formation of energy market.

Main goal of functioning and developing power industry is reliable and sustainable provision of all internal needs of the Republic of Kazakhstan in electric power on acceptable prices. This is the basis to provide for energy independence and safety, and reliable energy base for sustainable economic growth.

The complexity of solving this problem at present relates to considerable indefiniteness of rate and structure of the economy development, the problem of payment defaults, aging of equipment and delays of investment process.

Technological basis of power industry is the Electric Power Pool. The Electric Power Pool remains the highest organization form for generation, transmit and distribution of electric power regardless of the forms of ownership in the power industry and ways of forming wholesale and regional energy markets.

To achieve the goal of reliable and sustainable electric power supply for all internal energy needs of Kazakhstan during the given period, it is necessary to solve a series of problems. The essence and priority of the problems are determined based on the analysis of the current state of power industry in Kazakhstan and consideration of possible options for its development.

The current condition of power industry of Kazakhstan is characterized by the following:

- High concentration of energy generating capacities – up to 4,000 megawatt on one power plant.

- Big power plants are located mainly near fuel deposits.
- High share of the combined method of electric power and heat generation for industrial and municipal uses. Set electric capacity of thermal power plants working mainly under the heating schedule is over 38% of all power plants' capacity of the country. About 40% of heat consumption and 46% of electric power consumption are covered therewith.
- Insufficient (about 12%) share of hydropower plants in the balance of electric capacities of the Republic.
- Developed scheme of transmission lines, where lines of 500 and 1150 kV act as system-creating links.
- System of relay protection and emergency automatic equipment securing stability of the Electric Power Pool in emergency and postemergency situations.
- Single, vertically organized system of operative dispatching management carried out by the Central Dispatching Board, regional dispatching centers and dispatching centers of energy consumers.

Available information was obtained from different sector sources. It allowed analyzing and projecting the amounts of extraction, consumption and potential export of energy resources in the Republic and the share of energy consumption by power industry.

In 1990, total extraction of primary energy resources in Kazakhstan totaled 119.4 million tons of oil equivalent, including
 Solid fuel – 58.9 million tons of oil equivalent (49.3% of the total amount of primary energy resources),
 Oil – 25.8 million tons of oil equivalent (21.6%),
 Gas – 6.16 million tons of oil equivalent (5.2%),
 Nuclear fuel – 27.9 million tons of oil equivalent (23.4%),
 Renewable energy resources – 0.63 million tons of oil equivalent (0.5%).
 Consumed 49.3; 18.95; 11.56; 0.58; 0.63 million tons of oil equivalent respectively.
 Total consumption is 81.02 million tons of oil equivalent.

In 1990, thermal power plants consumed:

- 41.5% of the total consumption of solid fuel (20.47 million tons of oil equivalent)
- 40.9% of the total gas consumption (4.73 million tons of oil equivalent)
- 11.6% of the total consumption of oil (2.19 million tons of oil equivalent)

In 1990, total electric power generation amounted to 87.38 billion kWh. Thermal power plants generated 91%, hydropower plants – 8.4% and nuclear power plants – 0.6% of electric power.

In 1995, thermal power plants consumed:

- 75.5% of the total consumption of solid fuel (18.81 million tons of oil equivalent)
- 34% of the total gas consumption (3.18 million tons of oil equivalent)
- 8% of the total consumption of oil (1.55 million tons of oil equivalent)

In 1995, total generation of electric power amounted to 66.98 billion kWh. Thermal power plants generated 87.1%, hydropower plants – 12.4% and nuclear power plants – 0.5% of electric power.

In summary, extraction of energy resources (oil, coal, gas and nuclear fuel) in Kazakhstan may increase 2.5-2.8 times by 2030. In this case, the share of Kazakhstan in the total world production of primary energy resources may increase from 1.6% in 1990 to 3.2% in 2030.

The analysis of available information shows that the demand of Kazakhstan for primary energy resources may increase 1.4-1.55 times by 2030 in relation to 1990. The share of Kazakhstan in the total world consumption of primary energy resources by 2030 may remain at the level of 1990 (within 0.9%).

The analysis of the current condition of power industry and trends of future development of power industry in different countries and the projected assessment of development prospects for the fuel and energy complex of Kazakhstan show that the priority objectives, which should be solved before 2005, are the following. Regarding generating capacities:

- Restoration of power generation on functioning power plants through their rehabilitation and reconstruction, what is the cheapest and fastest decision;
- Maintenance of power plants' capacities at the project level through timely introduction of advanced equipment instead of outdated equipment, which should be dismantled;
- Introduction of new capacities on the functioning power plants, the initial work for which was carried out before 1998; construction of new gas (primarily the power plant near Aktubinsk) and hydropower plants (South of the Republic) to satisfy internal needs, to improve the structure of generating capacities, to create special peak and reserve capacities;
- Wider involvement of natural gas, including casing-head gas of oil deposits, in the fuel balance of power plants;
- Development of economically competitive, renewable energy resources.

The factor of demand for electric power and the programs of technical reequipment will determine dynamics of the process for the owners of energy facilities, which consider ecological requirements of the Republic of Kazakhstan. Developing technological standards for boiler plants newly constructed and/or being subjects of profound modernization on functioning thermal power plants, it is necessary to base on the world experience of technical normalization, achieved level of technical development, ecological peculiarities of Kazakhstan, condition and prospects of the Republic's economy. Norms, along with other aspects, should exercise favorable effect on investment climate in the Republic of Kazakhstan.

It is expedient to maximally conserve combined generation of electric power and heat on functioning thermal power plants and to orient prospective development of heat supply at the introduction of this technology where it will be economically reasonable, taking into account its high energy efficiency and energy-saving potential.

Compact automated heat sources with efficiency of 90% will find wide application beyond the zones of heat supply, where there is half of heat consumers.

In general, depending on development scenarios, in the structure of future electric power consumption, it is possible to project a tendency towards the decrease of the industry's share of electric power consumption from 66.7% in 1990 to about 62% by 2015. The projection of the tendency is based on the socially oriented economic development and the introduction of new technologies in the energy-intensive sectors. At same time, the share of electric power consumption in the socially oriented sphere will increase from 17.4% in 1990 to about 25% in 2015.

According to the recommended restoration and development of power plants, the generation of electric power will increase 1.3 times the level of 1995 by 2015. In this case, absolute value of gas used for generation of electric power and heat at power plants will increase 1.7 times. Consumption of coal and oil fuel will remain practically at the level of 1995. It is explained by the possibility to improve technical characteristics of replaced equipment and to decrease specific fuel consumption.

By 2015, not only the structure of fuel consumed by power plants but also the structure of electric power generation will change. It is possible, that gas power plants will increase electric power generation by 8 billion kWh. Coal power plants and hydropower plants will likely increase it by 10 billion kWh and 1 billion kWh respectively.

The structure of electric power generation by different types of power plants in relative units at the level of 2015 can be estimated by the following indices:

coal power plant – 66.8%,
gas power plant – 21.2%,
hydropower plant – 0.6%,
windmill power plant – 0.2%.

Total generation of electric power based on renewable energy sources (including hydro sources) in Kazakhstan was 8.3 billion kWh in 1995. It will increase up to 9.8 billion kWh in 2015.

In the structure of fuel consumed by heating power plants at the level of 2015, as estimated, the share of coal will decrease from 80% to 73%, the share of fuel oil will decrease from 6.6% to 6%, and the share of gas will increase from 13.4% to 21%.

The Environmental Research Center offers a multi dimensional approach for studying environment conservation problems:

- Development of maps of ecological character;
- Evaluation of ecological and resources potential, biodiversity, extent of disturbing natural systems;
- Environmental damage assessment caused by various types of economic activities;
- Introduction of new technologies and latest scientific achievements into the practice of rational conservancy;
- Inventory, mapping, and scientific justification of sites for establishing a nature reserve fund;
- Inventory, and assessment of biodeversion of flora and fauna;
- Development of GIS and data base for various regions of Kazakhstan;
- Processing of space information.

Саидмурат Таниберген
Агентство по стратегическому планированию
и реформам Республики Казахстан

Стратегия «Казахстан – 2030» предусматривает комплекс мероприятий, направленных на создание благоприятной среды обитания для нынешних и грядущих поколений страны. Ставятся задачи по обеспечению чистоты атмосферного воздуха и качества питьевой воды. Будет проводиться работа по уменьшению негативного воздействия накопленных промышленных отходов на состояние природной среды и здоровье людей. Особое внимание будет уделено дезактивации и рекультивации территорий, загрязненных в следствие многолетних ядерных испытаний, проводившихся в Казахстане в советский период.

Учитывая приоритетность для Казахстана природоохранных мероприятий и необходимость крупномасштабного международного сотрудничества, в настоящее время проводятся расчеты валовых выбросов парниковых газов и рассматриваются правовые аспекты Рамочной конвенции ООН по изменению климата с целью выработки согласованной позиции руководства страны в отношении целесообразности и условий присоединения Казахстана к Киотскому протоколу.

Тем не менее, возможность международных контактов и международной помощи Казахстану очевидна. Сжигание огромных количеств органического топлива для получения электрической и тепловой энергии, получение черных и цветных металлов из преимущественно сульфидных руд, крайне низкая лесистость территории — все это требует принятия безотлагательных мер по оснащению промышленных объектов современными очистными сооружениями и по расширению лесопосадок, что в совокупности позволит уменьшить выбросы парниковых газов.

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of the Republic of Kazakhstan

The Kazakhstan - 2030 strategy makes provision for the package of actions aimed at creating of favorable human habitat for the present and future generations of the country. There are outlined the challenges to ensure purity of the environmental air and the drinking water quality. Work will be carried out on decreasing the adverse effect by the accumulated industrial waste on the environmental conditions and human health. Particular attention will be given to decontaminating and recultivating of the territories polluted by the long-standing nuclear tests conducted in Kazakhstan during the Soviet period.

Having regard to the priority for Kazakhstan of the environmental actions as well as pressing necessity in large-scale international cooperation, at present the calculations are being made as to the total greenhouse gases emissions and the legal aspects of the UNO Framework Convention are being considered relating to the climate changes with the object of developing the concerted position of the officials of the country in respect of expediency and terms of adherence of Kazakhstan to the Kyoto Protocol.

Nevertheless, it is quite evident that there are potentialities in the international contacts and international assistance for Kazakhstan. The burning of massive quantities of the organic fuels in order to generate the electric and heat power, to recover the ferrous and non-ferrous metals principally from the sulfide ores, extremely low woodiness of the territory - all this requires to take immediate steps in equipping the industrial projects with the up-to-date treatment facilities and in expansion of the forest planting which, in the aggregate, will make it possible to decrease the greenhouse gases emissions.

НАЦИОНАЛЬНАЯ ЭКОЛОГИЧЕСКАЯ СТРАТЕГИЯ РЕСПУБЛИКИ КАЗАХСТАН ПО СОКРАЩЕНИЮ ВЫБРОСОВ ПАРНИКОВЫХ ГАЗОВ

Вступление

Республика Казахстан находится на этапе перехода от авторитаризма к демократии, от централизованно планируемой к рыночной открытой и регулируемой экономике. В стране происходят крупные экономические изменения и структурная перестройка экономики.

Текущее положение в стране характеризуется прекращением обвального падения экономики и переходом к замедленному падению. (Слайд 1). Стихийные рыночные процессы переходят к управляемым стабильным программам, комплексному подходу проведения реформ.

Экономика Казахстана развивалась как ресурсно-сырьевая база бывшего Советского Союза с огромной нагрузкой на природу. Отсутствие рационального учета природного и экологического потенциала, несоблюдение экологических требований, слабого использования экономических оценок, минимальное финансирование природоохранных мероприятий привело ко многим экологическим проблемам.

Понимание в необходимости изменений приводит к тому, что в Казахстане сейчас формируется новая экологическая политика, ориентированная на экономические методы природопользования. Это нашло свое отражение в законе "Об охране окружающей среды", в концепции экологической безопасности РК и в Стратегии 2030 "Экология и природные ресурсы". (Слайд 2).

Стратегия по изменению климата.

Мы собрались, чтобы обсудить одну проблему - изменения климата.

Несмотря на то, что продолжают споры ученых о зависимости изменения климата, потепления и экономической деятельности человека, очень много разногласий политического, экономического, технического характера. Несомненно, что нужно уже сейчас предпринимать активные меры в области изучения воздействия ПГ, инвентаризации, разработки стратегий и планов действий, как в целом по стране, так и по секторам экономики.

Мы знаем о работах проводимых в мире и хотим рассказать вам о положении в Казахстане.

Казахстан занимает первое место в Центральной Азии по выбросам ПГ. (Слайд 3).

Положение Казахстана по выбросам в мире. (Слайд 4).

Этапы работ в Казахстане по РКИК. (Слайд 5).

Для того, чтобы меры по сокращению выбросов ПГ в Казахстане не были случайными и спонтанными, а были экономически оправданными и эффективными должна быть разработана стратегия, основанная на координации действий всех министерств, ведомств и заинтересованных организаций. Учитывающая интересы всех организаций и прежде всего интересы людей.

Содержание Стратегии. (Слайд 6).

Приоритетные мероприятия по выбросам ПГ. (Слайд 7).

Интересы РК. (Слайд 8).

CO 2 Emissions in Central Asia, 1995

(000 metric tons)

<i>Country</i>	<i>Total emission</i>	<i>Population (Th. in 1998)</i>	<i>Emission per Capita</i>
Kazakhstan	221,478	16,854	13.2
Kyrgyzstan	5,463	4,497	1.2
Tajikistan	3,741	6,161	0.7
Turkmenistan	28,334	4,316	7.0
Uzbekistan	98,877	24,105	4.4

Source: World Resources 1998-99

CO 2 Emissions in World, 1995

<i>Country</i>	<i>Total emissions (million tonnes)</i>	<i>Emissions per Capita (tonnes)</i>	<i>Emissions/GDP (Kg/US\$)</i>	<i>Commitments</i>
Kazakhstan	221.5	13.2	3.38	?
Austria	59.3	7.4	0.41	- 8 %
Germany	835.1	10.2	0.63	- 8 %
Russia	1,818.0	12.2	2.14	0 %
Ukraine	438.2	8.5	2.45	0 %
Australia	289.8	16.2	0.88	+ 8 %
USA	5,468.5	20.5	0.85	- 7 %

Source: World Resources 1998-99

The Strategy of the Economy Sectors

- **Energy Sector**
 - improving of the energy efficiency;
 - involving of the renewable energy;
 - increasing of the clean fuel share.
- **Industry Sector**
 - restructuring;
 - increasing of the energy efficiency;
 - implementing of energy saving measurements.
- **Coal mines Sector**
 - methane utilization.
- **Agriculture Sector**
 - increasing productivity of livestock;
 - transformation of lands productivity;
 - developing of ecological farming.
- **Forestry**
 - increasing of the forest area.

NATIONAL ECOLOGICAL STRATEGY OF THE REPUBLIC OF KAZAKHSTAN ON REDUCTION OF EMISSIONS OF GREENHOUSE GASES

S. A. Elkin, National Ecological Center of Sustainable Development

Introduction

The Republic of Kazakhstan is at the stage of transiting from authoritarianism to democracy, from the centralized and planned economy to the economy, which is market, open, and regulated. Big economic changes and structural reconstruction of economy go on in the country.

Current situation in the country is characterized by the termination of avalanching downfall and the transition to slow decline (Slide 1). Spontaneous market processes transit to the manageable stable programs and the complex approach of carrying out reforms.

The economy of Kazakhstan developed as a base of resources and raw materials for the former Soviet Union with great load on nature. The absence of rational record keeping of natural and ecological potential, non-observance of ecological requirements, weak use of economic assessments, and minimum funding of environmental measures led to many ecological problems.

Understanding of the necessity of changes results in the fact, that now new ecological policy oriented at economic methods of nature use is being formed in Kazakhstan. This was reflected in the Law “On Environment Protection”, in the concept of ecological safety of Kazakhstan and in the Strategy 2030 “Ecology and Natural Resources” (Slide 2).

Climate Change Strategy

We gathered to discuss one problem – the problem of climate change. Despite the disputes of scholars on relationship of climate change, warming and human economic activity continue, there are very many political, economic and technical differences. Undoubtedly, it is essential to undertake active measures without delay for both the country as a whole and each sector of economy in the areas of the study of GHG impact, inventory and development of strategies and action plans.

We know about works carried out in the world and want to tell you about the situation in Kazakhstan.

Kazakhstan holds first place on emissions in the Central Asia (Slide 3).

Position of Kazakhstan in the world concerning emissions (Slide 4).

Stages of work concerning the Frame Convention on Climate Change in Kazakhstan (Slide 5).

For the measures on reduction of GHG emissions in Kazakhstan to be not spontaneous and casual but justified and efficient, it is necessary to develop a strategy

based on the coordination of activities of all ministries, authorities and concerned organizations. This strategy should consider interests of all organizations and in the first place that of people.

Contents of the Strategy (Slide 6).

- Priority measures on emissions (Slide 7).

- Interests of the Republic of Kazakhstan (Slide 8).

Некоторые специфичные пути снижения выбросов парниковых газов (ПГ) в Казахстане

I. Особенности Казахстана для оценки потенциала снижения выбросов ПГ следует считать:

- 1. Высокая доля ТЭЦ , использующих необогащенные высокочольные угли**
- 2. Заметная часть общей выработки энергии расходуется на металлургических предприятиях**
- 3. Выделяется большое количество не утилизируемых попутных ПГ (метана) при добыче нефти и угля**
- 4. Имеется большое количество накопленных угольных и кальцийсодержащих промышленных отходов**
- 5. Значительную часть промышленности Казахстана составляет добыча и переработка урана и производство обогащенного ядерного топлива (27 % общего производства топлива)**

II. С учетом сказанного , основными направлениями по снижению выброса ПГ в реальном секторе экономики Казахстана представляются:

- 1. Расширение производства обогащенных углей. При этом можно ожидать : а) существенного снижения объема транспортировки угля железнодорожным и автомобильным парками; б) снижения затрат ресурсов (энергия, вода, персонал и др.) на обработку , транспортировку и хранение золы ТЭЦ .**
- 2. Расширение использования энергосберегающих технологий в цветной и черной металлургии, включая переход на новые процессы обжига сульфидного сырья без получения серной кислоты. При этом , кроме снижения выбросов ПГ , будут снижены выбросы оксидов серы , мышьяка, азота и др.**
- 3. Расширение утилизации попутного метана при добыче нефти и угля с получением дополнительной энергии.**

Выбросы CO₂ на территории Центральной Азии в 1995 г.
(тыс. метрических тонн)

Страна	Общий объем выбросов	Население (тыс., 1998 г.)	Объем выбросов на душу населения
Казахстан	221478	16854	13,2
Кыргызстан	5463	4497	1,2
Таджикистан	3741	6161	0,7
Туркменистан	28334	4316	7,0
Узбекистан	98877	24105	4,4

Источник: Мировые ресурсы 1998-1999 гг.

С. Елькин
NEC SD

Выбросы CO₂ в мире 1995 г.

Страна	Общий объем выбросов (млн. т.)	Объем выбросов на душу населения (тонн)	Выбросы/ВВП (кг/долларов США)	Обязательства
Казахстан	221,5	13,2	3,38	?
Австрия	59,3	7,4	0,41	-8%
Германия	835,1	10,2	0,63	-8%
Россия	1818,0	12,2	2,14	0%
Украина	438,2	8,5	2,45	0%
Австралия	289,8	16,2	0,88	+8%
США	5468,5	20,5	0,85	-7%

Источник: Мировые ресурсы 1998-1999 гг.

С. Елькин
NEC SD

СТРАТЕГИЯ ОТРАСЛЕЙ ЭКОНОМИКИ

- **ЭНЕРГЕТИКА**
 - Улучшение эффективности применения энергии
 - Привлечение возобновляемых источников энергии
 - Увеличение доли чистого топлива
- **ПРОМЫШЛЕННОСТЬ**
 - Реструктуризация
 - Улучшение эффективности применения энергии
 - Осуществление энергосберегающих мероприятий
- **УГЛЕДОБЫВАЮЩАЯ ПРОМЫШЛЕННОСТЬ**
 - Применение метана
- **СЕЛЬСКОЕ ХОЗЯЙСТВО**
 - Увеличение производительности животноводства
 - Трансформация производительности земель
 - Развитие экологического сельского хозяйства
- **ЛЕСНОЕ ХОЗЯЙСТВО**
 - Увеличение лесных площадей

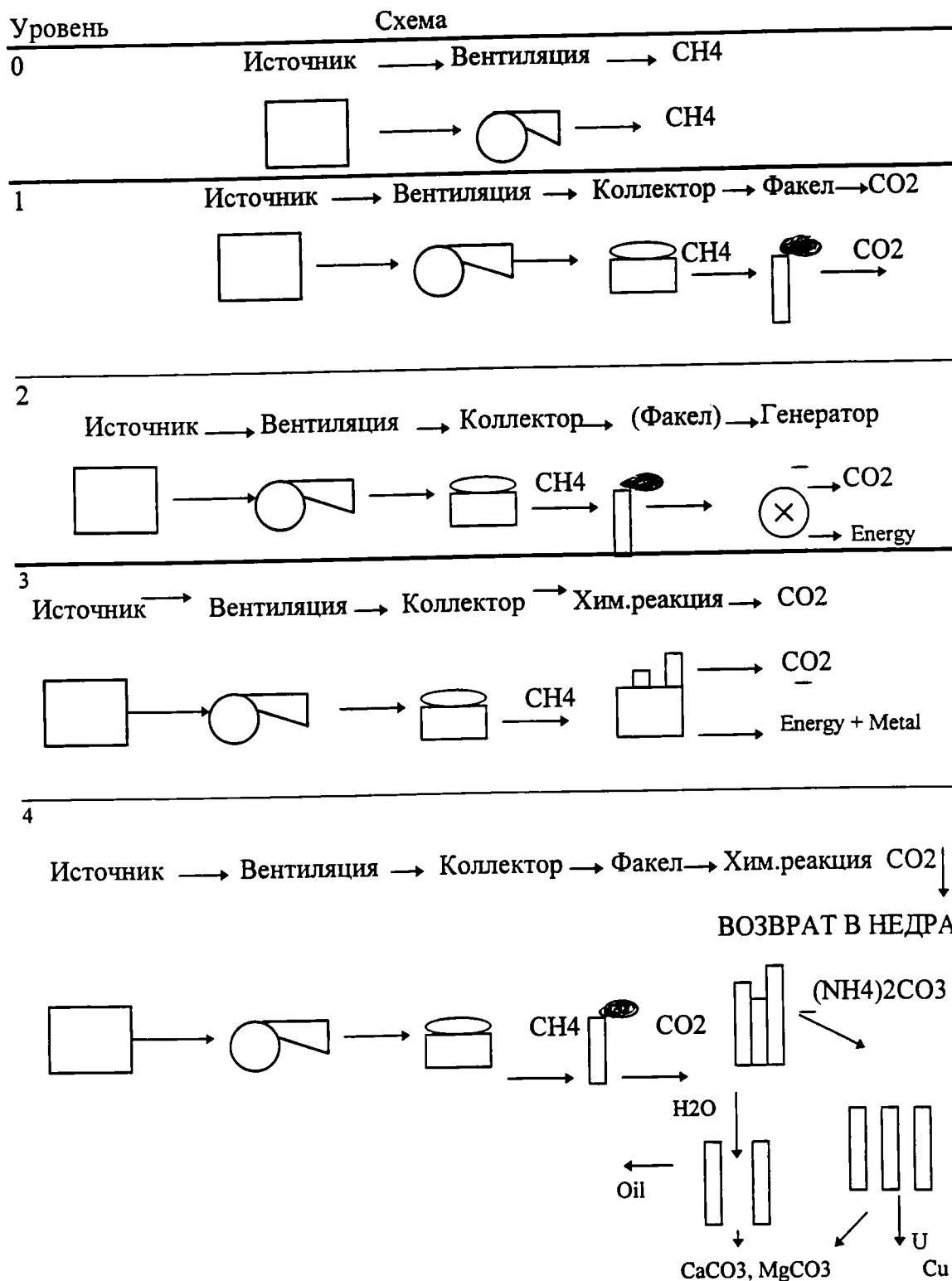
С. Елькин
NEC SD

4. Вовлечение в промышленную переработку отходов, содержащих угли и оксид кальция . Например , использование их в металлургических агрегатах вместо стандартных углей и известняков . При этом только на одном предприятии - АО "Испат-Кармет"- сокращение выброса ПГ ожидается в объеме до 300 - 400 тысяч тонн CO₂ в год.
5. Поддержка устойчивой работы уранового комплекса Казахстана. При этом:
 - А) Производимое ядерное топливо позволит поддерживать существующую заметную долю производства энергии на атомных электростанциях в традиционных странах-потребителях казахстанского ядерного топлива -России, Украине и др.
 - Б) Экспортируемый из Казахстана более дешевый очищенный природный уран также может способствовать конкурентоспособности ядерной энергетики во многих странах Америки , Азии и Европы и тем самым создать условия для снижения выбросов ПГ в глобальном масштабе.
6. Привлечение научного потенциала страны к исследованиям по связыванию выделяющихся в промышленном секторе ПГ в устойчивые соединения. Например, водные растворы уголекислоты могут быть использованы для закачки в недра при добыче нефти и выщелачивании урановых и медных руд. При этом высока вероятность фиксации карбонат-ионов в земной толще с образованием инертных карбонатов кальция и магния.

Данные предложения частично иллюстрированы прилагаемым рисунком.

СОКРАЩЕНИЕ ПАРНИКОВЫХ ГАЗОВ

Обзор возможных решений



Duisebaev Baurzhan
National Ecological Center on Sustainable Development of the RK
(North-Eastern Regional Department)

Some Specific Ways of Reducing GHG Emissions in the RK

- I. Following peculiarities for evaluation of the potential in reducing GHG emissions must be considered specific for Kazakhstan:
 1. A big share of thermal power stations which use raw coal with high-ash content;
 2. A considerable part of total power generation used by metallurgical plants;
 3. Big amounts of associated gas (methane) coming with oil and coal extraction, which are not utilized;
 4. Big amounts of coal ashes and process wastes with calcium content;
 5. Considerable part of industry of Kazakhstan is comprised of uranium extraction, processing, and production of enriched nuclear fuel (27% of the total fuel production).
- II. Considering what has been stated above, the main directions in reducing GHG emissions in the economic sectors of the RK are as follows:
 1. Expansion of production of cleaned coal. It is expected that it will lead to:
 - a) considerable reduction of volumes of railway and automobile traffic;
 - b) reduction of costs of resources (energy, water, staff, etc.) for processing, transportation, and storage of ashes of thermal power stations;
 2. Expansion of application of energy saving technologies in non-ferrous and ferrous metallurgy, including transition to new processes of sulphatizing roasting without producing sulfuric acid. Besides, reduction of GHG emissions will lead to reduction of oxides of sulfur, arsenic, nitrogen, etc;
 3. Expansion of utilization of associated methane received with oil and coal extraction will give a source of additional energy;
 4. Recycling of process wastes containing ashes and calcium oxides. Their utilization, for example, in metallurgical units instead of coal and limestone. Reduction of GHG emissions at the JSC Ispat Karmet only, is expected to be in the range of 300-400 thousand tons of CO₂ per year;
 5. Support for sustainable development of the Uranium Complex of Kazakhstan:
 - a) Production of the nuclear fuel will allow maintaining the existing power generation capacities of nuclear power stations in countries,

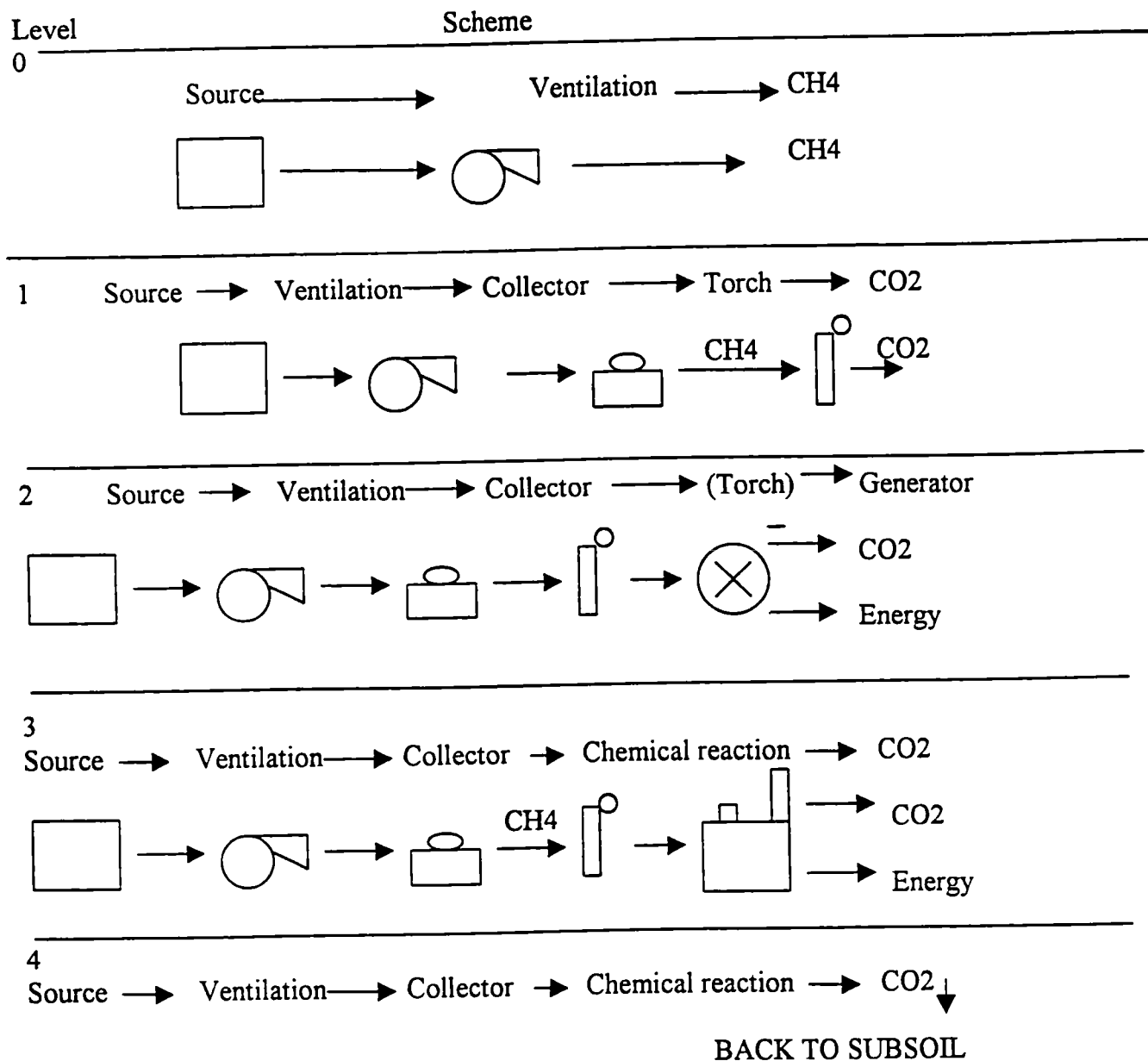
which are traditional consumers of Kazakhstani nuclear fuel, such as Russia, Ukraine, etc;

- b) Less expensive purified natural uranium exported from Kazakhstan will facilitate competitiveness of nuclear energy sector in many countries of America, Asia, and Europe creating conditions for reducing GHG emissions globally.
6. Attraction of scientific potential of the country for studying transition of industrial GHG emissions into resistant compounds through binding. For example, water compounds of carbon dioxide can be used for pumping into the oil wells for leaching uranium and copper ore. This increases likelihood of fixation of carbonate ions in the subsoil with formation of inert carbonate of calcium and magnesium.

The suggestions stated above are partially illustrated on the Figure below.

REDUCTION OF GHG EMISSIONS

Review of Possible Solutions



«О сокращении выбросов парниковых газов в энергетическом секторе Казахстана»

Развитие человеческой цивилизации на Земле сопровождается неизбежным ростом потребления энергоресурсов. Основные технологии производства энергии связаны с потреблением ископаемых топлив и сопровождающих это потребление глобальными объемами выбросов в атмосферу продуктов горения топлива. Последствием таких объемов выбросов в атмосферу является происходящие изменения климата и связанные с этим изменением климата глобальные негативные изменения среды обитания человека, наносящие огромный вред человеческой цивилизации.

Республика Казахстан подписала Рамочную Конвенцию Организации Объединенных Наций об изменении климата в 1992г. и таким образом, присоединилась к мировому сообществу в вопросе снижения выбросов парниковых газов и демонстрирует понимание проблемы и готовность, по мере экономических возможностей, осуществлять меры, направленные на снижение выбросов ПГ.

В соответствии с имеющимися материалами инвентаризации выбросов парниковых газов 1990-1994гг, Казахстан относится к группе государств со значительными выбросами парниковых газов. В 1990г выбросы парниковых составили примерно 266 млн. т CO₂-эквивалента, в 1994г - 200 млн.т CO₂-эквивалента.

Примерно 50% от общей эмиссии ПГ приходится на энергетический сектор Республики. Значительные показатели выбросов ПГ в энергетическом секторе Казахстана обуславливаются структурой генерирующих мощностей (75% мощностей - тепловые электростанции), структурой топливного баланса (85% уголь), техническим состоянием оборудования, обусловленным физическим и моральным износом основной части мощностей.

Сокращение выбросов парниковых газов энергетическим сектором Республики является приоритетным направлением в стратегии деятельности по сокращению этих выбросов. Общий потенциал такого сокращения оценивается в 40%. При этом под потенциалом понимается возможность сокращения выбросов ПГ при осуществлении определенных мероприятий, направленных на это сокращение.

Потенциал сокращения выбросов ПГ можно условно распределить между производством и потреблением энергии. В свою очередь мероприятия по сокращению выбросов ПГ можно сгруппировать в группы мероприятий по энергосбережению и - повышению энергоэффективности.

В краткосрочной перспективе преобладающими являются мероприятия энергосбережения, в средне и долгосрочной перспективе - повышения энергоэффективности. Для условия Казахстана существуют особенности в применении тех или иных мероприятий по снижению выбросов парниковых газов в энергетическом секторе. В докладе предполагается охарактеризовать возможность применения тех или технических мероприятий в энергетическом Казахстане.

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Theses of the Report
On Reduction of Greenhouse Gas Emissions in the Energy Sector of the RK
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Development of the human civilization is accompanied with inevitable increase in the consumption of energy resources. Main technologies in the sphere of energy production are connected with consumption of fossil fuels, which leads to excessive amounts of emissions of fuel combustion products to the atmosphere. As a consequence, we experience climate changes of great negative effect on human environment that cause enormous damage for human civilization.

The Republic of Kazakhstan has signed the UN Framework Convention on Climate Change in 1992 and joined the world community in efforts for reducing GHG emissions demonstrating understanding of the problem and readiness to implement economically feasible measures on reducing GHG emissions.

In accordance with available inventory documents on GHG emissions for 1990-1994, Kazakhstan is referred to the group of countries with considerable GHG emissions. In 1990 the GHG emissions comprised approximately 266 million tons of CO₂ equivalent, in 1994 this number reached 200 million tons of CO₂ equivalent.

About 50% of total GHG emissions are connected with the energy sector of Kazakhstan. These considerable amounts of GHG emissions can be explained by the structure of power generation capacities: 75% of capacities belong to thermal power stations, fuel balance structure (85% of coal), and poor operating conditions of the equipment due to physical and moral depreciation of the main assets.

Reduction of GHG emissions in the energy sector of the RK is of primary importance to the strategy of reducing the GHG emissions. The overall potential of this reduction is in the range of 40%. The term potential is understood here as a possibility of reducing GHG emissions while implementing measures on GHG emissions limitation.

The potential of reducing GHG emissions can be divided between the energy production and energy consumption spheres. The measures on reducing GHG emissions can be further grouped according to energy saving, and increase of the energy efficiency activities.

Energy saving measures will prevail in the short-term period, while in the mid- and long-term period there will prevail measures on increasing energy efficiency. There are some specifics in implementing the measures on reducing GHG emissions in the energy sector of Kazakhstan. The possibility of implementing various measures on reducing GHG emissions in the energy sector of Kazakhstan is a subject of this report.

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ТЕЗИСЫ

“Правовое обеспечение участия Казахстана в рамочной Конвенции ООН по изменению климата от 9 мая 1992 года и Киотском протоколе”

Участие Казахстана в рамочной Конвенции ООН по изменению климата от 9 мая 1992 года и Киотском протоколе требует адекватного правового обеспечения. Это означает необходимость **создание новых, изменение и дополнение действующих законодательных и подзаконных актов.**

Правовая работа должна проводиться в трех уровнях законодательства:

- уровне законов;
- уровне указов Президента и постановлений Правительства;
- уровне приказов, распоряжений, инструкций ведомств.

В Республике Казахстан имеются некоторые наработки в создании природоохранной нормативной документации, включая пакет национальных законов и подзаконных актов. Определен правовой статус объектов охраны окружающей среды и природных ресурсов, разработана система мер, обеспечивающих качество окружающей среды, ведется мониторинг окружающей среды, развивается система экологического аудита, установлены компетенция и функции центральных и местных природоохранных органов.

Вместе с тем, анализируя национальное законодательство, можно сделать вывод о **недостаточной правовой урегулированности отдельных природоохранных аспектов, в том числе, вопросов, связанных с обеспечением целевого уровня выбросов парниковых газов.**

Анализ на уровне национальных законов показывает:

- отсутствие нормативной базы регулирования **корректировки объема эмиссии парниковых газов (ПГ);**
- достаточно действенный **правовой механизм государственного контроля** контроля природоохранными общественными объединениями, включая международные объединения, за целевыми уровнями выбросов ПГ;
- **отсутствие достаточно значимых санкций за нарушение хозяйствующими субъектами объемов выбросов ПГ, превышающих обычную практику, эффективных мер стимулирования природоохранных действий, в том числе предоставлением льгот при налогообложении.**

Анализ национальных **актов Правительства** показывает:

- вопросы сокращения эмиссий выбросов ПГ не стали ключевыми при разработке политики экологической безопасности ;
- не предусматривается **стимулирование** административными, правовыми и экономическими средствами **сведения к минимуму неблагоприятных последствий** изменения климата;
- отсутствует правовая база для оперативного информационного обмена и мониторинга, включая анализ и контроль, по вопросам выбросов ПГ;
- отсутствует нормативная база предоставления финансовых преференций при производстве и использовании **альтернативных видов топлива, технологий, процессов, ноу-хау**, благоприятных для климата.

Анализ **актов министерств и ведомств** показывает:

- необходимость **оптимизации системы государственного управления** охраной окружающей среды и природными ресурсами;
- отсутствие достаточно эффективного правового механизма контроля за соблюдением установленных законами требований по охране окружающей среды;
- временные инструкции Министерства экологии и биоресурсов имеют правовые изъяны, в части по вопросам взыскания причинного ущерба.

В целом законодательство зачастую **не исполняется** на уровне правоприменительной практики, что снижает его эффективность.

Предлагается:

- **провести детальный сравнительно-правовой анализ национальных законов и подзаконных актов на предмет их соответствия рамочной Конвенции по изменению климата и Киотскому протоколу с разработкой соответствующих рекомендаций национальным законодательным и исполнительным органам;**
- **создать правовую базу для внедрения программы торговли квотами на выброс парниковых газов;**
- подготовить предложения о **внесении соответствующих изменений и дополнений** в действующие законы “Об экологической экспертизе” от 18 марта 1997 года и “Об охране окружающей среды” с целью устранения указанных выше недостатков;
- принять меры по развитию **сотрудничества на межрегиональном уровне**, в том числе через межгосударственные организации экономической интеграции;
- создать **правовую основу для стимулирования** государственного администрирования и товаропроизводителей местности, где имеется снижение выбросов атмосферных загрязняющих веществ, в том числе, посредством выделения дополнительных средств из республиканского бюджета на развитие этой местности;
- создать специализированную Адвокатскую контору, занимающуюся экологическими вопросами и представлением интересов природоохранных организаций в судах.

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THESES

«The Legal Coverage of Kazakhstan's Participation in the UNO Framework Convention of May 9, 1992 on the Climate Change and in the Kyoto Protocol»

Participation of Kazakhstan in the UNO Framework Convention on the Climate Change of May 9, 1992 and in the Kyoto Protocol requires the adequate legal coverage. This means the necessity of **developing new legislative and subordinate acts, inserting amendments and addenda into the laws in force.**

The legal work should be carried out on **three levels of legislation:**

- level of the **laws;**
- level of the **Edicts of President and Decrees of the Government;**
- level of the **orders, regulations and rules of the Departments.**

In the Republic of Kazakhstan there are available certain developments in drawing up of the environmental protection normative documentation including the package of national laws and subordinate acts. The legal status of the objects for the environmental and natural resources conservation has been specified, a system of actions has been developed ensuring the environmental quality, the system of ecological audit is in its developmental stage, the scope of competence and functions of the central and local nature protection authorities have been stipulated.

At the same time, when analyzing the national laws it may be concluded that separate environmental protection aspects have inadequate legal regulation and among them the issues associated with ensuring the target level of the greenhouse gases emissions.

The analysis on the level of the **national laws** demonstrates:

- lack of the normative base for regulating the **volumes adjustment of the greenhouse gases (GHG) emissions;**
- sufficiently effective **legal mechanism** of the government **control** and control from the part of the environmental protection public associations, including the international unions, over the target levels of the GHG emissions;
- **lack** of reasonably significant **sanctions** for infringement by the economic entities of the volumes of the GHG emissions exceeding the regular practices as well as lack of effective promotion measures in the area of the nature conservation activities including those with the privileges granted in taxation.

The analysis of the national **acts of the Government** shows:

- the issues of reducing the GHG emissions didn't come to be the key problems in developing the ecological safety policy;
- the provision is not made for **stimulating** with administrative, legal and economic means in order to **reduce to a minimum the adverse effects** of the climate change;
- the legal base is not available for the operative information exchange and monitoring, including analysis and control, regarding the challenges of the GHG emissions;
- there is no normative base for granting financial preferences in case of development and use of **alternative types of fuels, technologies, processes, know-how** favorable for the climate.

The analysis of the **acts of the Ministries and Departments** indicates:

- necessity in **optimizing the government system** of the environmental and natural resources **management**;
- lack of sufficiently effective legal mechanism of control over observance of the established by the laws requirements concerning the environmental protection;
- the provisional regulations of the Ministry of Ecology and Bioresources possess defects regarding the issues of recovery of the damage caused.

By and large, on frequent occasions the laws **are not executed** on the level of the laws application practices, and this decreases efficiency of legislation.

It is recommended:

- to make a **comparative law analysis** of the national laws and subordinate acts in order to define their compliance with the Framework Convention on the Climate Change and with the Kyoto Protocol followed by development of **respective recommendations** for the national legislative and executive organs;
- to create the **legal base in order to introduce the quotas trading program** concerning the greenhouse gases emissions;
- to prepare proposals on **inserting of respective** amendments and addenda to the laws in force 'On Ecological Expert Examination' of March 18, 1997 and «On Environmental Protection» with the purpose of eliminating the aforementioned shortcomings;
- to take measures for developing **cooperation on the interregional level** including cooperation through interstate organizations for economic integration;
- to create the **legal basis for stimulating** the state administration as well as the commodity producers in the locality where the reduction of the atmospheric pollutants emissions is observed including stimulation through allocation of additional funds from the republican budget for this locality development;
- to found a specialized Lawyers Office concerned with ecological issues and representing the interests of the environmental protection organizations in the courts.

Liliya Dimeeva
Environmental Research Center (ENVIRC)

ENVIRC is a non-governmental public organization for implementing projects connected with ecological and environmental conservation problems.

ENVIRC was established in 1992 on the initiative of the group of scientists from the National Academy of Sciences of the RK.

ENVIRC has implemented more than 50 projects of social and economic significance. Some of them are given below:

- Inventory, environmental assessment, and mapping of national parks and nature reserves of Kazakhstan;
- Environmental damage assessment of thermal power facilities of Almaty, Ust-Kamenogorsk, Zhezkazgan, Aktyubinsk, and Arkalyk;
- Environmental damage assessment of seismic prospecting activities on the Caspian and Aral Sea shelves;
- Fauna of Barsakelmes Nature Reserve. Analysis of current conditions and prospects for scientific research;
- Cadastre of rare, extinct, and endemic plants of mountainous nature reserves of Kazakhstan;
- Ecological and biological basis for developing methods and means of pest control in southern and south-eastern parts of Kazakhstan;
- Analysis of chemical and bacteriological composition of waste waters of Almaty;
- Preparation of project documentation on establishing a national park in the Charyn Canyon;
- Oasis Project. Conservation and restoration of saxaul and tamarisk ecosystems in Aralsk;
- Effects of Almaty waste waters on ecological conditions of the Ili River and its delta.

Partners and clients of the ENVIRC are the Ministry of Ecology and Natural Resources of the RK, Kazakhstan Caspiy Shelf, OKIOC H.B., Dames & Moore, SGS Kazakhstan, Full-Bright Fund, INTAS, KazNPIenergoprom, Center of Remote Sensing (CEReS) of Chiba University (Japan), Center of Ecology of Bielefeld University (Germany), and others.

ENVIRC organized and conducted expeditions in Kazakhstan for scientists from Japan, USA, Austria, Great Britain, France, Germany, and China.

Jointly with Ministry of Ecology and Bioresources of the RK, Ministry of Agriculture of the USA, and Russian Fund for Fundamental Research, the ENVIRC sponsored publishing of the Map of Vegetation of Kazakhstan and Central Asia, which is of scientific, practical, and educational significance. The ENVIRC employees were among those who worked on the map.

The Environmental Research Center offers a multi dimensional approach for studying environment conservation problems:

- Development of maps of ecological character;
- Evaluation of ecological and resources potential, biodiversity, extent of disturbing natural systems;
- Environmental damage assessment caused by various types of economic activities;
- Introduction of new technologies and latest scientific achievements into the practice of rational conservancy;
- Inventory, mapping, and scientific justification of sites for establishing a nature reserve fund;
- Inventory, and assessment of biodeversion of flora and fauna;
- Development of GIS and data base for various regions of Kazakhstan;
- Processing of space information.

Экологический Исследовательский Центр (ЭИЦ) ENVIRC - неправительственная общественная организация выполняет проекты, связанные с проблемами экологии и охраны окружающей среды.

ЭИЦ ENVIRC организован в 1992 году по инициативе группы ученых Национальной Академии наук РК.

За период работы ENVIRC выполнено более 50 проектов, имеющих социальное и народнохозяйственное значение, среди них:

- Инвентаризация, экологическая оценка и картографирование национальных парков и заповедников Казахстана;
- Оценка воздействия на окружающую среду объектов теплоэнергетики городов Алматы, Усть-Каменогорска, Жезказгана, Актюбинска, Аркалыка;
- Оценка воздействия на окружающую среду сейсморазведочных работ шельфов Каспийского и Аральского морей;
- Животный мир заповедника Барсакельмес: анализ современного состояния и перспективы научных исследований.
- Кадастр редких, исчезающих и эндемичных растений горных заповедников Казахстана.
- Эколого-биологические основы разработки эффективных методов и средств борьбы с сорной растительностью на юге и юго-востоке Казахстана.
- Изучение химического и бактериологического состава сточных вод г.Алматы.
- Подготовка проектной документации для создания национального парка «Чарынский каньон».
- «Оазис» (ГЭФ/ПМГ) – сохранение и восстановление саксауловых и тамариксовых экосистем в г.Аральске.
- Влияние сточных вод г.Алматы на экологию реки Или и ее дельты и др.

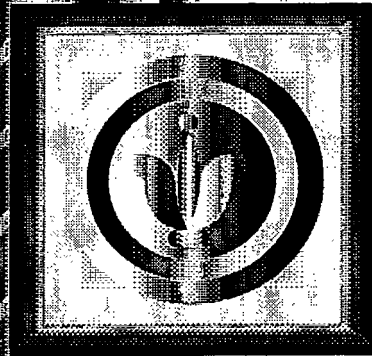
Партнерами и заказчиками ЭИЦ ENVIRC являются: Министерство экологии и природных ресурсов РК, Казахстан Каспий Шельф, OKIOC Н.В., Dames & Moore, SGS Казахстан, Full-Bright fund, INTAS, КазНИПИЭнергопром, Центр дистанционного зондирования (CEReS) Чиба университета (Япония), Центр экологии университета Билефельда (Германия) и др.

ЭИЦ ENVIRC организовал и провел экспедиции на территории Казахстана для ученых Японии, США, Австрии, Великобритании, Франции, Германии и Китая.

Совместно с Министерством экологии и биоресурсов РК, Министерством сельского хозяйства США и Российским Фондом Фундаментальных Исследований ENVIRC выступил спонсором издания "Карта растительности Казахстана и Средней Азии" имеющий научно-прикладное и образовательное значение. В числе авторов карты есть и сотрудники ЭИЦ ENVIRC.

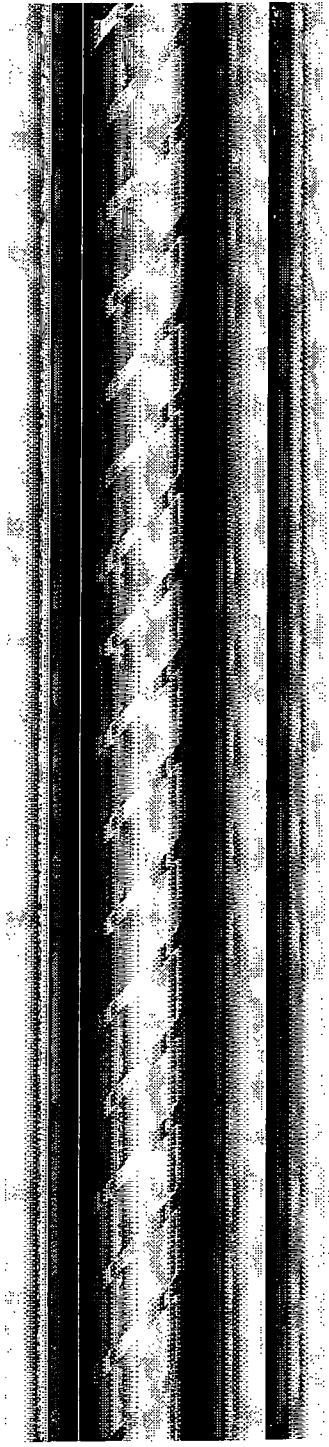
Экологический Исследовательский Центр ENVIRC предлагает многосторонний подход к изучению проблем связанных с охраной окружающей среды:

- создание карт экологической серии
- оценка экологического и ресурсного потенциала, биоразнообразия, степени нарушенности природных систем
- оценка воздействия на окружающую среду (ОВОС) различных видов хозяйственной деятельности
- внедрение новых технологий и новейших достижений науки в практику рационального природопользования
- инвентаризация, картографирование и научное обоснование объектов природно-заповедного фонда
- инвентаризация и оценка биоразнообразия флоры и фауны;
- создание ГИС, баз данных для различных регионов Казахстана
- обработка космической информации



Inventory and projections of GHG emissions in Kazakhstan

Olga Pilifosova
KazNIIMOSK



Structure of the presentation

● Overview

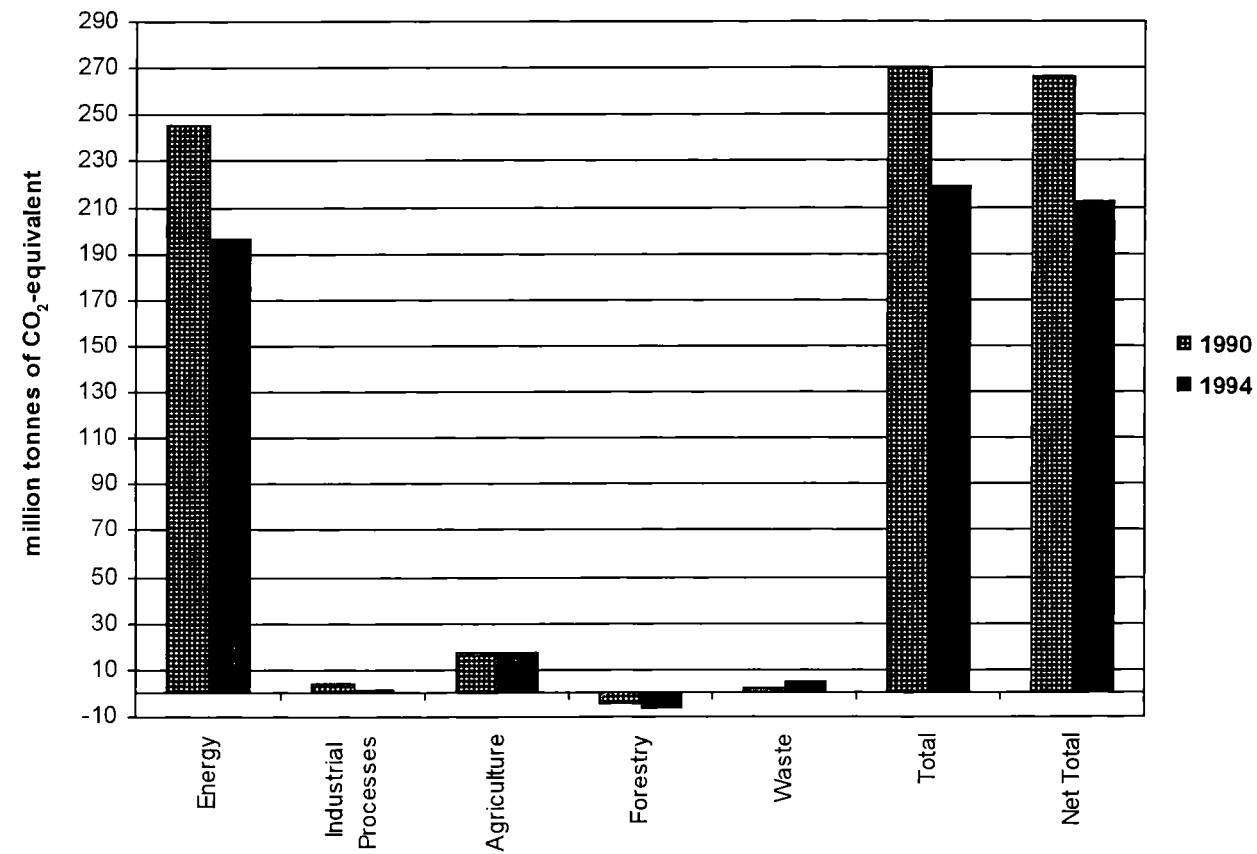
- Introduction
- GHG inventory for 1990 and 1994
- Methods and results of CO₂ emissions projections
- Limitations of the previous analysis and future work

● ENPEP: features of the past analysis and possibilities for future

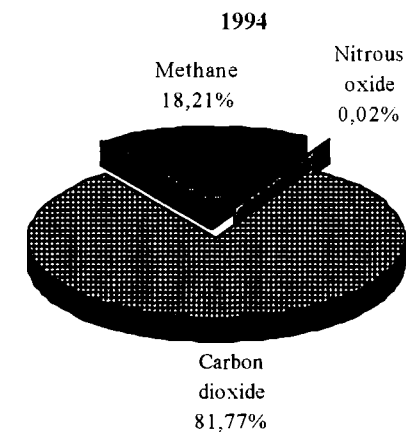
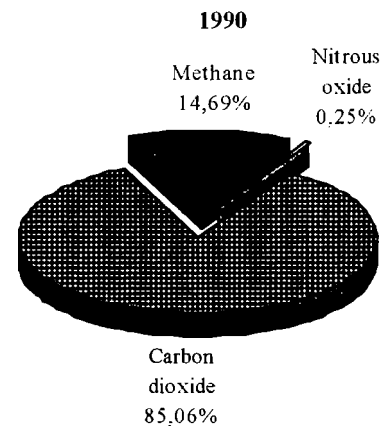
Introduction

- **US Country Studies and SNAP programs (1994-1998)**
 - GHG emissions inventory for 1990
 - Vulnerability & adaptation analysis
 - GHG mitigation analysis
 - Selection of priority measures for the NAP
- **Netherlands Climate Change Assistance Programme (1998-1999)**
 - First National Communication
 - GHG emissions inventory for 1994
 - Refinement of GHG emissions inventory for 1990

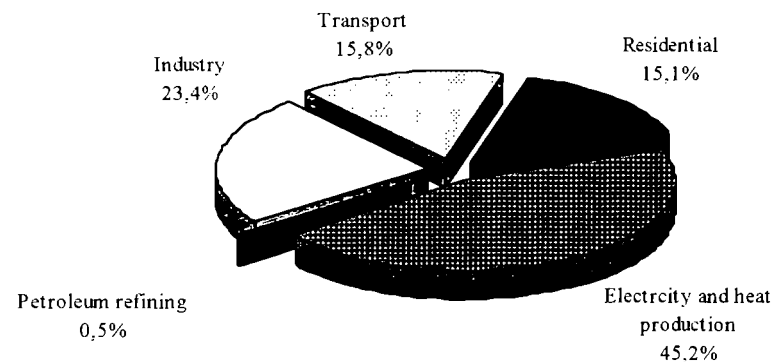
Total Emissions of Direct Greenhouse Gases in 1990 and 1994



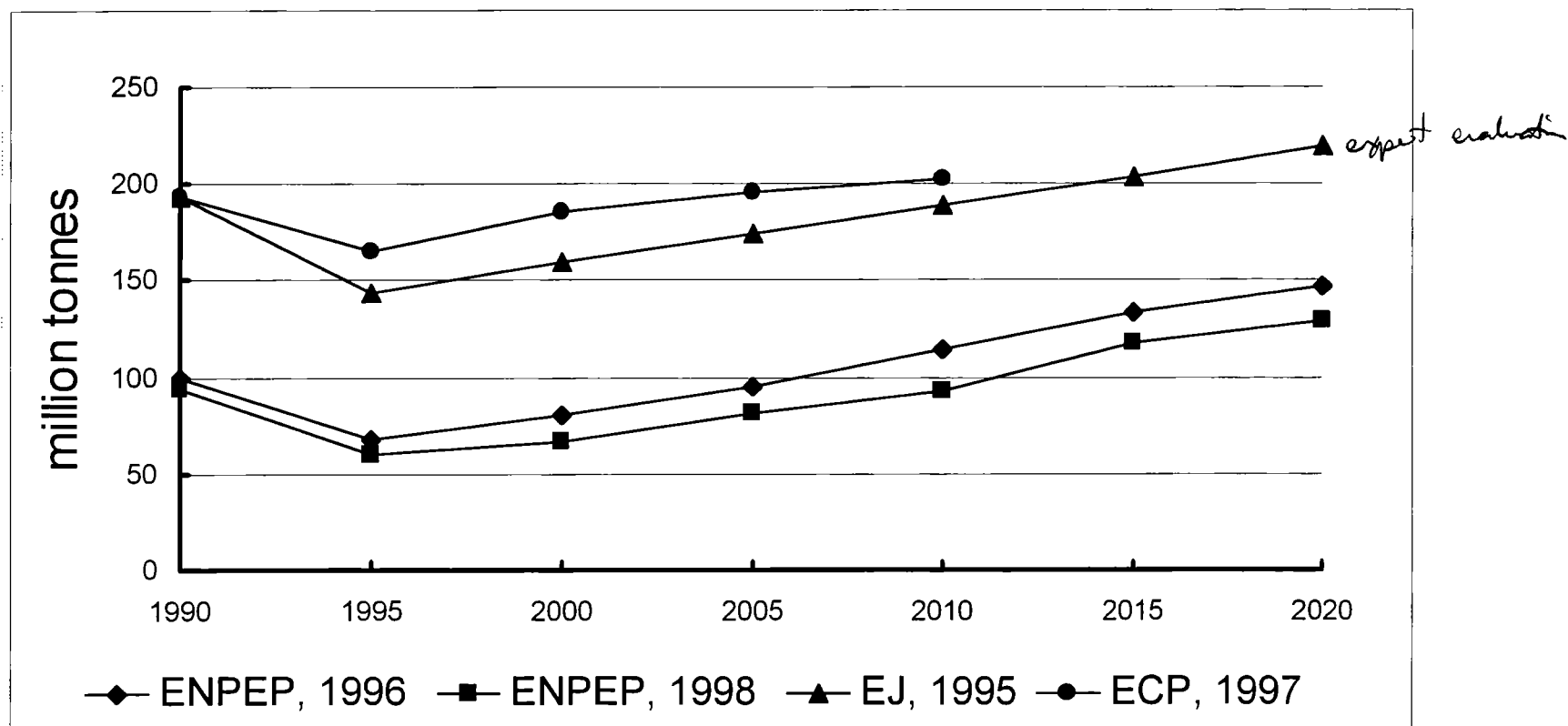
Percentage Share of Major Greenhouse Gas Emissions in 1990 and 1994



CO₂ Emissions from Fuel Combustion in 1990



CO₂ emissions under different baseline scenarios



ENPEP Model

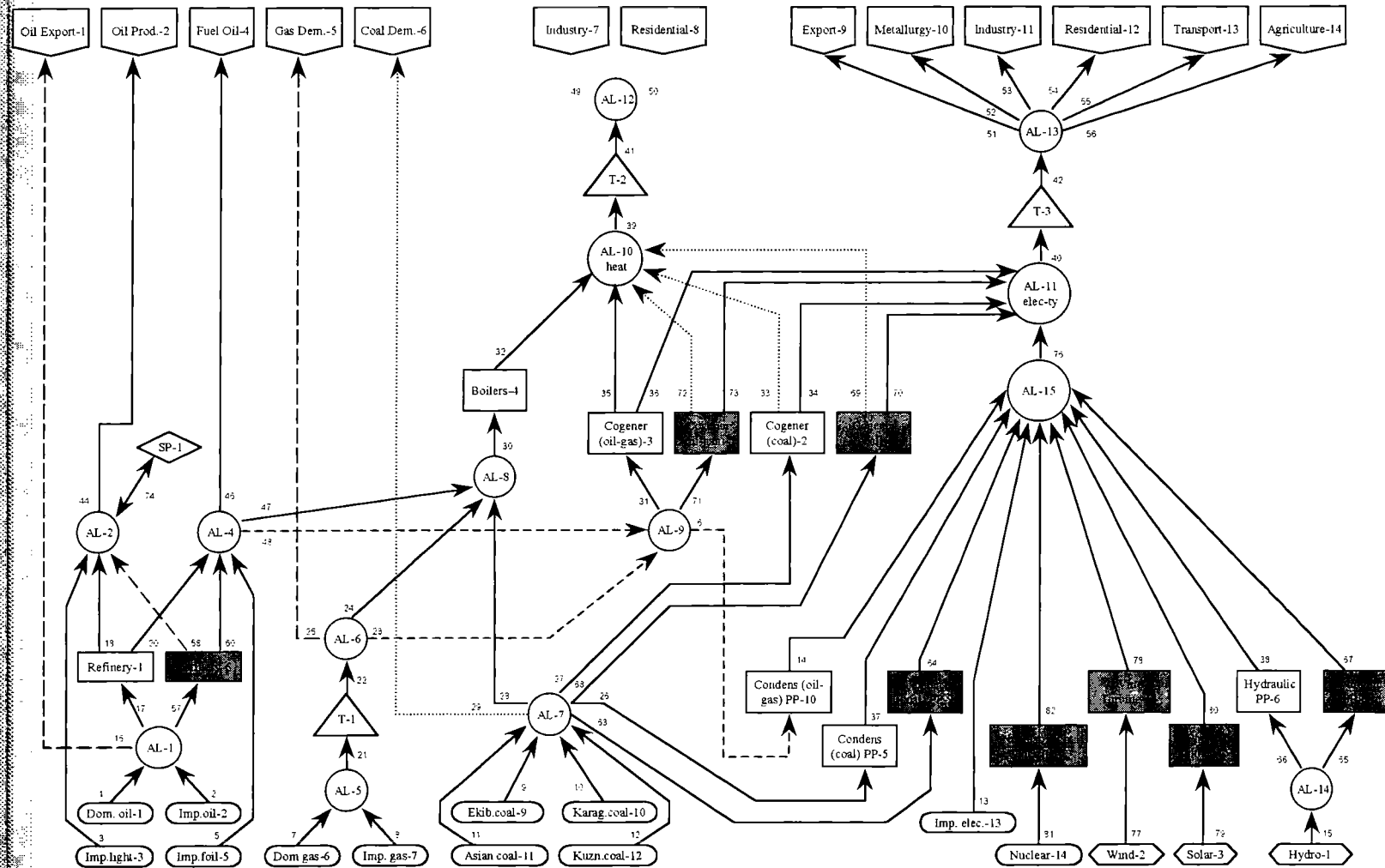
- **BALANCE module**

**Projects energy supply and demand
balance for the studying period**

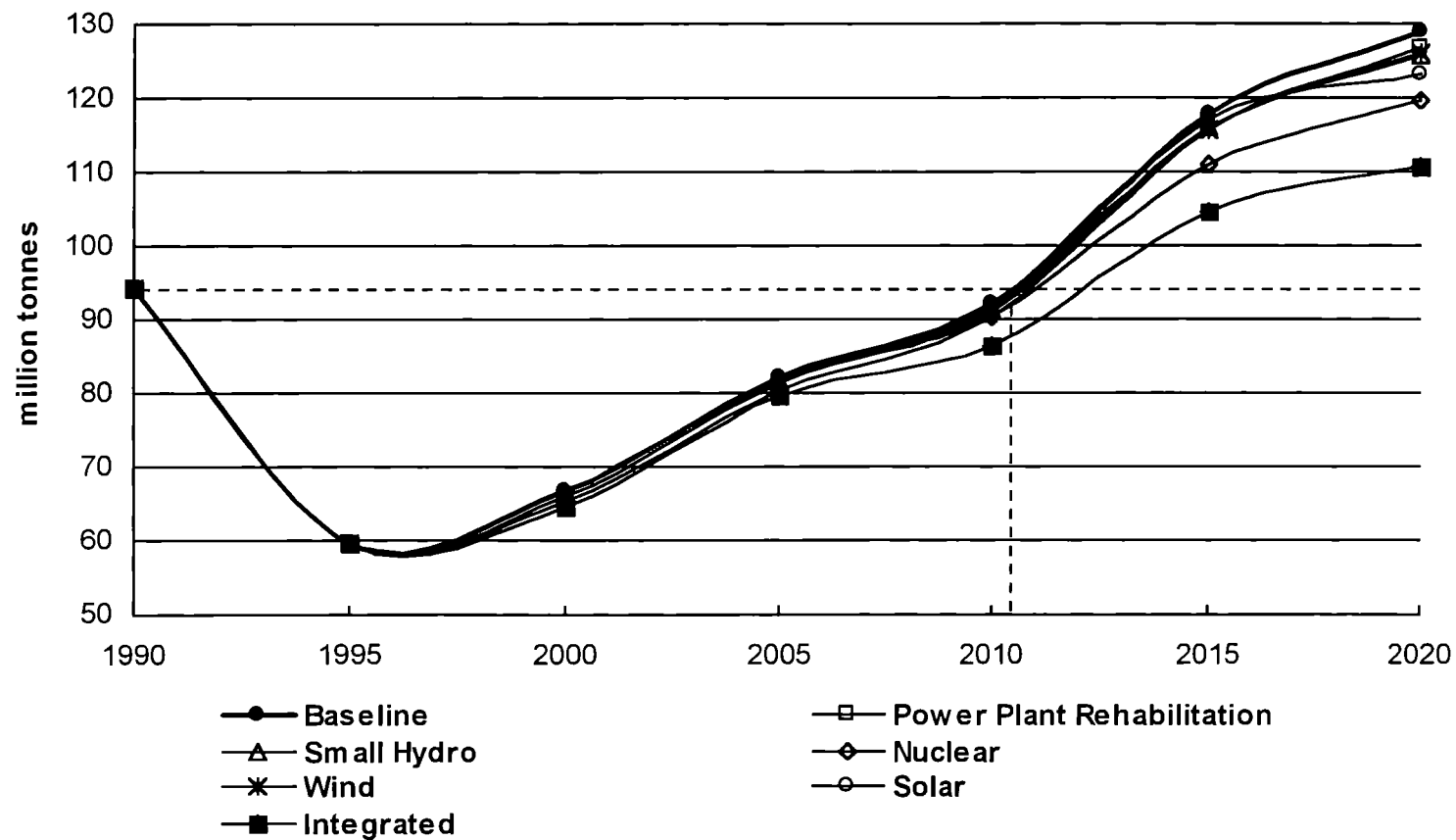
- **IMPACTS module**

**Calculates the environmental burdens of
the energy supply system**

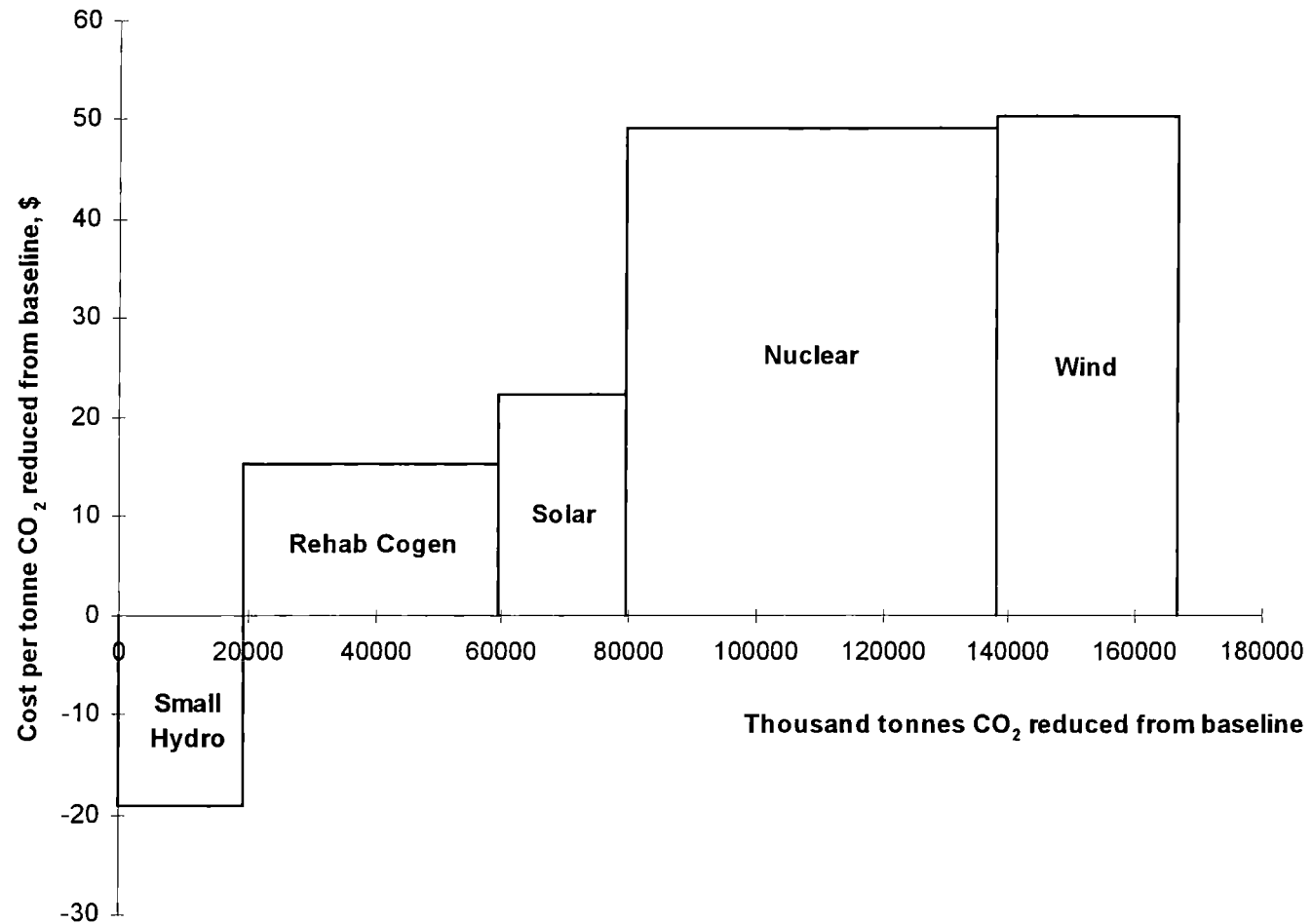
Kazakhstan Energy Network



CO₂ Emissions for the Baseline and Mitigation Scenarios



CO₂ Reduction Cost Curve



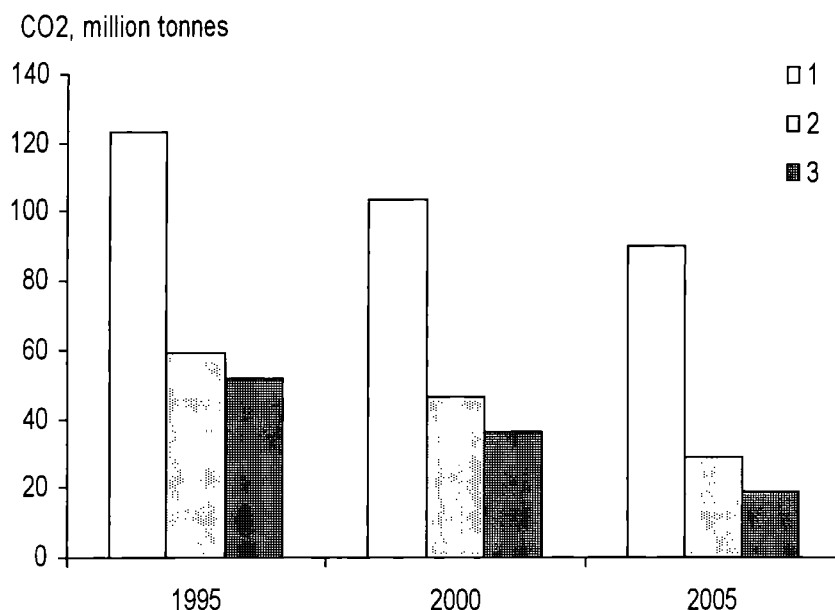
Main Results

- Baseline scenario CO₂ emissions reduction will reach about 40% of the 1990 level by 1998. The emissions will reach the 1990 level in 2011 and exceed this level on 37% in 2020.
- Cumulative CO₂ emissions reduction for the whole period would amount to 158 million tonnes (3-11% annually)
- Prioritization of the measures: rehabilitation and modernization of thermal power plants; small hydro; nuclear; wind; solar

Limitations

- High level of aggregation -- energy network was not detailed enough
- Cost analysis is mostly qualitative due to the high level of aggregation and cost data uncertainties.
- Great uncertainty in macroeconomic and sectoral development projections
- The analysis was focused only on energy production sector -- end-use technologies were not considered.

CO₂ Reduction Potential of the Energy Saving Program



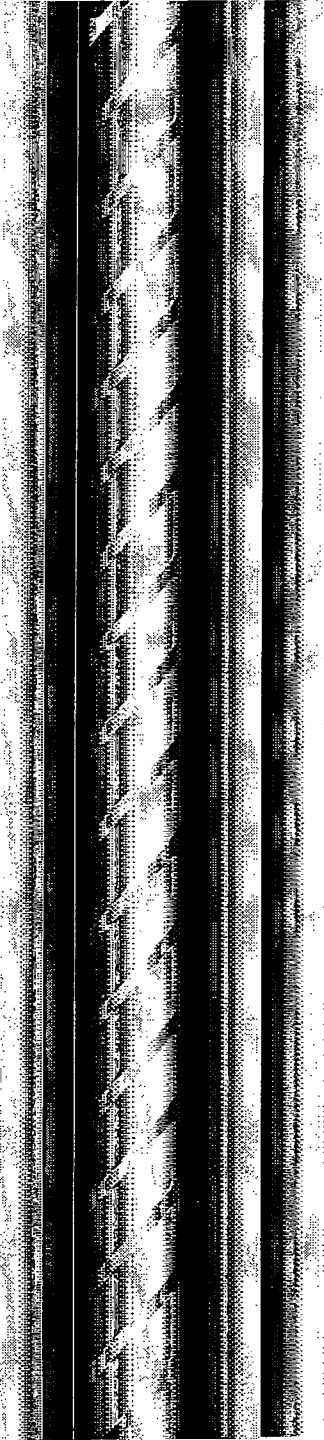
Energy saving potentials:

1. Technological - maximum potential (theoretical)
2. Economical - under real economical restrictions
3. Market - substantively achievable



Next Steps

- Develop CO₂ emission baseline scenario(s) for all energy activities including energy production and consumption: industry, transport, agriculture, residential sector
- Evaluate total mitigation potential and costs of emission abatement, including measures on energy saving and increasing gas share in fuel balance



Data and technical assistance needs

- Economy development scenarios for the relevant sectors of economy: structure, growth, and fuel consumption => energy demand
- Data for GHG emissions inventory until 1998
- Information on measures for each sector:
 - cost data
 - influence on energy consumption
- Technical assistance
 - modeling
 - cost analysis

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LONG-TERM STRATEGY OF THE
REPUBLIC OF KAZAKHSTAN - 2030

STRATEGY "ECOLOGY AND NATURAL RESOURCES"

**MAIN PROVISIONS
OF THE NATIONAL STRATEGY OF
THE REPUBLIC OF KAZAKHSTAN ON
GREENHOUSE GAS EMISSIONS REDUCTION**

ALMATY
1998

Draft Report

Kazakhstan and Climate Change Abatement

January 1999

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EXECUTIVE SUMMARY: KAZAKHSTAN AND CLIMATE CHANGE ABATEMENT

The US government has expressed its strong interest in assisting the Government of Kazakhstan's efforts to join Annex I/Annex B of the FCCC and the Kyoto Protocol. Both governments have agreed on a common goal of identifying a credible greenhouse gas (GHG) reduction commitment in time for the next Conference of the Parties in October 1999. Considerable work has already been undertaken by Kazakhstani organizations, often with US Government agency support, but much remains to be done. Critical aspects of past and future USAID-funded work in this field may be divided into four main categories:

1. Forecasting emissions paths

Work completed or underway:

- 1990 Baseline inventory was completed under USAID's Country Studies Program for CO₂, Methane, and Nitrous Oxide in all sectors.
- 1994 inventory underway (estimated completion, Spring 1999).
- ENPEP model was used by Kazakh counterparts to provide preliminary forecasts of CO₂ emissions from the energy sector, specifically electricity.

Near-term work needed:

- Expand inventory to include all gasses.
- Support selected sectoral analyses, including deeper analysis of energy sector to identify interventions that would help the Kazakhs to meet growth targets lower than business as usual scenario.
- Assist with creation of "business as usual" scenario: use better economic data as input (existing analysis uses government 30-year plan), which has serious shortcomings.
- Assist with selection of GHG reduction target for 2008-2012.

2. Estimating costs of GHG reductions

Work completed or underway:

- Using the ENPEP model, six possible approaches to power sector GHG reductions were examined. Small hydropower was found to be least cost (assuming new capacity is needed, which is unlikely in the near- and medium-term), followed by rehabilitation of existing thermal power.
- It was estimated that significant emission reductions will accrue if reforms that lead to orderly privatization are made in the energy sector.
- An estimate was made that there is a potential for end-use efficiency improvements in the manufacturing sector of between 25% and 40%.
- Potential gains to efficiency in electricity production were estimated based on a study of four power plants.

Near-term work needed:

- Additional analysis of least-cost GHG reduction options should be conducted prior to selection of a GHG reduction target for 2008–2012 (in cooperation with the World Bank).
- Quantify emissions reductions associated with energy sector reforms as well as potential emission reductions in other sectors including industry and agriculture.

Longer-term work needed:

- Assist with development of institutional capacity to conduct emissions trading and JI projects.
- Assist with energy sector reforms that will encourage privatization and with it, investment in cleaner technologies (generation, T&D, end-use)

3. Benefits to Kazakhstan of GHG reductions

Work completed or underway:

- Estimate of value of health damages caused by key air pollutants was conducted (reduction of particulates is a common secondary benefit of GHG emissions abatement).

Near-term work needed:

- Quantification of energy and dollar savings that can be derived through energy efficiency improvements in order to drive home the benefits of abatement of GHG emissions.

Benefits of trading

4. Developing policy instruments/institutional capacity for abatement

Work completed or underway:

- Development of energy law and regulation, improvement in pricing, and move towards privatization has provided base for ability to reduce GHG emissions.

- Pilot program in emissions trading between stationary sources (for particulates) took place in Almaty in October 1996.
- USAID works closely with KazNIMOSK on GCC issues. The lead for climate change within GOK resides in the Ministry of Environment.

Near-term work needed:

In order to have the capacity to provide solid growth target estimates in time for COP5 in October, 1999, the Ministry of Environment needs the following near-term assistance in the policy arena:

- Establish growth targets so that they can estimate costs associated.
- Coordinate with World Bank which is also proposing to work on credible scenarios.
- Assistance in developing and implementing enforcement mechanisms to ensure implementation of newly developed energy laws and regulations, which provide a base for ability to reduce GHG emissions.
- Institutional capacity building: there are people who know how to do modeling, but no credible macroeconomic model currently exists for Central Asia. A model needs to be established and people in CAR need training on how to use it.

Medium- to long-term work needed:

- Development of improved environmental policies, economic reforms, energy sector reforms and legislation to maximize private sector participation, with particular focus on policy incentives for private investors in power generation and distribution.
- Development of energy legislation and policy to support more rational use of energy, including analysis/removal of subsidies, improved collections, metering.
- Development of systems for recycling revenues from sales of emissions reduction credits, and of systems for management of excess reduction credit "assets."
- Development of environmental finance structures.
- Outreach/education needed to better inform the public, the private sector, and policy makers about risks of climate change and likely financial benefits from trade.

I. INTRODUCTION: THE LEAD-UP TO BUENOS AIRES

In November 1998 in Buenos Aires, the Government of Kazakhstan expressed its willingness to take on a commitment to reduce Greenhouse Gas (GHG) emissions and become a party to Annex I of the Framework Convention on Climate Change and Annex B of the Kyoto Protocol. Though some US government officials were favorably surprised with this position, in many ways it was a natural result of work which has been underway in Kazakhstan for some time, led by a number of US government contractors and grantees, together with their local counterparts.

In the months leading up to Buenos Aires, USAID assistance concentrated its efforts on improving the GOK's understanding of the possible advantages of Annex I/Annex B membership. These efforts focused on organizing a series of presentations in collaboration with the GOK's National Ecological Center. An inter-ministerial working group was convened, drawing its members from a variety of GOK institutions. This working group was provided with a background paper with recommendations for consideration. The Group considered this and conducted a review of the climate change-relevant documents that Kazakhstan was then preparing, especially its national communication to the UN Secretariat and its preliminary national strategy for greenhouse gas reductions (to which US government support had been given under the Country Studies Program).

Based on these documents the working group assembled a set of recommendations which were presented to a larger seminar of 40 officials from all the relevant Ministries, plus several electricity companies, research institutes, and the international donor community. The USAID input was well received and was followed by an announcement of the GOK's intention to sign the Kyoto Protocol in advance of the Buenos Aires meeting. USAID continued to support the Kazakh delegation before and during the Buenos Aires meeting.

II. GROUNDWORK IN THE AREA OF CLIMATE CHANGE¹

The delegation's success in Buenos Aires was the result of prior as well as recent efforts. An appreciation of potential impacts of climate change on the country, and understanding of economic approaches to environmental problems, energy policy and energy efficiency issues were all necessary background that the GOK had obtained prior to Buenos Aires. A variety of USAID contractors and projects had collaborated with the GOK on these topics and thereby contributed to increased understanding in these key areas.

By announcing its intention to accede to Annex I of the FCCC and Annex B of the Kyoto Protocol, the GOK committed itself to a variety of challenging future tasks. These activities, which are discussed in detail by type of task, may be organized according to the following general categories:

1. Setting of Emission Growth Targets;
2. Policy Development and Implementation;
3. Institutional Development; and

¹ Please see Appendix 1 for short summaries of US government-supported activities.

4. Public Outreach.

Though the decision to accede to Annex I and Annex B was wholly GOK's, US support for preliminary analyses was critical to the result in Buenos Aires. The GOK's state-of-the-art approach to GHG reduction policy, detailed in the Kazakhstan National Climate Change Action Plan (adopted by the GOK in October 1997) was supported by the US Country Studies Program.

This document summarizes results from US government assistance programs in Kazakhstan which focus on key components of setting emission growth targets and developing policies to achieve those targets. Crucial activities requiring US Government support are discussed in the following section.

III. FORECASTING A BUSINESS AS USUAL EMISSIONS PATH

Groundwork Completed

The first step in this process was completion of the 1990 emissions inventory, which was presented in Buenos Aires. The US Country Studies Program sponsored by USAID, USEPA and DOE, assisted the Kazakh Research Institute for Climate and Environmental Monitoring (KazNIMOSK) in its development of the first stages of Kazakhstan's national inventory of greenhouse gases in 1996. This inventory included only estimates of CO₂, methane and nitrous oxide emissions. CO₂, is by far the most important GHG, and during the period 1990–1996 CO₂ emissions are estimated to have declined by 25%. A second inventory covering 1994 is expected to be completed by spring 1999.

Various forecasts of CO₂ emissions have been conducted since 1995. The ENPEP energy-planning model developed in the US by the Argonne National Laboratories was the first internationally recognized model to be applied to the forecasting of Kazakh emissions. KazNIMOSK was the lead agency in Kazakhstan, and it prepared the analysis with US Country Studies support. The analytical methodologies underlying projections other than those derived from the ENPEP model are not fully understood.² It appears that over time all the models have increased in sophistication, but still fall far short of what is required to support an Annex B commitment. The chief weaknesses are a tendency to assume linear relationships rather than complex interactions, and a poor understanding of the likely relationship in the future between GDP and energy consumption.

The following table presents several forecasts of CO₂ emissions. The last two estimates were partially supported by the US Country Studies Program. The third row of data was developed in support of the Initial Communication to the FCCC, but the 1990 and 1994 figures differ somewhat from those in that document. The last row contains data and projections in support of the preliminary National Climate Change Strategy prepared by the National Ecological Center for Sustainable Development. USAID provided partial support for this work.

² Aside from KazNIMOSK, the Institute of Economic Research and the Ministry of Energy have also conducted analyses.

Table 1: Forecasts of CO₂ Emissions (millions of tons)

Projection Source	1990	1995	2000	2005	2010	2015
1. Official Estimate (Expert Opinion)	191.0	145.0	160.0	-	-	-
2. Institute of Economic Research	193.9	165.5	185.3	196.1	202.3	-
3. ENREP Model-Based Estimate	205.6	141.3	164.5	195.1	234.7	272.1
4. Official Estimate including likely reductions	205.6	141.3	159.6	189.4	219.8	258.8

Information source: *Preliminary Assessment of Kazakhstan Potential to Generate CO₂ Credits under Different Scenarios*. Internal document provided by KazNIMOSK.

Energy production is the largest of GHG. In the inventory presented in the Initial National Communication, the energy-producing sector made up almost half of all CO₂ emissions. As shown in Table 2 below, within this sector, electricity usage has dropped precipitously since 1990 due to severe economic decline, and it is expected to remain below the 1990 level at least until 2005. Under the “minimum” scenario, usage does not reach 1990 levels until after 2020.

Table 2: Electricity Demand Projections According to Different Energy Development Scenarios (TWh)

Scenario	1990	1995	1996	1997	1998	1999	2000	2005	2010	2015	2020
Maximum	104.7	74.4	66.2	57.1	60.0	65.0	80.0	95.0	110.0	120.0	130.0
Intermediate	104.7	74.4	66.2	57.1	56.0	57.0	60.0	80.0	95.0	105.0	115.0
Minimum	104.7	74.4	66.2	57.1	54.6	55.5	57.0	67.5	78.0	88.0	98.0

Information source: Table 1.3: Initial National Communication. Calculations from *Energy Development Strategy Until 2030*, as adopted June 1998.

CO₂ emissions by the power sector were estimated using the ENPEP model. This set of estimates is part of CO₂ emission projection source #3 discussed above, which was funded under the US Country Studies Program. As shown below, using this “bottom-up,” technology driven model, CO₂ emissions were forecasted to reach 1990 levels by 2010 based on an assumption that the 1990 level of GDP would be regained in 2003.

Table 3: CO₂ Emissions from the Energy-Producing Sector (millions of tons)

Actual Emissions					Projections	
1990	1994	2000	2005	2010	2015	2020
94	74	67	83	93	118	129

Information source: *Table 3.4: Initial National Communication*

In the case of all Kazakhstani models as well as the ENPEP model, it is likely that emissions projections are inflated. This is because all economic projections incorporated into the analysis are based on the official government “2030 Plan,” which prescribes Kazakhstan’s desired pattern of development up to the year 2030. This long-term plan for economic development is a matter of law, but the economic growth projections incorporated into the *2030 Plan* are widely believed to be overly optimistic. Any forecasts must therefore be treated with caution.

The policy objective which the analysis to date was designed to support (fulfilling FCCC reporting obligations and exploring the possible benefits of Annex B membership) was much less ambitious than the new policy objective of taking on an appropriate Annex B emissions reduction commitment. Hence, it is not surprising that much more analytical work will be required in the future.

Next Steps: Analysis Needed to Set GHG Emissions Growth Targets

Kazakhstan’s initial communication to the FCCC Secretariat makes clear that considerable monitoring capacity exists. The ability to project future emissions, however, is severely limited by a lack of credible macroeconomic models for Kazakhstan. Support in developing such models is a necessary precursor to Kazakhstan’s adoption of a credible commitment.

- As was already noted, with USAID support the estimation of current GHG emissions has been done. The group led by KazNIMOSK has the capacity to prepare future inventories if continued support is available. This group requires some additional support for sectoral analysis.
- A credible estimation of future GHG emissions in the “business as usual” scenario has not been done. Completion of this task will require outside expertise, as existing macroeconomic models are insufficient and the linkage between the macroeconomy, energy usage and energy policy is relatively poorly understood.
- Because the business as usual scenario has not been done, selection of a GHG reduction target for 2008-2012 has also not been completed. This emissions reduction goal must include real reductions, but leave the opportunity for Kazakhstan to benefit financially from economic growth and trading. This requires completion of the above “business as usual” scenario, plus additional

analyses on least-cost options facing Kazakhstan. The choice of this target is crucial, and the associated uncertainties are very large.³

IV. COSTS OF GREENHOUSE GASES REDUCTION

Groundwork Completed

Several USAID-supported activities have also been focusing on the costs of GHG reductions. Again using the ENPEP model, six possible approaches to GHG reductions in the power sector were considered by the research team based at KazNIMOSK. These steps included rehabilitating thermal power plants, supplementing thermal power with small hydropower, solar, and wind energy, as well as supplanting thermal power with nuclear energy. The team found that nuclear power had the highest CO₂ emissions reduction potential, but it also had virtually the highest *average* cost per ton reduced. Only slightly higher in cost was supplementing thermal power with wind energy. As shown in the table below, the cheapest option was considered to be small hydro-power, which overall has lower costs than existing generation methods. However, small hydro has very limited potential for total contribution to emissions reduction, since it could replace only about 600MW of installed thermal capacity. Overall, rehabilitation of existing thermal plants appears to be the optimal strategy because of its high potential impact on emissions at relatively low cost.

Table 4: Costs of Reducing CO₂ in the Power Sector in Kazakhstan (\$/ton)

	Small Hydro-Power	Rehabilitating Cogeneration	Solar	Nuclear	Wind
\$/Ton	-19.96	15.26	22.35	49.05	50.33

Source: "Mitigation Assessment for Kazakhstan," in *Global Climate Change Mitigation Assessment: Results for 14 Transitioning and Developing Countries*, August, 1997.

Important precursors to this modeling exercise were detailed energy efficiency analyses conducted under the USAID-sponsored Kazakhstan National Energy Efficiency Program. Since Kazakhstan is the world's largest emitter of CO₂ per unit of GDP due to inefficient energy use, significant inefficiencies exist in the industrial sector, particularly among metal, chemical and refining plants. There is therefore large potential energy efficiency improvements in the industrial sector: fuel savings of 25% in the near term and 40% long term; and electricity savings of 10% in the near term and 20% long term, according to estimates prepared by USAID contractors.

³ Witness, for example, the possibility that the Czech and Slovak Republics, Hungary and Poland may end up net buyers of tradable emissions reduction credits. For a discussion, please see "Study on Russian National Strategy for Greenhouse Gas Reduction," by A. Golub, A. Avertchenkov, V. Berdin, A. Kokorin and E. Strukova prepared for the World Bank and the Government of the Russian Federation, Moscow, 1998.

Center, with USAID support, achieved just such results through two plants (one in Uzbekistan). During technical analyses that were completed in 1996, it was found that costs could be reduced while pollution emissions were reduced if simple methods to conserve energy and materials were implemented. It is not known how representative are such findings, drawing on the Central and Eastern European experience it seems reasonable to suppose that significant opportunities for energy efficiency improvements exist in the Kazakh industrial sector.

Energy efficiency improvements have significant GCC implications. More efficient use of energy, less energy production, transmission, and distribution, directly reducing GHG emissions. USAID activity in this area has included preparation of a National Program for Energy Efficiency Savings and recommended an approach that included necessary policy reforms to realize the savings. This formed the basis for the official GOK position on this topic and paves the way for demand management in Kazakhstan.

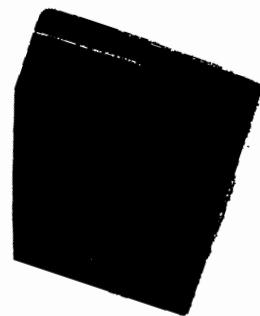
Significant GHG emission reductions opportunities can be made in the industrial sector, the largest proportion of GHG emission reductions opportunities are in the energy sector, which is responsible for about half of Kazakhstan's CO₂ emissions. Meaningful emissions reductions require a series of structural reforms in the energy sector, entailing energy sector restructuring and privatization, energy tariffs and bill collections, regional energy trade, power plant efficiency improvements, and end-use energy efficiency improvements.

Under the Energy Sector Reform Program, the technical efficiency in four major power plants was examined and it was concluded that major, no cost/low cost energy efficiency improvements of up to 10-20% could be made. Since approximately 80% of Kazakhstan's GHG emissions come from coal, and largely by power plants, there are a significant number of such opportunities. USAID-funded studies have also examined savings potential in roughly 30% of Kazakhstan's generating capacity and in the Almaty district heating system. Such efforts were critical in convincing Kazakhstani officials that CO₂ emission reductions may not be prohibitively expensive and that taking on an Annex B commitment could be in the national interest.

In the arena of energy sector restructuring and privatization, power sector decentralization is well underway. Generation is approximately 80% privatized, but distribution is generally not privatized. Natural gas distribution is still wholly owned by state. Restructuring has direct implications on GCC. Restructuring facilitates privatization by breaking the energy enterprises into manageable pieces that allow investors to understand their value and prospects for improvement in the enterprises. In turn, privatization provides motivation for cost reduction in several ways:

Privatization encourages more efficient operation, as the energy enterprises have to operate in a commercial manner.

Privatization provides a framework for the owners to invest capital in the power plants to improve operations.



- The capital investments provide a means to use cleaner fuels and and install cleaner, more efficient technologies, and to reduce transmission and distribution losses.
- To operate commercially, private owners will increase bill collections, which in turn motivates customers to reduce consumption.

The USAID-supported Energy Sector Reform Program, which has focused restructuring and oil and gas sector reform, has provided significant preliminary support in this area. The Program conducted extensive analyses of electricity pricing and energy regulatory reform. By introducing the notion of proper pricing of energy, the program has also paved the way for reforms that will be critical for meeting any proposed Annex B target. This important educational value should not be under-estimated.

Proper pricing of energy and removal of energy subsidies, while perhaps crossing into the policy instruments arena, is expected to be a very low-cost (even negative cost) method for reducing emissions of CO₂. Reducing and phasing out any significant energy subsidies will indeed probably be a very important step toward GHG reductions. Though it is believed that to-date little analysis or quantification of energy subsidies has been conducted, the experience of the European transition economies is very clear on this point. Allowing the prices of energy to rise to reflect the opportunity cost of those resources - even before trying to address the pollution externalities associated with combustion - is the single most important step that has been undertaken to reduce air pollution and improve energy efficiency in Central and Eastern Europe.⁴

Even without GHG or any other pollution reduction goal, we also know that energy subsidies are bad for the economy. They distort the economic structure, orienting the choice of technology and day-to-day practice towards wasting resources instead of saving them. The artificially low tariffs prompt increased energy use among customers due to undervaluing the true energy costs. The low collection levels deprive energy enterprises of funds needed for investments that would improve operations and efficiency, lead to installation of cleaner technologies, thereby cutting emissions. Collecting bills owed is also a precondition for customers to have incentive to reduce consumption. Kyoto mechanisms that offer incentives or GHG reductions just increase the costs of these fundamentally bad policies by valuing the currently valueless carbon reduction benefit. *Trading opportunities provided by the Kyoto Protocol therefore increase the returns to fundamentally good policies.*

Next Steps: Targets and Least-Cost Options

- As was discussed in the previous section, Kazakhstan needs to select a GHG reduction target for 2008-2012. Before this work can be completed, however, serious analysis of the least-cost GHG reduction options facing Kazakhstan will be necessary. Such possibilities must, of course, be included in any modeling framework employed.

⁴ For more details please see *Controlling Pollution in Transition Economies: Theories and Methods*, R. Bluffstone and B.A. Larson eds., Edward Elgar Publishing Co. 1997.

- Of particular near-term interest is research into the level and opportunity for reducing energy subsidies. Though this activity will need to be part of the overall modeling exercise already described in Section III, because of the potentially political nature of this policy step it would be best to also consider it as a separate analytical exercise. Indeed, to support the public outreach program that will be crucial to the GOK's Annex I bid, an important part of the work will need to focus on quantifying the health and economic costs generated by those subsidies. This component therefore is closely linked to the benefits of GHG reduction (Section V. below).
- Demonstration projects that show consumers that better efficiency in the energy sector can lead to improved rather than less effective services, and illustrate for producers that increased energy efficiency reduces costs.

Next Steps: Longer-term Actions, Post COP-5 and the Setting of Targets

Energy Sector Restructuring and Privatization

- Further restructuring, demonopolization of electric distribution.
- Regulatory agency development and market rule formulation.
- Further restructuring, regulatory development, and privatization of the gas system.

Energy Tariffs and Bill Collections

- Increased metering
- Market-based tariff methodologies.
- Increased privatization of distribution to increase collections.

Regional Energy Trade

Regional energy trade provides opportunities for GHG reductions. Electricity has been traded regionally, and oil pipeline work has entailed regional cooperation. The regional trading has GCC implications due to the potential for regional hydro and natural gas resources through regional trading. USAID activity in this area includes development of a formal regional trading agreement; assistance in integrated grid operations; and environmental improvements in pipeline development.

Next Steps needed include:

- Resolving investment issues on electricity transmission and market development
- Improvements in the water/power management system.

Power Plant Efficiency Improvements

- Creation of an investment climate and institutional mechanisms favorable to emissions trading and joint implementation.

End-Use Energy Efficiency

- Developing private sector capabilities to deliver energy efficiency services
- Creating investment climate and institutional mechanisms favorable to emissions trading and joint implementation.

V. BENEFITS OF GREENHOUSE GASES REDUCTION

Groundwork Completed

Significant local ancillary benefits are expected to result from GHG reductions. Perhaps the most important are improvements in human health due to declines in respiratory illness caused by non-GHG pollutants. Of particular importance are reductions in particulate, SO₂ and NO_x emissions that are expected to occur as energy efficiency improves.

Relatively little analysis has been undertaken regarding these benefits, but one component of USAID's collaborative work with the Ministry of Environment and Natural Resources during 1994-98 was reform of the Kazakhstani system of pollution charges. This economic instrument will likely be a significant tool for GHG emission reductions, and therefore the effort may have its most important impacts in the area of policy reform. As part of this work, however, the monetary value of health damages caused by key air pollutants was estimated. The results of the project clearly pointed out the economic value of health costs generated by air pollution. Policy makers therefore became familiar with these relatively new methodologies, and developed an appreciation for the economic costs of pollution. Though not directly focused on GHG mitigation, as already mentioned in Section IV., the use of such methodologies will be critical if the GOK is to demonstrate that significant local environmental benefits will result from Kazakhstan's participation in the FCCC.

Next Steps: Enhancing Understanding by Policy Makers and the Public of Benefits

Kazakhstan has many environmental problems that appear to be more pressing than the potential problems posed by global climate change. In order for Kazakhstan to be a successful player in the international trading regime, building national support for its participation is essential. The following efforts are recommended:

- Targeted environmental valuation studies that quantify the non-marketed local environmental benefits of GHG reductions.
- Demonstration projects that show a link between reduction of GHG emissions and improvement of local environmental conditions.
- Outreach in the form of public forums, brochures, skill upgrading and training to better inform the public and policy makers about the dangers of climate change, and the likely financial benefits from trading.
- Capture the costs of energy emissions abatement measures in energy tariffs.

VI. POLICY INSTRUMENTS FOR REDUCING GREENHOUSE GAS

Groundwork Completed

The development of energy law and regulation is a critical foundation on which Kazakhstan's ability to reduce GHG emissions rests. Privatization of the sector has created stronger incentives for appropriate pricing and effective collection. USAID has been involved in extensive analysis of electricity restructuring and pricing and has played a critical role in development of the electricity law. At the end of 1998, some 80% of Kazakhstan's electricity generation was privatized, creating opportunities for investments in more efficient, less polluting equipment.

As was already noted, the USAID has worked with the GOK to reform its environmental policy system, including economic instruments such as pollution charges. This activity builds on and parallels similar efforts in other transition economies that were undertaken by USAID. Throughout Central and Eastern Europe, as well as Russia and Central Asia, a variety of environmental policy reforms were successfully investigated, evaluated and implemented with USAID support. As part of these activities, the book noted in Footnote 6 was produced. An enormous body of experience on environmental policy reforms and implementation of economic instruments in transition economies has therefore been built up by USAID.

As part of its work with the GOK to develop better and more cost-effective environmental laws and regulations, USAID also proposed new economic instruments for consideration. One important part of that effort was the development of a pilot program for trading in air pollution emission credits (particulates). Although it remained only a pilot effort, a trade that took place between two Almaty industries in October 1996 was the first inter-firm pollution trade in the former Soviet Union.⁵ This pilot activity was actively supported by the Almaty City Department for Ecology and Bioresources (ACDEB) Under the Ministry of Environment and Natural Resources, and it was through this support that the two firms were able to realize the reduced compliance costs that motivate pollution trading. The pilot trade also raised the general awareness of the possible benefits of emissions trading, and gave rise to the Kazakhstan Carbon Initiative (KCI). The KCI was an inter-agency coordinating group, supported by USAID, which promoted a progressive position for Kazakhstan at Kyoto.

By educating key policy makers regarding emissions trading, the activity almost certainly contributed to Kazakhstan's position in Buenos Aires. With the support that USAID has provided on the subject of pollution charges, certain key Kazakh policy makers can also be expected to have a sophisticated understanding of economic instruments that will undoubtedly prove useful in developing GHG reduction policies.

⁵ This trade may also be the first trade of stationary source pollution emission rights anywhere outside of North America.

Next Steps in Policy Development

A Kazakhstan GHG reduction target would constitute only the beginning. Implementation of policy measures will be needed to reduce emissions to the committed level. In order for Kazakhstan to continue participating in a trading regime in the longer term, its policies must also be designed to take full advantage of possibilities for economic gain offered by emissions trading, joint implementation or the clean development mechanism. This will require at least the following:

- Development of improved environmental policies, energy sector reforms and legislation to create a framework for investments in GHG reductions in Kazakhstan.
- Development of energy legislation and policy that supports a more rational usage of energy. As already noted, this area must include the analysis and subsequent removal of energy subsidies, improved collections, metering, and other commercial operating factors.

Next Steps in Institutional Development

As part of efforts to create administrative capacity, it is essential to develop transparent, simple and easily administered systems, bearing in mind that idealized policy structures are unlikely to work in Kazakhstan. Three requisite institutions are the following:

- Systems for recycling revenues from sales of emission reduction credits.
- Improved environmental finance in a climate in which capital is scarce and borrowing difficult.
- Systems for management of excess emission reduction credit "assets." These structures must ensure that Kazakhstan can not only continue to participate in trading regimes credibly over the long term, but will also benefit from that participation.

VII. NEWLY EMERGING EFFORTS IN THE AREA OF CLIMATE CHANGE

Kazakhstan's decision to become party to Annex I and Annex B prompted an invitation from the Umbrella Group to join as an observer, which Kazakhstan has accepted.⁶ The GOK position has sparked considerable interest from the United States and other international parties as well.

A few proposed projects, which are expected to develop in the first quarter of 1999, are examined briefly below. This list is not presumed to be all-inclusive, but it is indicative of the variety of activities that will soon be underway.

⁶ Kazakhstan will be represented at the January Umbrella Group meeting by Bulat Esekin and Sergey Yelkin. Their participation is supported by USAID.

World Bank-Funded National GHG Reduction Strategy Study: With support from Austria, the World Bank will begin in January a Kazakhstan National GHG Reduction Strategy Study. This analysis is likely to attempt to quantify CERs (Certified Emissions Reductions); estimate the cost of GHG reductions; develop a portfolio of possible AIJ/CDM projects; identify regulatory, institutional and capacity building requirements for AIJ/CDM; and “analyze the choices Kazakhstan is facing in addressing climate change... in the context of the national development goals of Kazakhstan.”⁷ It is anticipated that the World Bank will attempt to develop some economic projections that are more credible than those currently available. The study is not, however, expected to be conclusive and is unlikely to examine trading issues. (Principal: Helmut Schreiber). USAID frequently works in conjunction with the World Bank by undertaking complementary activities. In this case, work (particularly on economic projections) should be closely coordinated between the US government and the World Bank, to avoid duplication of efforts or discrepancies in underlying assumptions, policy recommendations and results.

Coal-Bed Methane Outreach Program: This USEPA-sponsored program has initial funding to explore the possibility of coal mine methane projects in Kazakhstan. The Program will be sending a delegation to Kazakhstan in February to begin examining the prospects for GHG emissions reductions in this area. USEPA is proposing to make initial contacts with the GOK and possibly develop a detailed coal mine methane emissions inventory and resource guide for potential investors. The GOK is likely to look very favorably on efforts in this area, as mine methane capture has long been at the top of the government’s priority environmental project (NEAP) list (Principal: Roger Fernandez).

NREL-TCAPP: The National Renewable Energy Laboratories has developed a workplan (the Technology Cooperation Agreements Pilot Project) together with counterparts in Kazakhstan which identifies priority clean energy technologies and defines barriers to their deployment in Kazakhstan. The next phase of this plan proposes to facilitate near-term private investment in high priority technologies and to secure donor and domestic support for longer-term actions to remove market barriers. It is not clear from available materials if full funding has been secured (Principal: Collin Green). If this work goes forward, it should be coordinated with other US government work arising from the GCC effort, and should target the technologies and industries identified in the emissions reduction analysis.

Clean Production Working Group: (Seeking US counterpart) The Ministry of Ecology and Natural Resources has requested US Government support for establishment of a “Cleaner Production Working Group” to be based in Pavlodar. This Group would build on work originally done by the World Environment Center with USAID funding. The Ministry is especially interested in establishing advisory capacity for cleaner production of raw materials, including mining, metallurgy, energy, oil and coal extraction, and uranium extraction and processing. Improved energy efficiency is a major objective and byproduct. Support from UNEP is currently being sought, but is by no means assured. The Ministry of Ecology and Natural Resources has approached the EPIC Program to inquire what US agencies might be able to provide technical and limited financial support. This working group could provide a very effective mechanism for distribution of information on available technologies and has founding members who come highly

⁷ From the draft terms of reference for the Kazakhstan National Strategy Study.

recommended.

Climate Change Mitigation Fund

USEA in conjunction with Edison Electric Institute has funding to carry out feasibility studies of potential Joint-Implementation projects between U.S. and foreign utilities. Kazakhstan is one of several countries included in this effort.

USAID-Sponsored Greenhouse Gas Emissions Reduction Initiative (GGERI)

Although still in the planning stages, this pilot project would build the infrastructure to track emissions reduction activities on behalf of the Kazakh government in conformance with internationally accepted guidelines. An electronic emissions Registry would be created as an accounting device to measure progress against emissions reduction targets. By measuring the impacts of domestic actions, emissions trades, JI projects and CDM, the Kazakh government can make informed decisions to develop and modify its climate strategy as necessary. Policy decisions affected might include the allocation of credits for trading or the extent of participation in Joint Implementation and CDM projects. GGERI also seeks to work with government institutions which would certify JI credits, lending credibility to potential investments.

VIII. CONCLUDING REMARKS

It is in the interest of the United States that Kazakhstan make a credible commitment toward meaningful participation in the Framework Convention on Climate Change (FCCC) as soon as possible. It is also desirable that the Government of Kazakhstan use economic instruments to meet those obligations. Success in this area is clearly contingent on donor support and coordination.

At this time the Ministry of Environment and Natural Resources (MENR) closely coordinates GOK efforts in the area of climate change. To support this structure, donor-sponsored climate change activities should establish contacts with the MENR. While other agencies must increasingly become more involved, MENR makes an ideal lead partner for early development. Highly placed members of the MENR are fully committed to the development of tradable emissions, and other ministries have expressed their appreciation and support for the MENR's leadership role.⁸

The question of international assistance priorities requires early resolution if the US is to provide donor leadership as well as the prompt and effective assistance promised in Buenos Aires. It would appear that the most promising opportunities for US assistance lie in the aforementioned areas, some of which need to be completed by October, when COP 5 will take place, and some which will require longer implementation periods.⁹

⁸ Post-Buenos Aires interviews indicated that the Ministry of Energy, Industry and Trade as well as the Ministry of International Affairs expect MENR to continue to provide leadership.

⁹ For more details regarding these recommendations, please see EPIQ publications by Bluffstone (1998) and Dudek and Golub (1998).

It is evident that there is a need for a wide variety of assistance and expertise. The US Government would do well to build on its existing leadership and successes to ensure that the level of inter-agency and donor coordination remains high. The absorptive capacity of Kazakh organizations remains weak, and a great deal of institutional development and capacity strengthening will be required to ensure Kazakhstan's meaningful participation in the FCCC and the Kyoto Protocol -- especially with respect to a tradable emissions regime. This participation, however, will provide substantial benefits for all cooperating parties.

Appendix I

SUMMARY OF PREVIOUS US GOVERNMENT SUPPORT IN THE AREA OF CLIMATE CHANGE

The following brief summaries outline earlier US government-sponsored efforts that laid the groundwork for Kazakhstan's decision to participate as fully as possible in emissions trading regimes laid out in the Kyoto Protocol. These important contributors are listed roughly in chronological order.

Environmental Policy and Technology Project (USAID): The EPT-Central Asia project operated in Central Asia from 1994-1998 and was implemented by CH2MHILL together with IRG and local counterparts. In Kazakhstan - and in all of Central Asia - the EPT project contributed substantially to mitigation of climate change impacts by promoting the rational use and allocation of limited water resources. EPT efforts included seminars on water pricing, technical assistance on water distribution, research on valuation of water uses, modeling of water supply and demand, assistance in developing interstate agreements on water sharing through the Interstate Council (ICKKTU). The project also supported efforts to make more explicit the links between water and energy pricing in a region where hydro-electricity (especially in winter) and water (especially in summer) are essential and limited resources.

Harvard Institute for International Development (HIID) Program: This USAID-supported environmental policy assistance program operated in Central Asia from 1994 - 1998. As part of this effort, in June 1995 consultants conducted an initial feasibility study for the establishment of a pilot air pollution emissions trading program in Almaty. Their report outlined the technical, economic and institutional constraints to introduction of emissions trading and concluded that a pilot program was feasible. Following this feasibility study, USAID and HIID initiated the Almaty Emissions Trading Program. Although it remained only a pilot effort, a trade that took place in October 1996 was the first inter-firm pollution trade in the former Soviet Union. This pilot trade raised awareness of the possible benefits of emissions trading, and gave rise to the Kazakhstan Carbon Initiative (KCI). The KCI was an inter-agency coordinating group, supported by USAID, which promoted a progressive position for Kazakhstan at Kyoto. HIID also developed a Health Damages Assessment working group to estimate the damages caused by air pollution in an effort to improve the process of setting pollution charges. The group focused its analysis on Almaty and Tashkent (in Uzbekistan), and the basic issues of methodology in measurement, monitoring and enforcement provided the members with experience that will certainly be applicable to further GHG work. HIID continues its efforts in Central Asia as a partner in the EPIC program.

Kazakhstan National Energy Efficiency Program (USAID): Several analyses implemented by Burns and Rowe together with IRG and local counterparts in 1995 looked at the inefficiencies in the Kazakh energy sector. Following their experience with broad policy issues, the USAID-supported

analysts then conducted technical investigations into the efficiency improvement potential of heat and power systems at four major plants, Ermakovskaya, Ekibastuz, Karaganda, and Ust-Kamenogorsk. Privatization of these power plants has complicated the issue of implementation, but the Ministry of Energy, Industry and Trade still remains interested in creating the necessary incentives to implement the recommendations made in 1995. IRG also conducted energy efficiency audits on components of the Almaty district heating system. IRG has also provided analysis on energy pricing and taxation in Kazakhstan. IRG continues its efforts in Central Asia as a partner in the EPIC program

World Environment Center (WEC) Program: The World Environment Center worked in Kazakhstan with USAID support from October 1995-July 1996. WEC developed waste minimization demonstration projects at a chemical plant in Pavlodar, Kazakhstan and a cement factory in Fergana, Uzbekistan. The WEC team's purpose was to disseminate cleaner production techniques and promote efficiency in production. The demonstration projects in Pavlodar enabled improvements in process efficiency, savings in energy and materials, and reduced pollution. The nascent cleaner production working group in Pavlodar credits WEC with its establishment.

Country Studies Program (USAID, USEPA, DOE): The US Country Studies Program assisted the Kazakh Research Institute for Climate and Environmental Monitoring (KazNIMOSK) in its development of the first stages of Kazakhstan's national inventory of greenhouse gases in 1996. Their support included the vital task of training the KazNIMOSK staff in the use of the ENPEP energy sector model (developed at Argonne National Laboratory) to estimate the cost of reducing emissions in Kazakhstan. The Country Studies Program also provided technical and financial support to the KazNIMOSK in preparing the National Climate Change Action Plan and the Kazakhstan Climate Change Vulnerability Assessment. In addition, the Country Studies Program assisted in preparing the initial assessments of mitigation options in the energy sector and the non-energy sector.

US Energy Sector Reform Program (USAID): The national component of this regional effort, implemented by USAID contractor Hagler-Bailly, has played a critical role in development of the electricity law of the Republic of Kazakhstan. The Program has also conducted extensive analyses of electricity pricing and energy regulatory reform and restructuring (including privatization). The regional program has also promoted development of a Central Asian power pool, under which USAID-supported advisors worked with a regional electricity working group and the ICKKTU to develop regional agreements on management of the Central Asian electricity transmission grid. Analysts have also worked in oil and gas sector reform under the program, including developing regulatory legislation, consulting with the government on appropriate tariffs, and advising on privatization of gas distribution. Hagler Bailly continues to implement related work under a new USAID/CAR contract in cooperation with the USAID Global Environment Center.

ISAR-Central Asia Program: ISAR has worked with local counterparts throughout Central Asia to develop small scale alternative energy sources and to provide public education on climate change and alternative energy. With USAID support, ISAR produced the first Russian-Kazakh language introductory manual on climate change, and distributes it as a teaching tool to schools and NGOs. ISAR also participated in a cooperative effort with UNDP/GEF and the NGO "Anu-Umiti" in Aralsk to install a small wind energy facility (6 kw). This wind system, which came on-line in Summer 1998, provides electricity to a women's hospital in Aralsk. ISAR and Anu-Umiti have also cooperated on several seminars focusing on climate change and alternative energy use.

Environmental Policies in Central Asia (EPIC) Program Under the USAID EPIQ Contract. Since the project began work in July 1998, EPIC it has worked closely with the GOK on the topics of Annex I and Annex B commitments. The Program provided consulting assistance prior to COP 4 in Buenos Aires and also supplied a consulting economist who advised during the meeting. The Program's work in the area of regional water and energy management also assists the GOK in its efforts to adapt to global climate change. Water shortage is expected to be the major negative effect of greenhouse warming. Efforts to improve the use of water and efficiency of the power pool are therefore viewed as critical.

Appendix II

Selected USAID-Supported Publications and Reports Relevant to Climate Change in Kazakhstan and Central Asia

Burns & Rowe/ International Resources Group, Kazakhstan National Program for Energy Savings: Final Report, by Browning, Banks, et al. July 1995.

Burns & Rowe, Technical Report: Kazakhstan Expanded Energy Program- Heat and Power System Efficiency Improvements in Ermakovskaya and Ekibastuz Plants, Final Reports, December 1995.

Burns & Rowe, Technical Report: Kazakhstan Expanded Energy Program- Heat and Power System Efficiency Improvements in Karaganda and Ust-Kamenogorsk Plants, Final Reports, January 1996.

Canara Corp., Action Plan for Pilot Projects on Demonopolization and Restructuring of the Distribution Sector in Kazakhstan, 24 January 1994.

Canara Corp., Post-Privatization Support for Distribution Systems in Kazakhstan, May 1997.

CH2M Hill, Regional Water Pricing Committee Meeting Conference Proceedings, June 23-July 3, 1996. Medeo, Kazakhstan.

EPIC Program, Kazakhstan and Climate Change, by Theresa Sabonis-Helf, August 1998.

EPIC Program, Kazakhstan in the World of the Kyoto Protocol: Preparation for the Buenos Aires Meeting, by Svetlana Ten, October 1998 (Russian Language).

EPIC Program, The Kyoto Protocol and its Consequences for the Countries in Transition not Included in Annex B, by Daniel Dudek and Alexander Golub, October 1998.

EPIC Program What Next? Assisting Kazakhstan to Meet its Commitments Under the Framework Convention on Climate Change, by Randall Bluffstone, December 1998.

EPT, Summary of the Seminar on Water Pricing in Central Asia, by Barbara Britton, (Available in English or Russian), February 1996. Available from USAID or the EPIC library, locator number EPT/ R-6.

EPT, Issue Paper #2: Valuation of Water Uses as a Tool for Resolving Water Sharing Issues in Central Asia, by Robert C. Anderson, (Available in English or Russian), January 1997. Available from USAID or the EPIC library, locator number EPT/ R-17.

EPT, Issue Paper #6: Analysis of Water Laws in the Republics of Central Asia, by Saule Bakenova, (Available in English or Russian), July 1997. Available from USAID or the EPIC library, locator number EPT/ R-29.

EPT, Working Meeting of Energy/Water Uses Round Table, Lake Issyk-Kul, Kyrgyzstan, by Barbara Britton, (Available in English or Russian), August 1997. Available from USAID or the EPIC library, locator number EPT/ R-34.

EPT, Final Report from the International Seminar on the Rational Use of Water and Energy Resources in the Central Asian Region, by Anderson, Barnes, Britton, Hutchins, Mann and McCauley, (English Language), September 1998. Available from USAID or the EPIC library, locator number EPT/ R-36.

Hagler-Bailly, Energy Regulatory Reform and Restructuring, Republic of Kazakhstan, November 11, 1994.

Hagler-Bailly, Restructuring Kazakhstan's Electric Power Industry, March 16, 1995.

Hagler-Bailly, Status Report: The Electric Power Sector of Kazakhstan, April 27, 1998.

Hagler-Bailly, 1998 Comparison of NIS Electric Power Restructuring and Reform, June 1998.

Hagler-Bailly, Report of Wholesale Market Approach, Procedures, and Implementation Plan, September 1998.

HIID, Feasibility Assessment for an Area-wide Emissions Trading Bubble in the City of Almaty, by S. Farrow. In cooperation with the Almaty City Department of Ecology and Bioresources and the Ministry of Ecology and Bioresources of the Republic of Kazakhstan, (Available in English and Russian), July 1995.

HIID, Kazakhstan Investment Fund Considerations, by Theodore Smith. HIID Environment Discussion Paper No. 28, 1997.

HIID, Project Report: The Almaty Emissions Permits Trading Pilot Program, by Richard Berger, February 1998.

HIID, Project Report: Assessment Models for Health Damage from Air Pollution in the Cities of Almaty, Kazakhstan and Tashkent, Uzbekistan, by Richard Berger, March 1998.

HIID, Newly Independent States Environmental Economics and Policy Project: Final Report for Kazakhstan and the Central Asian Republics, November 1994-March 1998, July 1998.

ICCMA, (International City/County Management Association), Building A Regulatory System for Kazakhstan: Building Codes and Standards in A Market Economy, by D. Harris, February 1993.

IRG, Energy Efficiency Audit Report: Almaty Heating Systems Enterprise, June 1993.

IRG, Kazakhstan - Energy Efficiency in the District Heating System of Almaty: Policy and Institutional Analysis, June 1993.

IRG, Kazakhstan Energy Pricing and Taxation Study: Petroleum, Gas and Coal Pricing and Taxation, by Browning and Poats, June 1993.

NOAA, Final Report: Estimation of Seasonal Dynamics of Arid Zone Pasture and Crop Productivity Using NOAA/ AVHRR Data, by Gitelson, Kogan, et al. 1995. In cooperation with Ben Gurion University and Jacob Blaustein Institute for Desert Research.

PER (Partners in Economic Reform), Coal Project in Kazakhstan May 1993-January 1994, by Irving and Marunich, January 1994.

USCSP (US Country Studies Program), Climate Change Vulnerability Assessment in Kazakhstan, jointly written by USCSP and the Kazakh Scientific and Research Institute for Environment and Climate Monitoring (KazNIMOSK), 1996.

USCSP, Support for National Action Plan (SNAP) for the Republic of Kazakhstan, First Progress Report, jointly written by USCSP and KazNIMOSK, March 1997.

WEC (World Environment Center), Waste Minimization Training Manual for Central Asia Republics Industries, (Russian and English), 1996.

WEC, Waste Minimization Demonstration Project, Joint Stock Company Chimprom, Pavlodar Kazakhstan, March 1996.

WEC Waste Minimization Demonstration Project, Joint Stock Company Chimprom, Pavlodar Kazakhstan, Visit #2, June 1996.

Appendix III

KEY LOCAL COUNTERPARTS FOR WORK IN KAZAKHSTAN RELEVANT TO CLIMATE CHANGE

Kazakh Scientific Research Institute for Environment and Climate Monitoring (KazNIMOSK), Under the Ministry of Environment and Natural Resources

Involved in the National Communication, US Country Studies Counterparts, Participants in Annex B working group.

Olga Pilofosova

Irina Eserkepova

Svetlana Mizina

Kazakhstan Institute of Economic Research (Under the Ministry of Energy, Industry and Trade)

Involved in projections of energy demand, Health Damage Assessment Models Program, EPIC Program working group on Accession to Annex I.

Kanat Barentaev

Nadezhda Fedorova, (retired)

Almaty City Department for Ecology and Bioresources (ACDEB) Under the Ministry of Environment and Natural Resources

Involved in the Almaty Emissions Permits Trading Pilot System covering particulates.

Bulat Esekin, (formerly.)

Khadzhimukan Aryonov, Head of Almaty City Department for Ecology and Bioresources (ACDEB)

Beibut Dyusekov, Deputy Head ACDEB

Galina Telekova, Chief, Department of Ecological Expertise and Audit, ACDEB

Mironyuk, Chief, Department of Automobile Transport, ACDEB

Sergey Belov, Chief, Department of Information and Analysis, ACDEB

National Ecological Center for the Sustainable Development of Kazakhstan (NEC) Under the Ministry of Environment and Natural Resources

Responsible for project identification and development, Implementation of the National Environmental Action Plan, Involved in EPIC Program Working Group on Accession to Annex I, Involved in proposed cleaner production working group.

Bulat Esekin, Director, formerly of ACDEB

Sergey Yelkin, Manager of NEC Climate Change division

Ajar Baisekalova, Project Appraisal, NEC

Baurzhan Duisebaev, Clean Production Manager

Proposed Working Group on Cleaner Production:

Most of the group originated with the WEC Waste Minimization Project in Pavlodar.

V.P. Trojanov, Technical Director Joint Stock Company Chimprom

Irina Darkambaeva, WEC Country Coordinator

A.G. Siryk, Chimprom Production and Development Director, Chimprom

Baurzhan Duisebaev, National Ecological Center

Delegation to COP-4 (Buenos Aires) Supported by USAID Through EPIC:

** Designates those who have worked with USAID climate change-relevant projects in the past.*

Irina Eserkepova, * KazNIMOSK (travel supported by USAID)

Bulat Esekin, * Director of the National Ecological Center for Sustainable Development (travel supported by USAID)

Minister Serikbek Daukeev, * Ministry of Ecology and Natural Resources

Deputy Asylzhan Akhmetov, * Chair of the Ecological Committee of the Mazhilis (lower house of Parliament)

Suinshlik Tiesov, Director of the Electricity Dept., Ministry of Energy, Industry & Trade

Erbulat Sembayev, First Secretary of the First Department, Ministry of Foreign Affairs