

11. 世銀ドラフトペーパー 疑問メモ

世銀 DP(Air Pollution in Ulaanbaatar, Discussion Paper, Version for Comment: June 22, 2009) 疑問メモ

Systematic な bias あり。

- ・ゲル地区ストーブの排出を過大評価
- ・大気環境中の PM10, PM2.5 濃度、特にゲル地区の過大評価
- ・火力発電所の排出を過小評価
- ・火力発電所による大気環境への影響を過小評価。

誇張された大気環境モニタリング結果にシミュレーションを、無理やり適合させている疑い。ゲル地区ストーブを主犯とし、火力発電所を無害と見なそうとする意図が感じられる。

疑いの根拠：

1. ゲル地区ストーブの排出を過大評価

- a) 石炭の EF は、JICA の実測に比べて、大きなものを採用。(JICA ゲルストーブ測定結果の代表性の検討必要。少なくとも、壁式ストーブは一般ストーブよりも、EF は低いはず。これが、DP では、考慮されていない。過大評価へのバイアス)
- b) 薪の EF—石炭よりも更に高いものを採用。——NUM の CMB 分析による、PM10 の起源で石炭燃焼によるものと薪によるものの比率と帳尻が合わない。Guttinkunda でもこうした扱いを行っていない。(要確認)
- c) Kiosk5000 箇所のストーブ (PM10 排出量として全体の 5%) をゲル地区ストーブに加算。下駄履きをさせている。

2. 大気環境中の PM10, PM2.5 濃度、特にゲル地区の過大評価。

- a) 高い測定値に、薪の EF の設定とシミュレーションモデルを無理に合わせたように思える。ゲル地区におけるサンプリングポイントがゲルストーブ煙突の至近距離とした (プロGRESS・レポート要確認) 疑いがある。この大気環境濃度の高い測定値は、実は煙突からの排煙の直接的な暴露に拠るものではないか？
- b) PM2.5 の主要な汚染源をゲル地区ストーブとしているが、これは、Lodoysamba 教授の未発表論文 (title 確認) の分析と一致しない。PM2.5 中の炭素成分の起源、coal1, coal2 で、燃焼温度の高い (火力発電所や HOB) ものが PM2.5 で大きな比率を占めると分析している。ゲルストーブの燃焼温度は低いはず。
- c) PM10 モニタリング (黄砂モニタリング) で規則正しく繰り返される 1 日

2回のピークをゲル地区ストーブの着火で説明。それで、すべて説明できるのか疑問。

(i) なぜならば、ゲル地区からの排煙の影響が小さい、黄砂モニタリング NAMHEM 屋上のサイトでも観測されている。

(ii) このピークは週レベルのサイクルを持っている。週末など2日間は、ピークが現れない。(2日のピークなしは常に繰り返す。が、週末とは限らないところが不思議。)

(iii) 6月時点でも、黄砂モニタリング・サイトでこの規則的なピークがある。

(iv) 従って、ゲルストーブ以外の原因がある可能性もある。

・車両交通

・火力発電所 運転パターン要検討

d) 高濃度の大气中の PM10 は、この規則的な排出ピークによる寄与が大きいと Lodoysamba 教授は考えている。もし、排出ピークに別の汚染源が原因しているとすれば、即ち、その汚染源の重要度が上がり、ゲルストーブの重要度が低下することになる。

モニタリングポイントがゲルストーブ煙突近傍で測定されたピークは、ゲルストーブ起源といえる。

NAMHEM 屋上モニタリングでのピークは、どう考えたらよいか？ゲルストーブの影響が DP の言うように、きいてきているのか？その場合の交通起源とのバランスはうまく説明できるのか？

もし、自動車交通や発電所の運転パターンが利いているのであれば、ここのモニタリング・サイト別に別途の原因があり、しかし、時間が一致するのか？これも不自然。各サイトにおけるピークのパターンを比較検討する必要あり。

3. 火力発電所の排出を過小評価

a) EF の設定。Cleaned か？uncleaned か？

b) 集塵効率の設定——高すぎるのではないか？

c) 火力発電所の運転は年間を通じて一定と仮定。本当にそうか？要検討。冬場に熱需要が高いことから、当然石炭投入量も大きいのではないか？火力発電所が稼動する夏に大気汚染がないから、火力発電所は影響が小さいと、本当に言えるのか？屁理屈ではないか？疑問あり。

d) 夏の PM10 大気環境濃度は、MNS 年間平均 ($50 \mu\text{g}/\text{m}^3$) や WHO のガイドライン ($20 \mu\text{g}/\text{m}^3$) を満たしていないのではないか？いないとすれば、火力発電所、自動車と自然起源のものが汚染源として問題視されるべき。夏の PM10, 2.5 濃度の確認必要。火力発電所の運転パターン要確認。夏は Mixing height が高い。即ち、火力発電所からの排出は、地上レベルの汚染に影響する。

e) CHP2, 3 の EF については、JICA の実測結果と大きく異なる。多分 JICA が正しいだろう。

4. 火力発電所による大気環境への影響を過小評価。

a) 気象条件の設定:2007 年気象条件 (Larsen) と 2008 年気象条件 (深山簡易シミュレーション) とで何が違うか? 要確認 (どうやって?)

b) 人口分布 (現状および将来) Larsen の人口暴露量の算定の前提となった、人口分布は何か? 不明のままではないのか? 南部、西部の火力発電所の影響を受ける地区の人口についてどのような前提か? 要確認。少なくとも、将来予測として、JICA 都市開発 MP で行ってもらう必要あり。

5. SO₂ 濃度、NILU のパッシブサンプラーと CLEM の 校定法に従ったマニュアル測定と比較。パッシブサンプラーによるものよりも、CLEM による測定値が低いとの指摘。だから、CLEM による測定は間違いと本当に言えるのか、疑問あり。NILU のパッシブサンプラーはどのように、カリブレートされたのか精査の必要あり。

理論武装のための宿題:

JICA 測定の代表性

JIS 測定法と欧米の測定法の相違やズレがあるのか、ないのか、認識必要。

DP による大気環境モニタリングの精度の把握

以上

12. Air QUISとJICAプロジェクトのインベントリ・システム、シミュレーションの関係

AirQUIS と JICA プロジェクトのインベントリ・システム、シミュレーションの関係

世界銀行の Discussion Paper においては、ノルウェーの大気科学研究所 (NILU) が開発した Air Quality Management System である「AirQUIS」を使って、汚染物質発生源による大気環境への影響を評価している。この AirQUIS システムは、そのモジュールとして、発生源インベントリ・システムやシミュレーション・システムを装備しており、JICA プロジェクトで予定している発生源インベントリ・システム構築や大気質予測シミュレーションと重複する可能性が考えられる。

AirQUIS システムは NILU が開発した商用パッケージ・ソフトウェアであると考えられ、第 3 次詳細計画策定調査での調査の範囲では、このパッケージ・ソフトウェアがモンゴル側にインストールされておらず、当然、技術移転も行われてはいない。さらに、別途、世界銀行北京事務所の Gailius 氏が言及している NAMHEM への技術移転についても、NAMHEM の担当者は承知していなかった。

現時点では AirQUIS システムそのものを解析することはできないので、一部は想定になるが、インベントリ・システム部分について言えば、様々な情報を活用してインベントリを作成する過程を全て標準化することは困難である。インベントリ・システムに必要な入力データを与えればインベントリを作成できるが、この入力データそのものが直接、入手できる場合ばかりではなく、入力データを作成するために 1 次データを処理する必要がある場合もある。

JICA プロジェクトでは、IT ソフトウェアとしてのインベントリ・システムだけではなく、インベントリ作成用の基礎データの収集方法についての検討も含めて、カウンターパートが継続的にインベントリを更新していくことができる様に技術移転を行う。

最終的に AirQUIS システムにインベントリ・データを集約することが技術的に妥当であり、カウンターパートがそれに合意するのであれば、例えば、JICA プロジェクトのインベントリ・システムから AirQUIS システムへのデータ・インポート用のインターフェースを作成するという選択肢も有り得る。

また、AirQUIS のシミュレーション・モデルは Discussion Paper の記述で見ると、精緻なシミュレーション・モデルであると言える。現時点で JICA プロジェクトでの使用を予定しているシミュレーション・モデルは AirQUIS システムのものに比較すると単純化されたモデルである。

AirQUIS システムでは、気象モデルと大気質予測モデルがあり、気象モデルで対象地域の気象場を予測した後に、その気象場のデータと発生源データに基づいて、汚染物質濃度を予測する。モデルの分類としてはオイラー型モデルと言われるもので、移流・拡散方程式を数値的に解いて濃度を予測することから、計算量が膨大になる。

一方、JICA プロジェクトで予定しているシミュレーション・モデルは移流・拡散方程式

の様なタイプのモデルは数十年以上に亘って世界的に EIA や大気質管理に活用されてきた歴史があり、有用性は証明されている。

これまで、大気質予測シミュレーションの実施経験が少ないモンゴル側カウンターパートにいきなり高度なシミュレーション・モデルの使用を求めるよりも、まず、基本的なシミュレーション・モデルでの技術移転を図ることが望ましい。また、別な言い方をすれば、JICA プロジェクトで行う基礎的なシミュレーション・モデルと AirQUIS システムのより高度なシミュレーション・モデルの両方がモンゴル側に移転されることに何ら問題は無いと考える。

別の観点では、JICA プロジェクトでは FORTRAN という科学計算用コンピュータ言語で記述されたソースコードが公開されているシミュレーション・モデルを使い、かつ、このシミュレーション・モデルは無償でダウンロードできる。このことが、このシミュレーション・モデルが世界的にデファクト・スタンダード化した大きな理由である。正確に確認はできていないが、AirQUIS システムは有償であり、ソースコードは非公開である可能性が高い。この点でも、JICA プロジェクトでシミュレーション・モデルの技術移転を行う意義があると言える。

確かに政策決定を行う様な行政担当者がシミュレーション・モデルの詳細について知る必要は無いが、モンゴル側のカウンターパート・グループの中には、シミュレーション技術分野について熟知する専門家を養成することがモンゴル側の大気汚染管理行政全体の能力向上には不可欠である。

結論としては、世界銀行が推奨する AirQUIS システムと JICA プロジェクトで実施予定のインベントリ・システムやシミュレーションは、重複するものでなく、双方のプロジェクトを補完的に進めることによって、モンゴル国、ウランバートル市の大気汚染対策プログラムを効率的に推進できるものとする。

以上

13. 5項目評価補足説明

説明資料（5項目評価）

報告書冒頭の事業事前評価表（案）と第4章で評価の詳細を述べたので、さらに説明を加えるべき内容もないが、以下に若干の補足事項を記す。

① 市及びAQDCCの積極性

今回の調査が始まる前にウランバートル市長令を以ってC/P-WGを早々に指名するなど、市当局の本プロジェクトに対する期待の大きさを実感させられ、またC/P機関であるAQDCCとの連携の緊密さも理解できた。

ワークショップの議長を務めたMr. Batsaikhan (AQDCC副長官)は事前にPDMとPOの案をよく読みこみ、JICAのプロジェクトの方法も十分に理解しており、その中での自分の役割も自覚していることが伺えた。その部下等も会議・打合せや現地視察においてそれぞれの役割に応じた積極的な動きを示した。

このような姿勢がプロジェクト開始後もまたプロジェクト終了後も継続するものと考え、妥当性や自立発展性の評価の判断材料の1つとした。

② 対象とする主たる排出源

第2次詳細計画策定調査¹によれば、ウランバートル市内における最近の石炭の年間消費量は、調査機関によってかなりの開きはあるが、全体で430～490万トン、このうち火力発電所では330～380万トン、HOBでは7～40万トン、ゲル地区では40～50万トン消費されているとみなされる²。

本プロジェクトでは、石炭消費量が全体の約70% (NAMHIMのデータにより算出)と圧倒的に大きい3つの火力発電所と、企業が所有している約200基のHOBを主たる調査の対象としている。火力発電所はまとまった大口消費設備であり、年間を通じた大気汚染物質の排出源であるから、その対策の効果は大きい。HOBは、石炭消費量はゲル地区と同等かいくらか少ないと考えられるが、数は相対的に少なく、許認可等を通じた指導が比較的容易であって、横への広がり期待できる。このような点から有効性が高いと予測する理由の1つとした。

ただし、火力発電所においては不完全ながら集塵設備が稼働している部分が多いため、石炭消費量の割合に比べれば塵埃排出量は低いこと、また、HOBとゲルでの石炭消費は冬季に限られるため、これらの消費の割合は冬季には年間を通じた上記の割合よりも大きくなり、塵埃の排出比率はさらに大きなものとなることに留意すべきである。

¹ モンゴル国・ウランバートル市大気汚染削減プロジェクト第2次詳細計画策定調査報告書(案)、2009年5月、p.63

² 同上 p.63の表3-12のうち、時期的にかなり古いJICA Coal Study, 1995と、他のデータから大きくかけ離れているGuttikunda, 2007の2つを除外して整理した。

また、北海道で石炭ストーブの生活を経験してきたシニアボランティアの、冬季の大気汚染の原因はゲルのストーブであろうという直感も尊重する価値があろう。ゲルストーブについては WB、ADB、EBRD などがストーブの構造やコークス、ブリケットへの燃料転換などについて検討を進めており、また第 2 発電所ではゲル向けなどを想定したコークス製造の構想を持っている。本プロジェクトではこれらの機関の活動との重複は避けて、ゲルストーブは排ガス測定の対象とすることに止めている。

ゲルに関してはストーブの燃料転換のほかにも集合住宅化などの構想もあるようであるが、いずれも居住コスト、燃料コストなどの上昇を招くことになり、これを経済的に弱い立場にある住民の負担をいかに軽減するかの施策が伴わなければ実現は困難であろう。

③ 他の援助スキーム等との関係

我が国のモンゴル大気汚染防止関連の資金援助では、具体的な判断データがないために相手方の要請に応えられないことも多いといわれている。本プロジェクトにおいて測定、シミュレーションなどによってデータが整備され、また診断などによって効果的な汚染防止策が提案されて、次の資金援助等のスキームつながっていくことが期待される。また燃焼効率の向上による省エネルギーが CDM の排出権取引に発展する可能性もある。これらをインパクトの評価材料の 1 つとした。

④ 他ドナーとの連携

モンゴルでは、WB、ADB、EBRD、GTZ など多くの国際援助機関が大気汚染対策に関連するテーマに取り組んでいる。JICA も含むこれらの機関は、WB を中心として連携・調整を行う場としてラウンドテーブルを持ち、またモンゴル政府は NCC を組織している。

本プロジェクトに関しても、ラウンドテーブルや NCC と緊密な連携をとり、また個々の各機関と連絡をとるなど、重複を避け相互に補完しあえる活動を行うことが期待される。このためにはプロジェクトチームのみならず、JICA 本体の強力な関わりが重要となろう。

WB は、高度なシミュレーション・モデルを用いた大気汚染に関するアセスメントを近く終了させるとしており、その関係者はその成果を本プロジェクトで引き継いで発展させることを望んでいる。

ADB、GTZ は、それぞれ市内外での HOB を調査して、その結果をセミナーまたは文書等によって公開している。本プロジェクトの実施に際してはこれらの成果も確認する必要がある。

WB、ADB、EBRD は前述のように、それぞれゲル地区のストーブの構造や燃料転換に取り組んでいるが、成果は必ずしも十分にはあがっていないようである。

しかし、いずれにせよこれら各援助機関との間でその役割分担を明確にし、無駄な重複をなくし、総体的にウランバートル市の大気汚染防止に貢献できることが望まれる。これもインパクトの評価材料の 1 つとした。

14. 北海道における家庭用燃料転換との比較

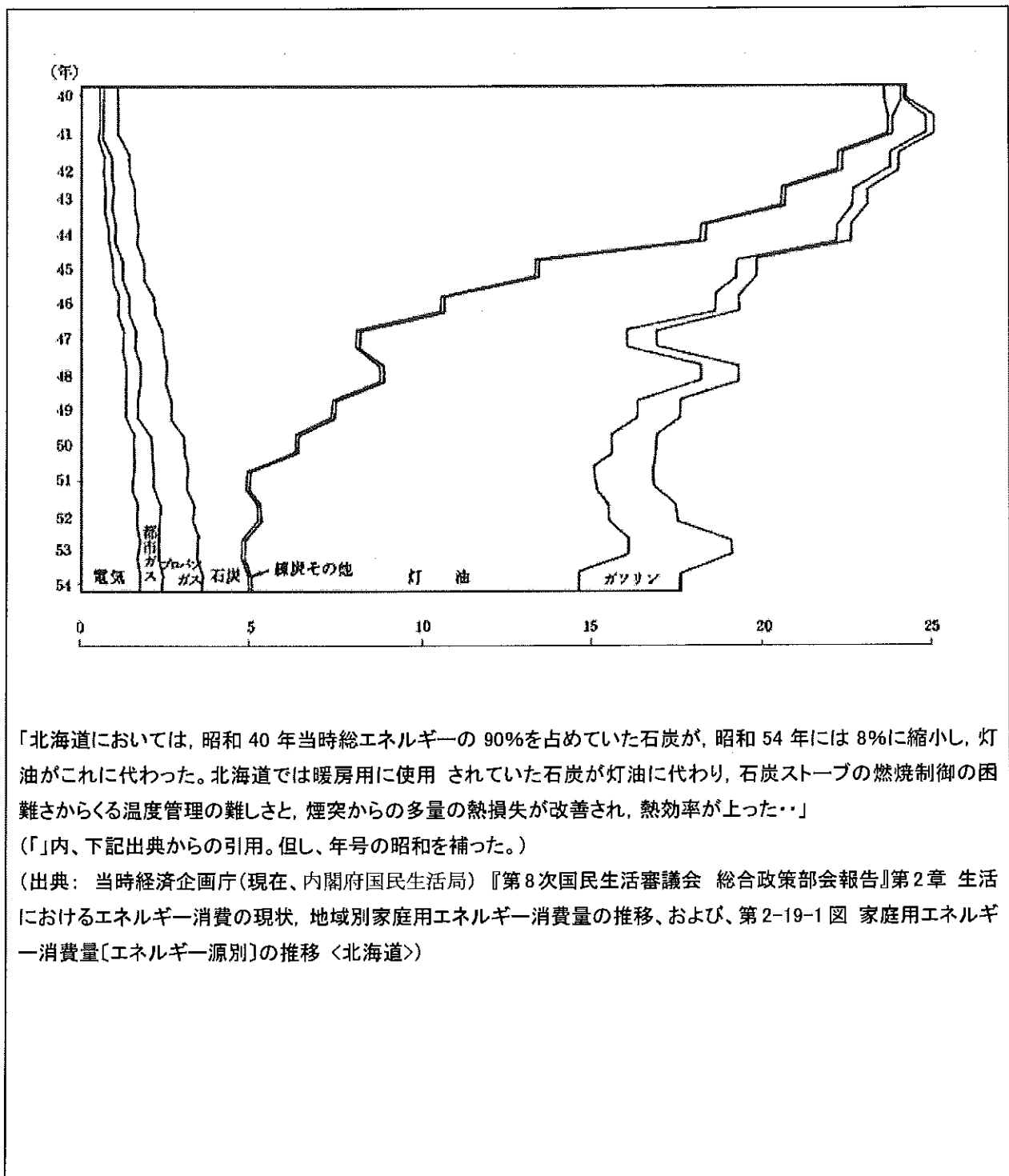
我が国においても、1960年代に、家庭用エネルギーの石炭から灯油、ガス、電気への転換が行われた。寒冷地の北海道の転換事例とモンゴル国ウランバートル市のゲル地区におけるコールブリケット、コークスなどの改善燃料と改善ストーブへの転換と比較してみるとは有用であろう。

北海道における家庭用燃料転換に関する様々な記述は散見されるが、体系的な調査研究は見当たらない。様々な断片的な情報から判断すれば、北海道における家庭用燃料転換は、現在、UB市で援助機関が意図しているようなプロジェクトの形で行政が家庭レベルに直接的に介入して達成されたものではない。我が国では、1960年代後半における、石炭から石油への転換という国策レベルでのエネルギー政策と、それに伴う石炭の政策需要量と目標出炭量といった、マクロ的な施策が大きな要因である。この帰結として、地方炭鉱の閉山、そして、石炭の供給と流通への制約が起こった。加えて、石油ストーブ、プロパンガス、都市ガスといった、液体あるいは気体で、熱効率と利便性のより高い代替燃料が供給されたこと、そして、家庭の所得向上と生活意識の変化により、燃料転換が引き起こされたと想像できる。我が国の場合はこうした根源的な変化により家庭用燃料の転換が結果として続いたという理解ができる。それでも、下図に示すように、概ね、石炭からの他の代替燃料へ、熱量にして半分程度置き換わるまでに、5年程度を要している。また、注目すべきは、石炭を原料とする固体燃料である練炭、豆炭への転換は決して行われていないことである。それどころか、そのシェアは、昭和40年をピークとして減っている。

こうした我が国における事例をUB市のゲル地区と比較する。現在、援助機関側が想定している代替燃料は練炭、豆炭、コークスといった、石炭を原料とする固体燃料である。これらは、利便性、熱効率で、石炭と比べて飛躍的に改善があるというものではない。また、我が国で起こったように、石炭の供給や流通を抜本的に制限するという事は、石炭に富むUB市においては、物理上また施策上、非常に困難である。また、転換の速度は決して速いものではなく、我が国の事例からは、家庭における石炭使用をほぼ根絶するには、14年程度の時間を要している。貧困層からなるゲル地区住民の所得の向上に大きな改善が見込めないとすれば、こうした変化は、北海道における事例よりも更に長い時間がかかっても不思議はない。

以上から、北海道における家庭用燃料転換の経験は、現在、援助機関で検討されているゲル地区の燃料転換、ストーブ転換の妥当性を支持するものではない。更に、ゲル地区燃料対策は、北海道における事例と照らし、燃料転換への成功の必要条件が整っていないことを示唆するものとなっている。

ボックス： 1960-70年代 北海道における家庭用エネルギー消費量〔エネルギー源別〕の推移



「北海道においては、昭和40年当時総エネルギーの90%を占めていた石炭が、昭和54年には8%に縮小し、灯油がこれに代わった。北海道では暖房用に使用されていた石炭が灯油に代わり、石炭ストーブの燃焼制御の困難さからくる温度管理の難しさや、煙突からの多量の熱損失が改善され、熱効率が上がった…」

(「」内、下記出典からの引用。但し、年号の昭和を補った。)

(出典：当時経済企画庁(現在、内閣府国民生活局)『第8次国民生活審議会 総合政策部会報告』第2章 生活におけるエネルギー消費の現状、地域別家庭用エネルギー消費量の推移、および、第2-19-1 図 家庭用エネルギー消費量〔エネルギー源別〕の推移〈北海道〉)

**Discussion on The 3rd Detailed Planning Survey on
The Capacity Development Project for Air Pollution Control in
Ulaanbaatar City, Mongolia
(August 23 – September 5, 2009)**

Date and time : Tuesday , 25 August 2009, 09:00-16:00

Place : AQDCC

Chairman : Mr. Taizo YAMADA as Senior Adviser in Environment, JICA

Schedule

[AM]

- (1) Introduction by Taizo YAMADA , Team Leader
- (2) Presentation on Record of discussion for the Technical Cooperation by Technical Team
- (3) Explanation of the Technical Cooperation Project by Mr. Yasutoshi SAGAMI as JICA Headquarter
- (4) Explanation of the 5 Criteria Evaluation by Mr. Ren ARAKANE, Technical Team
- (5) Explanation of the Draft Record of Discussion by taizo YAMADA , Team Leader
- (6) Discussion

Lunch

[PM]

- (7) Explanation of the Project Design Matrix by Mr. Akeo FUKAYAMA, Technical Team Leader
- (8) Discussion

**Capacity Development Project for Air Pollution Control in Ulaanbaatar City
Workshop for Counterpart Working Group (C/P-WG)**

[Organized by] Air Quality Department of the Capital City and JICA Mission Team

[Date] 10:00 – 16:00, August 26, 2009

[Venue] Meeting Room, Municipality of Ulaanbaatar

[Purpose]

- to explain PDM and PO to relative stakeholders of the Project including C/P-WG
- to discuss the project activities with C/P-WG in order to finalize them

[Tentative Program]

*Contents of program and time schedule is subject to change.

(1) Opening remarks by Mr. Injinnash (Director of Air Quality Department) and Mr. Yamada (JICA Mission Leader)	10:00 – 10:10
(2) Introduction	10:10 – 10:40
(3) Explanation of the Project Plan	
Explanation of Project Design Matrix (PDM)	10:40 – 11:40
Explanation of Plan of Operations (PO)	11:40 – 12:30
(Lunch Time)	
(4) Comments from C/P-WG members	13:30 – 14:30
(5) Discussion for each output	14:30 – 15:30
(6) Wrap-up session	15:30 – 16:00

[Attendants]

- Air Quality Department of the Capital City
- National Air Quality Office
- Central Laboratory of Environment and Meteorology
- Traffic Police Department of the Capital City
- Road Department of the Capital City
- Public Transportation Department of the Capital City
- Urban Development Policy Division of Ulaanbaatar City Mayor's Office
- Ulaanbaatar City Inspection Agency
- Engineering Facilities Department of the Capital City
- Heating Plant Utilization Authorization
- Thermal Power Plant 2
- Thermal Power Plant 3
- Thermal Power Plant 4
- National University of Mongolia
- National Inspection Agency
- JICA

List of attendance
 Workshop for the 3rd Detailed Planning Survey
 The Capacity Development Project for Air Pollution Control in Ulaanbaatar City

No.	Name	Organization
1	Tumurkhuyag	Director, The 2nd Power Plant
2	Lodoisamba	Professor, NUM
3	Enkhtsetseg	The 4th Power Plant
4	Altangerel	The 4th Power Plant
5	Oyunjargal	Road Department of Capital City
6	Enkhsaikhan	Transport Department of Capital City
7	Myagmarsuren	Transport Department of Capital City
8	Badamkhand	Inspection Agency of Capital City
9	Bayasgalan	Inspection Agency of Capital City
10	Tsogtsaikhan	MUB
11	Gantogoo	National Inspection Agency
12	Gantumur	Ministry of Nature, Environment and Tourism
13	Unurbat	NAQO
14	Bayarmagnai	NAQO
15	Soninbayar	The 2nd Power Plant
16	Oyuntuya	CLEM
17	Batbaatar	The 3rd Power Plant
18	Boldsaikhan	The 3rd Power Plant
19	Gantulga	Ministry of Finance
20	Enkhmaa	NAQO
21	Batsaikhan	AQDCC
22	Gan-Ochir	UB city mayor's office
23	Enkhtuvshin	AQDCC
24	Seded	AQDCC
25	Davaadorj	AQDCC

**The 3rd Detailed Planning Survey on
The Capacity Development Project for Air Pollution Control in
Ulaanbaatar City, Mongolia
(August 23 – September 5, 2009)**

<Purposes of the Mission>

- (1) Discuss and agree on the project design (project outcome, objective, outputs, activities, and necessary undertaking by the Mongolian side and Japanese side), to be documented in the M/M with Draft R/D, which will be signed during this mission;
- (2) Confirm a frame work of counterpart set up such as JCC, C/P and C/P-WG for the Technical Cooperation Project;
- (3) Collect and analyze relevant information on the Technical Cooperation Project planned activities; and
- (4) Perform the five criteria JICA project evaluation based on the PDM.

<Member List>

	Name/Job Title in the Mission	Position
1	Leader/ Environmental Management/ Mr.Taizo Yamada	Senior Advisor (Environmental Management and planning), JICA
2	Cooperation and Planning /Mr. Yasutoshi Sagami	Environmental Management Division 1, Environmental Management Group, Global Environment Dept.,JICA
3	Air Pollution Reduction /Mr. Akeo Fukayama	Consultant, SUURI-KEIKAKU Co.,Ltd.
4	Heat Power Plant/Boiler Technology /Mr. Yasufumi Nakajima	Consultant, NEWJEC Inc
5	Evaluation and Analysis /Mr. Ren Arakane	Consultant, GLOBAL PLANNING Co.

<Mission Schedule>

Aug.23 2009 – Sep.5 2009

	Date	Activities
1	8/23 Sun	<p>【Mr. Yamada, Mr. Arakane, Mr. Fukayama ,Mr. Sagami】 14:05 Departure from Narita (JL 955) 16:40 Arrival in Soul 20:10 Departure from, Soul (KE867) 22:40 Arrival in Ulaanbaatar</p> <p>【Mr.Nakajima】 15:20 Departure from Kansai-Kokusai airport (JL 963) 17:15 Arrival in Soul 20:10 Departure fro, Soul (KE867) 22:40 Arrival in Ulaanbaatar</p>
2	8/24 Mon	9:30 Meeting with JICA office C/C to MUB, NAQO, MOF, MMR
3	8/25 Tue	9:00 Discussing with Air Quality Department of UB city on Draft PDM, PO and R/D (*confirm on JCC, C/P and C/P-WG) PM Discussing with other major counterpart (if necessary)
4	8/26 Wed	10:00-13:00 Work-Shop for Counterpart-Working Group PM Additional meeting or PDM/PO revising
5	8/27 Thu	Discussion on M/M with Air Quality Dept Field Survey (the third Heat Power Plant)
6	8/28 Fri	Meeting with relevant donors (World Bank, ADB) Signing Ceremony for M/M 15:00 Report to EOJ 16:30 Report to JICA Office
7	8/29 Sat	<p>【Mr. Yamada ,Mr. Sagami】 00:20 Departure from Ulaanbaatar (KE 8868) 04:20 Arrival in Soul 08:20 Departure fro, Soul (JL950) 10:45 Arrival in Narita</p>
8	8/30 Sun	Arrange the reports
9	8/31 Mon ~9/3 Thu	Follow-up survey by Consultants
10	9/4 Fri	Report to Air Quality Department of UB city Report to JICA Office
11	9/5 Sat	Consultant teasm leaves for Japan

Abstract: M/M signed on 19th of December 2008

ANNEX I Proposed Technical Cooperation Project Preparatory Process

STEP 1: 1st JICA Detailed Planning Survey Mission (This Mission), December 2008

- Discussion on the proposed process of the project preparation;
- Preliminary discussion on ideas of outcomes, objectives and major outputs of the Project (based on the UB city proposal in 2007 and the previous JICA project formulation missions, 2007-2008);
- Preparation for the preliminary emission inventory survey; and
- Update of relevant institutional setups for UB air quality management.

Results expected:

- Agreement on the project preparation process;
- Agreed ideas of outcomes, objectives of the Project;
- Agreed arrangements for the preliminary emission inventory survey;
- Draft TOR for the preliminary emission inventory survey; and
- Updated information on the institutional setup for UB air quality management.

STEP 2: 2nd JICA Detailed Planning Survey Mission, tentatively planned for March – April 2009

- Execution of the preliminary emission inventory survey
- Related capacity development activities such as on site training and seminar

Results expected:

- Preliminary Emission Inventory (Identification of priority emission sources and necessary actions for further improvements of the emissions inventory),
- Preliminary assessment of emission mechanism and issues involved,
- Ideas for possible measures for emission reductions and necessary actions
- Capacity Assessment of the Mongolian side (UB city and relevant agencies) vis-à-vis the perceived necessary actions for emission reduction.
- Planning project activities to be supported by JICA and proposed institutional setup including project counter part formation, based on the UB city proposal in 2007 and the results of 1st and 2nd JICA Detailed Planning Survey Missions.

STEP 3: 3rd JICA Detailed Planning Survey Mission, planned for 2009 summer

- Discussion on the project design (outcomes, objectives, outputs, activities, counter part set up and necessary undertakings by Mongolian side and Japanese side)
- Decision and agreement on the project design (project outcomes, objectives, outputs and activities, counterparts setup, --)
- Project Design Matrix (PDM)
- Record of Discussion (R/D) signed

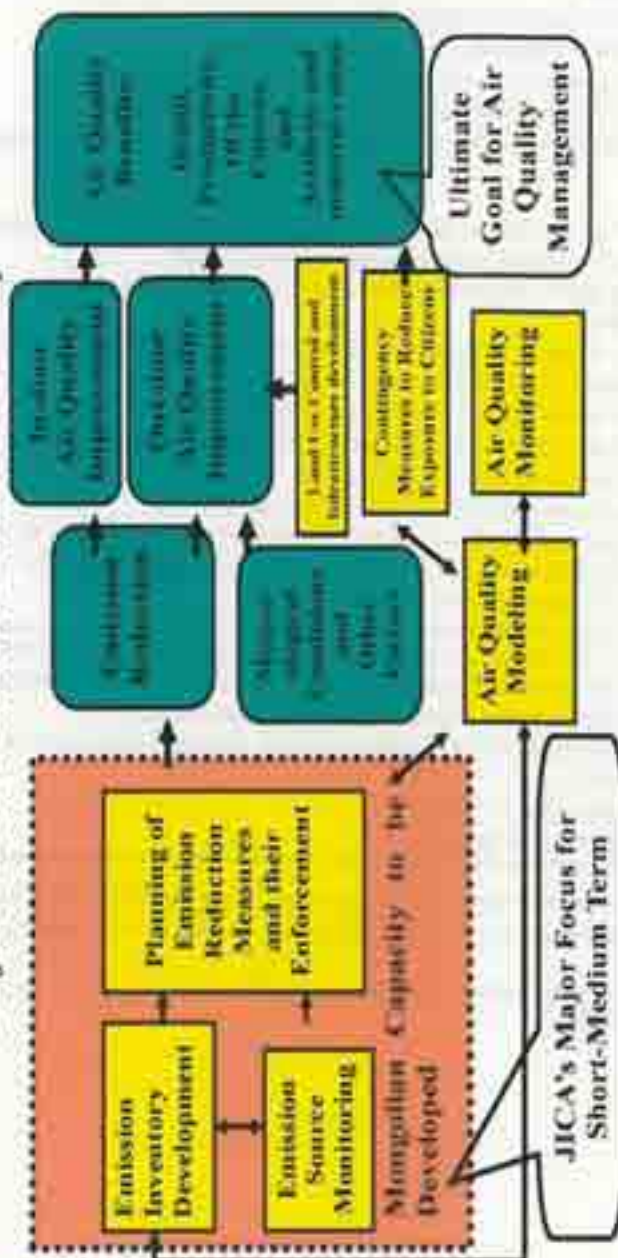
STEP 4: Technical Cooperation Project Inception, planned for 2009 autumn

- Series of project activities by Mongolian side and JICA in UB city and in Japan (in case of training course).

(Timing and contents of the Detailed Planning Survey Missions are only for discussion purposes and subject to change.)

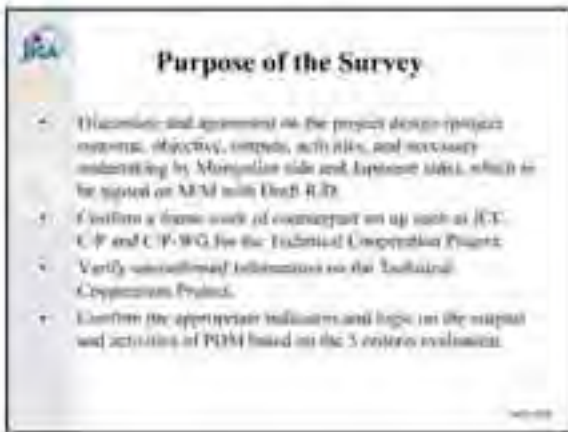
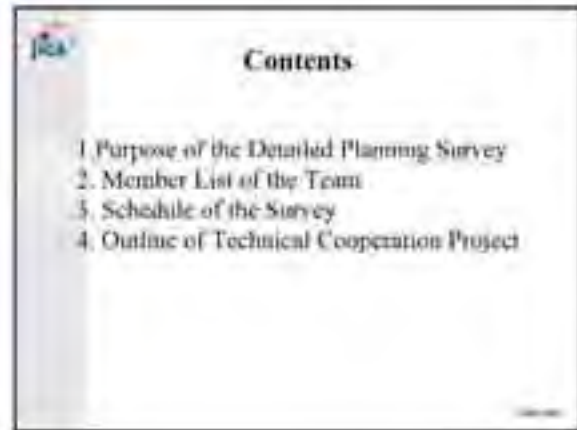
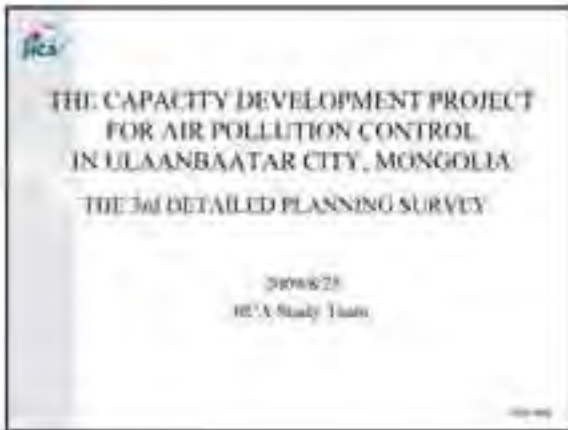
Outline of The Project (M/M on 19th December, 2008)

Proposed Focus of the Capacity Development Project for Air Pollution Control in UB City



(Updated by Taizo Yamada on August 21, 2009)

17-1. 本調査において先方との協議において使用された関連説明資料
(JICA技術協力プロジェクト)



Outline of Technical Cooperation Project

- Essential Elements in Supporting Capacity Development in Technical Cooperation
- Flow of Preparation Stage
- Outputs and Activities
- Plan of Operation (PO)
- H/D (Board of Directors)
- Flow of Implementation

Essential Elements in Supporting Capacity Development in TC

1. Ownership
2. Knowledge Acquisition

Flow of Preparation Stage

The flowchart illustrates the preparation stage through several key steps:

1. Identify need (Government/NGO, Technical Personnel Transfer)
2. Develop a PDM for approval of the project (Government/NGO)
3. Agree on PO (Government/NGO, Ministry/Technical Service)
4. Approve PO (Government/NGO, Ministry/Technical Service)
5. Approve PO (Government/NGO, Ministry/Technical Service)
6. Sign PO (Government/NGO, Ministry/Technical Service)
7. Sign PO (Government/NGO, Ministry/Technical Service)
8. Sign PO (Government/NGO, Ministry/Technical Service)
9. Sign PO (Government/NGO, Ministry/Technical Service)
10. Sign PO (Government/NGO, Ministry/Technical Service)

Project Design Matrix (PDM)

Activities	Resources	Organization	Means of Transport	Equipment
Project Start				
Project Planning				
Project Execution				
Project Completion				
Project Evaluation				
Project Review				

How to Read PDM

The diagram shows a grid where diagonal lines indicate the timing of resources, organization, and equipment relative to project phases. A horizontal bar at the bottom indicates the overall project duration.

Outputs and Activities

The diagram shows a 4x4 grid where the top row represents 'Outputs' (1, 2, 3, 4) and the left column represents 'Activities' (1, 2, 3, 4). The cells contain activity codes:

- Output 1: Activity 1.1, 1.2, 1.3, 1.4
- Output 2: Activity 2.1, 2.2, 2.3, 2.4
- Output 3: Activity 3.1, 3.2, 3.3, 3.4
- Output 4: Activity 4.1, 4.2, 4.3, 4.4

Plan of Operation (PO)

Purpose	Expected Outputs	Activities	Schedule		
			1st year	2nd year	3rd year
1		1-1			
		1-2			
		1-3			
2		2-1			
		2-2			
3		3-1			
		3-2			
		3-3			

R/D (Record of Discussions)

- Signer of R/D
- Measures to be taken by JICA
- Measures to be taken by the recipient government
- Administration of the project
- Joint evaluation
- Claims against Japanese experts
- Mutual consultation
- Measures to promote understanding of and support for the project
- Terms of cooperation

Signer of R/D

1. Mongolia Side

Mr. D. Galsan
(Vice-Minister of Transportation City of change of road and bridge,
Ministry of Transportation)

2. Japan Side

Mr. Yukio Imai,
(Chief Representative, JICA, Mongolia Office)

3. Witness

Mr. H. Kawamura,
(Director-General of Department of International Economic and Co-operation
Ministry of Finance)

Mr. D. Galsan,
(Minister of the Air Traffic Department Ministry of Transportation)

Measures to be taken by JICA

- Dispatch of Experts
- Acceptance of Trainees
- Provision of Equipment

Undertakings by GOM(1/3)

1. To ensure that the self-reliance operation of the Project will be sustained during and after the period of Japanese technical cooperation, through full and active involvement in the Project by all related authorities, beneficiary groups and institutions.
2. To ensure that the technologies and knowledge acquired by the Mongolian personnel as a result of the Japanese technical cooperation will contribute to the economic and social development of Mongolia.
3. To grant to Mongolian personnel, cooperation and benefits to the Japanese experts referred to in R/D above and their families.

Undertakings by GOM(2/3)

1. To take the measures necessary to receive and use the Equipment provided by JICA.
2. To ensure that the knowledge and experience acquired by the Mongolian personnel from technical training in Japan will be utilized effectively in the implementation of the Project.
3. To provide the services of Mongolian counterpart personnel and administrative personnel.

JICA Undertakings by GOM(3/3)

7. To provide office spaces and facilities for the project
8. To take necessary measures to supply or replace machinery, equipments, instruments, vehicles, tools, spare parts etc. at its own expense for the project
9. To take necessary measures to meet the training expenses for the project

JICA Flow of Implementation (1/2)

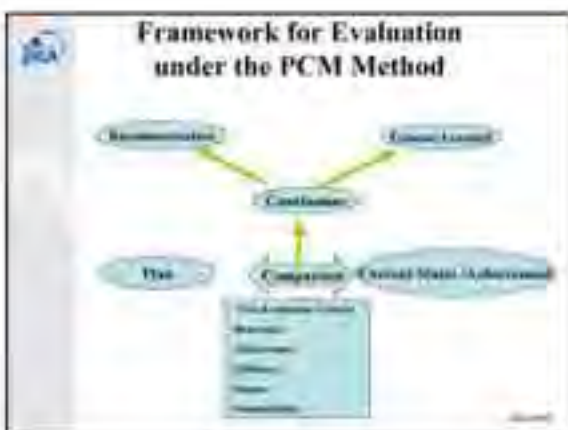
- Cooperation starts
- Draft of detailed execution plan
- Mid-term review of the project

JICA Flow of Implementation (2/2)

- Evaluation of cooperation results and discussion on steps after completion (Terminal Evaluation)
- Completion of the project
- Ex-post Evaluation (including Audit)

JICA Purpose of Evaluation

- Improving the Quality of the Current Project
- Improving the Quality of other Projects
- Improving transparency



JICA Five Evaluation Criteria

- Relevance
- Effectiveness
- Efficiency
- Impact
- Sustainability



• Relevance

Refers to the validity of a project purpose and an overall goal in connection with a development policy of a recipient government, as well as the needs of beneficiaries.

• Effectiveness

Refers to the extent to which the expected benefits of a project has been achieved as planned, and examines if the benefit was brought about as a result of the project (not as that of external factors).

10/11/11



• Efficiency

Refers to productivity of an implementation process, and examines if the inputs of a project was efficiently converted into the Output.

• Impact

Refers to direct and indirect, positive and negative impact caused by implementing a project, including the extent to which an overall goal has been attained.

10/11/11



• Sustainability

Refers to the extent to which a recipient country can further develop a project, and the benefits generated by the project can be sustained under the country's policies, technologies, systems and financial state of the country.

10/11/11



PDM and Five Evaluation Criteria



10/11/11

THANK YOU FOR YOUR ATTENTION!!



10/11/11

AGREEMENT
ON TECHNICAL COOPERATION
BETWEEN THE GOVERNMENT OF JAPAN
AND THE GOVERNMENT OF MONGOLIA

The Government of Japan and the Government of Mongolia,

Desiring to strengthen further the friendly relations existing between the two countries by the promotion of technical cooperation, and

Considering mutual benefits derived from promoting the economic and social development of their respective countries,

Have agreed as follows:

Article I

The two Governments shall endeavor to promote technical cooperation between the two countries.

Article II

Separate arrangements which govern specific technical cooperation programs carried out under this Agreement shall be agreed upon between the competent authorities of the two Governments. The competent authority of the Government of Japan is the Ministry of Foreign Affairs, and the competent authority of the Government of Mongolia is the Ministry of Finance and Economy.

Article III

The following forms of technical cooperation will be carried out by the Japan International Cooperation Agency (hereinafter referred to as "JICA") at its own expense in accordance with the laws and regulations in force in Japan as well as with the arrangements referred to in Article II:

- (a) providing technical training to Mongolian nationals;
- (b) dispatching experts (hereinafter referred to as the "Experts") to Mongolia;

- (c) dispatching Japanese volunteers with a wide range of technical skills and abundant experience (hereinafter referred to as the "Senior Volunteers") to Mongolia;
- (d) dispatching Japanese missions (hereinafter referred to as the "Missions") to Mongolia to conduct surveys of economic and social development projects of Mongolia;
- (e) providing the Government of Mongolia with equipment, machinery and materials; and
- (f) providing the Government of Mongolia with other forms of technical cooperation as may be decided upon by mutual consent between the two Governments.

Article IV

The Government of Mongolia shall ensure that the techniques and knowledge acquired by Mongolian nationals as well as the equipment, machinery and materials provided as a result of the Japanese technical cooperation as set forth in Article III contribute to the economic and social development of Mongolia, and are not utilized for military purposes.

Article V

In case JICA dispatches the Experts, the Senior Volunteers and the Missions, the Government of Mongolia shall:

1. (1) (a) exempt the Experts, the Senior Volunteers and members of the Missions from taxes including income tax, and fiscal charges imposed on or in connection with salaries and any allowances remitted to them from abroad;
- (b) exempt the Experts, the Senior Volunteers, members of the Missions and their families from consular fees, taxes including customs duties and fiscal charges, as well as from the requirements of obtaining import license and certificate of foreign exchange coverage, in respect of the importation of:

- (i) luggage;
 - (ii) personal effects, household effects and consumer goods; and
 - (iii) one motor vehicle per Expert, per family of the Expert, per Senior Volunteer and per family of the Senior Volunteer assigned to stay in Mongolia;
- (c) exempt the Experts, the Senior Volunteers and their families who do not import any motor vehicle into Mongolia from taxes including value added tax and fiscal charges in respect of the local purchase of one motor vehicle per Expert, per family of the Expert, per Senior Volunteer and per family of the Senior Volunteer; and
- (d) exempt the Experts, the Senior Volunteers and their families from the registration fee of the motor vehicles mentioned in (b)(iii) and (c);
- (2) (a) provide at its own expense suitable office and other facilities including telephone and facsimile services necessary for the performance of the duties of the Experts, the Senior Volunteers and the Missions as well as to bear the expenses for their operation and maintenance;
- (b) provide at its own expense the local staff (including adequate interpreters, if necessary) as well as Mongolian counterparts to the Experts, the Senior Volunteers and the Missions necessary for the performance of their duties;
- (c) bear expenses of the Experts and the Senior Volunteers for:
- (i) daily transportation to and from their place of work;
 - (ii) their official travels within Mongolia; and
 - (iii) their official correspondence;

- (d) provide the convenience for acquisition of appropriate housing accommodation for the Experts, the Senior Volunteers and their families; and
- (e) provide the convenience for receiving medical care and facilities for the Experts, the Senior Volunteers, members of the Missions and their families;
- (3) (a) permit the Experts, the Senior Volunteers, members of the Missions and their families to enter, leave and sojourn in Mongolia for the duration of their assignment therein, offer them the convenience for procedures of alien registration requirements, and exempt them from consular fees;
- (b) issue identification cards to the Experts, the Senior Volunteers and members of the Missions to secure the cooperation of all governmental organizations necessary for the performance of their duties;
- (c) offer the Experts, the Senior Volunteers and their families the convenience for acquisition of car driving license; and
- (d) carry out other measures necessary for the performance of the duties of the Experts, the Senior Volunteers and the Missions.

2. The motor vehicles mentioned in paragraph 1 shall be subject to payment of taxes including customs duties if they are subsequently sold or transferred within Mongolia to individuals or organizations not entitled to exemption from such taxes or similar privileges.

3. The Government of Mongolia shall accord the Experts, the Senior Volunteers, members of the Missions and their families such privileges, exemptions and benefits as are no less favorable than those accorded to experts, senior volunteers, members of missions and their families of any third country or of any international organization performing a similar mission in Mongolia.

Article VI

The Government of Mongolia shall bear claims, if any arises, against the Experts, the Senior Volunteers and members of the Missions resulting from, occurring in the course of, or otherwise connected with, the performance of their duties, except when the two Governments agree that such claims arise from gross negligence or willful misconduct on the part of the Experts, the Senior Volunteers or members of the Missions.

Article VII

1. (1) In case JICA provides the Government of Mongolia with equipment, machinery and materials, the Government of Mongolia shall exempt such equipment, machinery and materials from consular fees, taxes including customs duties and fiscal charges, as well as from the requirements of obtaining import license and certificate of foreign exchange coverage, in respect of the importation. The equipment, machinery and materials mentioned above shall become the property of the Government of Mongolia upon being delivered c.i.f. at the port of the disembarkation to competent authorities of the Government of Mongolia.

(2) In case JICA provides the Government of Mongolia with equipment, machinery and materials, the Government of Mongolia shall exempt such equipment, machinery and materials from taxes including value added tax and fiscal charges in respect of the local purchase.

(3) The equipment, machinery and materials mentioned in sub-paragraph (1) and (2) shall be utilized for the purpose specified in the arrangements referred to in Article II of this Agreement unless otherwise agreed upon between the competent authorities of the two Governments.

(4) The expenses for the transportation within Mongolia of the equipment, machinery and materials mentioned in sub-paragraph (1) and (2) and the expenses for their replacement, maintenance and repair shall be borne by the Government of Mongolia.

2. (1) The equipment, machinery and materials, prepared by JICA, necessary for the performance of the duties of the Experts, the Senior Volunteers and members of the Missions shall remain the property of JICA unless otherwise agreed upon between the competent authorities of the two Governments.

(2) The Government of Mongolia shall exempt the Experts, the Senior Volunteers and members of the Missions from consular fees, taxes including customs duties and fiscal charges, as well as from the requirements of obtaining import license and certificate of foreign exchange coverage, in respect of the importation of the equipment, machinery and materials mentioned in sub-paragraph (1).

(3) The Government of Mongolia shall exempt the Experts, the Senior Volunteers and members of the Missions from taxes including value added tax and fiscal charges in respect of the local purchase of the equipment, machinery and materials mentioned in sub-paragraph (1).

Article VIII

The Government of Mongolia shall maintain close contact, through organizations designated by it, with the Experts, the Senior Volunteers and members of the Missions.

Article IX

1. The Government of Mongolia shall admit JICA to maintain an overseas office of JICA in Mongolia (hereinafter referred to as the "Office") and shall accept a resident representative and his/her staff to be dispatched from Japan (hereinafter referred to as the "Representative" and the "Staff" respectively) who perform the duties to be assigned to them by JICA relative to the technical cooperation programs under this Agreement in Mongolia.

2. The Government of Mongolia shall:

- (1) (a) exempt the Representative, the Staff and their families from taxes including income tax and fiscal charges imposed on or in connection with salaries and any allowances remitted to them from abroad;
- (b) exempt the Representative, the Staff and their families from consular fees, taxes including customs duties and fiscal charges, as well as from the requirements of obtaining import license and certificate of foreign exchange coverage, in respect of the importation of:

- (i) luggage;
 - (ii) personal effects, household effects and consumer goods; and
 - (iii) one motor vehicle per Representative, per Staff, per family of the Representative and per that of the Staff assigned to stay in Mongolia;
- (c) exempt the Representative, the Staff and their families who do not import any motor vehicle into Mongolia from taxes including value added tax and fiscal charges in respect of the local purchase of one motor vehicle per Representative, per Staff, per family of the Representative and per that of the Staff;
 - (d) exempt the Representative, the Staff and their families from the registration fee of the motor vehicles mentioned in (b)(iii) and (c);
 - (e) permit the Representative, the Staff and their families to enter, leave and sojourn in Mongolia for the duration of their assignment therein, offer them the convenience for procedures of alien registration requirements, and exempt them from consular fees;
 - (f) issue identification cards and special passes to the Representative and the Staff to enter airport/seaport beyond passport control point to receive and send off the Experts, the Senior Volunteers and members of the Missions;
 - (g) offer the Representative, the Staff and their families the convenience for acquisition of car driving license; and
 - (h) carry out other measures necessary for the performance of the duties of the Representative and the Staff;
- (2) (a) exempt the Office from consular fees, taxes including customs duties and fiscal charges, as well as from the requirements of obtaining import license and certificate of foreign exchange coverage, in respect of the importation of the equipment, machinery, motor vehicles and materials necessary for activities of the Office;

- (b) exempt the Office from taxes including value added tax and fiscal charges in respect of the local purchase of the equipment, machinery, motor vehicles and materials necessary for the functions of the Office; and
- (c) exempt the Office from taxes including income tax and fiscal charges imposed on or in connection with office expenses remitted from abroad.

3. The motor vehicles mentioned in paragraph 2 shall be subject to payment of taxes including customs duties if they are subsequently sold or transferred within Mongolia to individuals or organizations not entitled to exemption from such taxes or similar privileges.

4. The Government of Mongolia shall accord the Representative, the Staff and their families as well as the Office such privileges, exemptions and benefits as are no less favorable than those accorded to representatives, staff and their families as well as offices of any third country or of any international organization performing a similar mission in Mongolia.

ARTICLE X

The Government of Mongolia shall take necessary measures to ensure security of the Experts, the Senior Volunteers, members of the Missions, the Representative, the Staff and their families staying in Mongolia.

ARTICLE XI

The Government of Japan and the Government of Mongolia shall consult with each other in respect of any matter that may arise from or in connection with this Agreement.

ARTICLE XII

1. The provisions of this Agreement shall also apply, after the entering into force of this Agreement, to the specific technical cooperation programs which have commenced prior to the entering into force of this Agreement, and to the Experts, the Senior Volunteers, members of the Missions, the Representative, the Staff and their families staying in Mongolia as well as to the equipment, machinery and materials related to the said programs.

2. The termination of this Agreement shall neither affect the specific technical cooperation programs being carried out until the date of the completion of the said programs, unless otherwise decided upon by mutual consent between the two Governments, nor affect the privileges, exemptions and benefits accorded to the Experts, the Senior Volunteers, members of the Missions, the Representative, the Staff and their families staying in Mongolia for the performance of their duties in connection with the said programs.

Article XIII

1. This Agreement shall enter into force on the date of the signature thereof.

2. This Agreement shall remain in force for a period of one year, and shall be automatically renewed every year for another period of one year each, unless either Government has given to the other Government at least six months' written advance notice of its intention to terminate the Agreement.

IN WITNESS WHEREOF the undersigned, duly authorized thereto, have signed this Agreement.

DONE in duplicate in English at Tokyo on December 5, 2003.

For the Government
of Japan:

川口 順子

For the Government
of Mongolia:



**Aide Memoire
October 1, 2009
Clean Air Project**

Purpose

The purpose of this Aide Memoire is to memorialize updates made to the Government of Mongolia (GoM) proposal for Compact funding dated July 24, 2009 and the summarize our common understanding of the proposed project, its implementation, and sustainability. MCC's project assessment is ongoing and no final decisions have been taken concerning MCC's funding of the project.

The proposed semi-coke plant at power plant #2 and coal water mixture (CWM) plant are no longer under consideration by MCC. An alternate proposed investment in fuel substitution is under consideration by MCC. Changes made to the proposed Energy Efficiency Facility (EEF) and Wind Activity are discussed in those sections.

Objectives and Outcomes

The objective of the project is to reduce urban air pollution in Ulaanbaatar by increasing the use of energy efficient appliances and cleaner fuels in the ger districts, and supporting the development of renewable energy. At least four second order objectives of reducing urban air pollution are: 1) an increase in household income through fuel cost savings, owing to greater fuel and appliance efficiencies; 2) reduced health costs owing to reductions in urban air pollution; 3) increased productivity resulting from reduced urban air pollution; and 4) increases in firm value resulting from increases in production capacity in response to increased consumption brought on by consumer subsidies.

Government commitment

The project benefits from the highest levels of commitment from the GoM, and more specifically the Ministry of Mineral Resources and Energy (MMRE), the Ministry of Nature, Environment, and Tourism, and the Ulaanbaatar City Government.

Total Project Cost

ACTIVITY	COST (\$ millions)
Energy Efficiency Facility	\$31.3
<i>Facility</i>	<i>\$28.2</i>
<i>Fees</i>	<i>\$3.1</i>
<i>Technical Assistance</i>	<i>\$0.0</i>
Fuel Substitution	\$20.0
<i>Price Equalization</i>	<i>\$20.0</i>
<i>Technical Assistance</i>	<i>\$0.0</i>
Wind	\$10.35
<i>Operational Subsidy</i>	<i>\$7.6</i>
<i>Fiber Optic Cable, Dispatching System Upgrade, and Substation Upgrade</i>	<i>\$2.5</i>
<i>Technical Assistance</i>	<i>\$0.25[TBC]</i>
Public Awareness Campaign	\$3.0
Program Admin	\$2.5

TOTAL	\$67.15million
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I. Energy Efficiency Facility (EEF)

Scope

The EEF will make available consumer subsidies for the purchase of energy efficient products and homes certified as meeting a set standard and/or otherwise demonstrating a superior efficiency over previous models. To start, the EEF will provide subsidies for energy efficient stoves and ger insulation. The subsidies will be fixed per product or home, based on affordability and market and economic analysis. Other products will be approved and subsidies set as data on efficiency, affordability, market and economic analysis becomes available. Other possible products supported include: heat only boilers, solar, refurbishment of pre-cast panel buildings, etc. While standards may already exist or Technical Assistance (TA) is already funded or planned by other donors in standard setting, testing, and certification of stoves, additional TA for this purpose may be required from the EEF in the setting of standards, testing, and certification for products to be supported by the EEF other than stoves.

Budget

The budget has been determined by an illustration of products and homes to be subsidized, volumes to be sold, prices, and subsidy levels of those products and homes. The current budget is \$28.2 million plus 10% or \$3.1million (10%) for bank implementation fees for a total of \$31.3 million. The spreadsheet is illustrative only and available production volume, actual prices, and subsidy levels will be confirmed with further production, market, and economic analysis. Bank fees will be negotiated and are expected to be less than the 10% budgeted. Reallocations from this budget to additional TA to be managed by MCA-M will be considered at a later date and as may be determined needed once the Asian Development Bank Technical Assistance (ADB TA), focused on among other things, establishing a stove testing regime and heat only boiler studies, commences.

Economics

MCC's economic assessment of stoves and ger insulation is in process. The economics of the EEF are driven at least by fuel cost savings, owing to greater efficiency, and health cost savings, owing to reduced urban air pollution. Additional gains may be available from the increased value added to production resulting from increases in investment made to supply growing consumption and/or carbon credits. A limited amount of investment capital is available domestically, albeit at short tenors and high interest rates. While investments in production also need attention similar to that described below for Fuel Substitution, it is believed that coordinated donor support, energy efficient product imports, and training through the TVET project, might also support increased production. The ADB TA also includes plans for improved domestic stove production.

Implementation Mechanism

The subsidies will be made available to consumers through banks. A selection process for participating ger district households is no longer under consideration. Instead, the subsidies are to be made available to all ger district households in UB. MCA-M will establish a PIU consisting of management, testing and certification, monitoring, market analysis and subsidy setting, technical assistance, and public awareness capability. MCA-M will sign implementing agreements with banks for the implementation of the program. Xac Bank and Khan Bank have both expressed a strong desire to participate and are likely candidates owing to their substantial customer base, existing capabilities and offerings in commercial and microfinance, and physical branch network presence in the ger districts. The banks will advertise

and promote energy efficiency, the subsidies, and their loan products in parallel with the EEF subsidies. They will accept orders and payments and make loans in parallel with the EEF subsidies from their branch offices. They will provide the orders and the non-subsidy payment to MCA-M. MCA-M will consolidate and procure the appliances and will ensure delivery of the appliances to the customer (not the bank). MCA-M and the bank (if a parallel loan has been provided) will obtain delivery confirmation and monitor any installation. As/if new products are added, additional implementing mechanisms will be considered, for example in the case of pre-cast panel building refurbishment. New products and appliances added to the list of support and subsidy levels will be determined based on MCA-M PIU analysis and agreement with MCC and communicated through the Public Awareness Campaign. MCA-M will explore further opportunities to integrate implementation of the EEF with the Clean Air Fund proposed to implement the Fuel Substitution activity as EBRD Technical Assistance (EBRD TA), focused on among other things, establishment of a legal, institutional, and operational framework for fuel substitution, including a Clean Air Fund and a fuels testing regime, advances.

Implementation Planning/Donor Coordination

The EEF benefits from work on ger insulation and stove testing already undertaken by the World Bank, GTZ, UNDP, ADB, and EBRD. An additional 24 months of ADB TA is planned starting in November 2009. Consumer subsidies for stoves could be made available after completion of the standards, testing, and certification process portion of the ADB TA is completed. The MMRE and MCA-M will sign a memorandum of understanding (MOU) with each of the ADB and EBRD concerning timely implementation of the ADB TA and EBRD TA on which the provision of subsidies funded by MCC depends, information sharing arrangements, and other procedures for coordination and collaboration in implementation. Opportunities to accelerate this timeline will be explored in coordination amongst the MMRE, MCA-M, EBRD, ADB, and World Bank.

Sustainability

The ADB TA and any MCA-M TA provide for permanent appliance standard setting, testing, and certification processes. At present, the consumer subsidies are not expected to be funded beyond the term of the Compact ending in September 2013. However, it is estimated that investments in energy efficient products will last an average of approximately 10 years and possibly longer, for energy efficient homes. The GoM may consider continued support to the program from the Clean Air Fund, in addition to the support contemplated for fuel subsidies at a later date.

Conditions Precedent to Disbursement:

Conditions Precedent to disbursement for the EEF activity in the Compact Amendment are likely to include the following:

- Completion of MOU with ADB and EBRD
- Establishment of an independent appliance testing, standard setting, and certification process.
- A process for the evaluation and approval of additional products to be subsidized.
- Completion of Implementation Agreements with banks.
- Draft Consumer Participation Agreement.
- Design and delivery of at least a 6 monthly Public Awareness Campaign addressing at least the benefits of energy efficiency, availability and amount of the subsidies, and participating partners.

II. Fuel Substitution

The basis for the proposed MCC investment in fuel substitution is the “Operational Framework for Fuel Substitution” (OF).

Scope

The scope of the MCC project includes only the price equalization payments or producer subsidy component of the OF. The EBRD will fund the development of the legal, institutional, and operational framework and the GoM will fund the affordability payments. Producer subsidies will be paid according to a price equalization formula for alternative fuels certified as meeting a set standard as explained in the OF. The European Bank for Reconstruction and Development (EBRD) has approved funding and is currently in procurement for a Consultant to deliver the other actions identified in the OF (EBRD TA). As the other actions identified in the OF are, together with price equalization payments, instrumental in achieving substitution of raw coal with alternative fuels, an MOU between EBRD, the MMRE, and MCA-M will be signed concerning timely implementation of the TA on which the provision of subsidies depends, information sharing arrangements, and other procedures for coordination and collaboration in implementation.

Budget

The current budget for price equalization payments comes from the OF, Figure 11: Economic Model. The \$20 million budget is the sum of the ‘Total Incentive Payments’ for the first 3 years or (\$0.6+\$5.3+\$10.1) + 25% contingency (in the event a phased approach to early implementation can be resolved). Reallocations from this budget to additional TA to be managed by MCA-M will be considered at a later date and as may be determined needed once the EBRD TA commences.

Economics

MCC’s economic assessment is in process. The economics of fuel substitution are driven by fuel cost savings, owing to greater fuel efficiency, and health cost savings, owing to reduced air pollution. Additional gains may be available from the increased value added to production resulting from increases in investment made to supply growing consumption, improved productivity, and/or carbon credits.

Implementation Mechanism

The price equalization payments are to be made available through the Clean Air Fund, to be established pursuant to the EBRD TA. Participating producers will need to sign a producer participation agreement, which will outline the terms and conditions of participation in the scheme including, among other things, environmental compliance, audit, the definition of the price equalization formula, and how payments will be made. MCA-M will make price equalization payments on behalf of the Clean Air Fund, until the end of the Compact. Overall donor coordination concerning Clean Air sector investments will be undertaken by the National Coordinating Committee (NCC).

Implementation Planning/Donor Coordination

The EBRD TA is estimated to take approximately 18 months, from November 2009 to May 2011. Therefore, price equalization payments are estimated to start anytime after that and likely in association with sales for the heating season commencing in September 2011. Expedited TA task sequencing and phased implementation are under consideration to determine whether price equalization payments could be disbursed sooner. Estimated price equalization payments will be updated based on production and pricing data available from the 2009 and 2010 heating seasons (alternative fuel availability levels and relative pricing to raw coal) and results from the EEF and other programs in the adoption of more efficient energy appliances (efficiency gains leading to lower fuel consumption). MCA-M will sign a memorandum of understanding (MOU) with the MMRE and the EBRD concerning timely

implementation of the EBRD TA on which the provision of subsidies depends, information sharing arrangements, and other collaboration. To encourage investment in clean fuel production and bring new energy efficient technologies to Mongolia, MMRE, MCA-M, and donors may organize an International Clean Energy Conference.

Sustainability

The investment is sustainable for three reasons:

- 1) The EBRD TA establishes a legal, institutional, and operational framework for fuel substitution.
- 2) Air Pollution Tax proceeds will be ring-fenced for the continuation of the subsidy
- 3) The subsidy is believed to be needed for approximately 7 years, initially funded by MCC, then the proceeds from the Air Pollution Tax, and eventually phased out as household incomes rise.

Conditions Precedent to Disbursement:

Conditions Precedent to disbursement for price equalization payments in the Compact Amendment are likely to include the following:

- Completion of MOU with ADB and EBRD
- Passage of Air Pollution Tax which ring-fences proceeds for continued price equalization beyond the Compact end date.
- A plan for phased establishment and enforcement of a raw coal ban and implementation of that plan.
- A draft Producer Participation Agreement
- Establishment of an independent fuel testing, standard setting, and certification process (which could include the establishment of a new lab or continued use of existing private sector facilities).
- Establishment of an operational Clean Air Fund.
- Design and delivery of at least a 6 monthly Public Awareness Campaign addressing at least the benefits and use of alternative fuels, availability of the subsidy, and participating producers.

Both the EEF and Fuel Substitution projects are supported by an integrated and comprehensive ongoing Public Awareness Campaign (\$3.0 million) concerning energy efficiency and pollution reduction. The Public Awareness Campaign will, among other things, inform the public, and specifically ger district residents, about the benefits of energy efficiency and cleaner fuels, appliances and fuels meeting standards, the availability and amount of subsidies, and how to participate.

III. Wind

Scope

The Wind activity includes an operating subsidy to be paid to the Renewable Energy Fund, established according to the Law on Renewable Energy, and onward to CRETN, the national transmission company, to temporarily smooth the impact of the increased tariff ascribed to power from the Wind Farm (\$.095/kwh paid to the Wind Park + approximately \$.032/kwh in transmission and distribution costs or \$.127/kwh) and the current \$.08 paid by consumers. It also includes an upgrade to the nearest CRETN substation, upgrade to the dispatching system software at the National Dispatching Center (NDC) to accommodate power from variable sources, and a 22km fiber optic cable between the substation and the NDC in Ulaanbaatar to connect the substation to the dispatching system.

Budget

The operating subsidy is estimated at \$7.6 million between planned Wind Park construction completion and the end of the Compact. The fiber optic cable, substation and dispatching system upgrades amount to \$2.5 million, at 2009 prices for equipment and installation. The budget includes training for the upgrades to the dispatching system. TA has been budgeted for the establishment of a Renewable Energy Fund in accordance with the Law on Renewable Energy.

Economics

MCC economic analysis currently shows an ERR of approximately 7%, which is below the hurdle rate for Mongolia. Additional benefits are being evaluated.

Implementation Mechanism

MCA-M will pay the subsidy to CRETN by way of the Renewable Energy Fund, to be established by MCA-M TA. CRETN will pay the Wind Park in accordance with the terms of the Power Purchase Agreement (PPA). MCA-M will implement the management oversight of, equipment and installation of the optic cable and upgrades to the substation and dispatching system.

Implementation Planning/Donor Coordination

EBRD and IFC are investors in and lenders to the project. Financial close is planned for December 2009 and commencement of construction is planned for April 2010. Construction is scheduled to be completed by Q4 of 2011.

Sustainability

The subsidy is meant only to provide a temporary transition to the higher price of electricity generated from renewable sources. Beyond the term of the Compact, further subsidies to Renewable Energy would be provided by the Renewable Energy Fund, which is planned to be capitalized and funded through receipts of carbon credits from the Clean Development Mechanism. The owners have invested a lot of time and money in development and this project is viewed as a catalyst for the further development of renewable energy projects.

Conditions Precedent to Disbursement

Conditions Precedent to disbursement for the subsidy component of the Wind activity in the Compact Amendment are likely to include the following:

- Mechanical completion of the Wind Park, fiber optic cable, substation and dispatching system upgrades.
- Establishment of an operational Renewable Energy Fund, in accordance with the Law on Renewable Energy.
- Completed training on new dispatching system.

19. Note on Ideas of Intervention for HOBs in the UB City–JICA technical assistance project :
Capacity Development Project for Air Pollution Control in Ulaanbaatar City–

December 8, 2009

Prepared by: Taizo Yamada

JICA Senior Adviser

(Environmental Management and Planning)

Note on Ideas of Intervention for HOBs in the UB City

- JICA technical assistance project: Capacity Development Project for Air Pollution Control in
Ulaanbaatar City

Contents of Note

1. Back Ground
2. Focus of the JICA Technical Cooperation
3. Project Outline and Activities for the HOB sector
4. Idea behind the Outputs and Activities Planned
5. Conclusion – Toward Synergy Effects of the Regulatory Capacity Development and the Market Based Instruments for Emission Reductions

(This Note was prepared by Taizo Yamada, JICA Senior Adviser in Environmental Management and Planning, JICA Head Office, Tokyo, Japan, based on information from documents elaborated by JICA. Views and opinions expressed in this note are not those of JICA or of the Government of Japan but solely belong to the author.)

Note on Ideas of Intervention for HOBs in the UB City
- JICA technical assistance project: Capacity Development Project for Air Pollution
Control in Ulaanbaatar City -

1. Back Ground

The Government of Mongolia (GOM) requested the Government of Japan (GOJ) to provide technical assistance for air pollution problems in Ulaanbaatar City (UB City) in 2007. The GOJ approved the Japan International Cooperation Agency (JICA) to prepare a technical assistance project and to implement it on behalf of the GOJ. JICA has executed a series of preparatory works during 2008 and 2009, including a Project Formulation Mission in 2008, the 1st, 2nd and 3rd Detailed Planning Survey Missions in 2009.

In the course of those missions, in particular, JICA implemented a Heat Only Boilers (HOB) survey visiting 82 HOB houses consisting of 180 boilers, on-site stack emission measurements according to the Japan Industrial Standards (JIS) protocol for selected 14 HOB boilers, three boilers at the 2nd and 4th Power Plant, and one stove and one wall stove at Ger area. Also JICA performed a preliminary emission inventory study and a basic air quality simulation based on the US EPA methodology. Those JICA studies found various uncertainties in the UB city in estimating for example emission factors of PM10 of the pollution sources partly caused by technical difficulties in performing TSP stack sampling for PM10 emission estimates combined with extremely cold winter time conditions when the air pollution is the most serious. Other uncertainty is caused by the serious lack of reliable information on the coal consumption and operational status of the HOBs. Despite those uncertainties the preliminary study revealed the importance and technical viability to address large and medium scale stationary sources such as the HOBs and the Power Plants in order to reduce amount of emissions and to improve air quality in the central part of the UB city, where population density is high. Also the JICA study found that HOBs' compliance of the emissions standards defined by the Mongolian National Standards (MNS) combined with emission reductions from the Power Plants will yield a tangible air quality improvement and that those efforts would be technically viable.

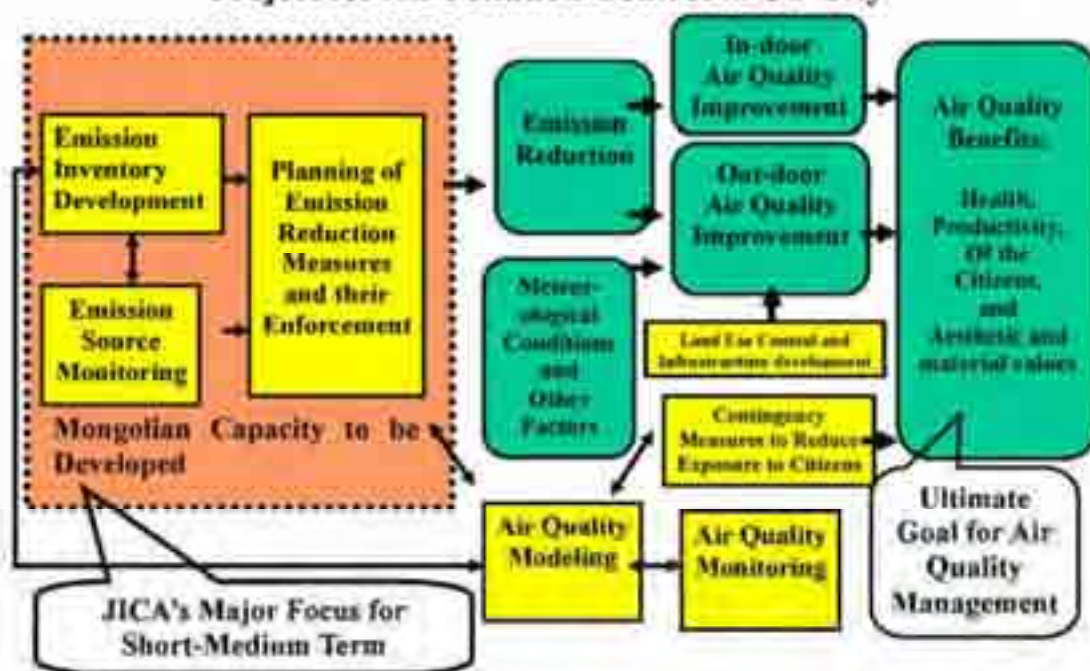
In the course of the JICA preparatory missions, the Mongolian side and JICA have

discussed and agreed the project concept, implementation frameworks, outlines and activities. The GOM and JICA are to sign the Record of Discussion (R/D) in the end of 2009 to start the project implementation in the beginning of 2010.

2. Focus of the JICA Technical Cooperation

The GOM and JICA agreed that the JICA technical cooperation should address emission reductions from medium and large scale stationary sources such as the HOBs and the Power Plants with emphasis on a capacity development of the Mongolian side centering around the Air Quality Department of the Capital City (AQDCC) and relevant city level and national level agencies including National Air Quality Office (NAQO/NAMHEM) and National Inspection Agency (NIA) among others. This was based on the consideration of various activities ongoing supported by the donor community, especially by the World Bank and by other bilateral donors, such as Ger area fuel switching and stove replacement program and air quality monitoring supports among others, and of technical competence of the Japanese side,

Proposed Focus of the Capacity Development Project for Air Pollution Control in UB City



3. Outline of the JICA project

The JICA technical assistance project -- Capacity Development Project for Air Pollution Control in Ulaanbaatar City -- will be implemented during three years starting from the beginning of 2010. The cost of in-kind contributions by JICA is estimated around US\$4M equivalent including provision of JICA expert team, equipment and training activities for the Mongolian counterparts in Japan and on site. The UB city will also provide various in-kind contributions to the project such as office space, various technical and logistical supports.

According to the Project Design Matrix (PDM) agreed on between the Mongolian side and JICA, the overall goal of the Project is: Measures for emission reduction of air pollutants will be strengthened in Ulaanbaatar City.

The objective of the Project is: Capacity for air pollution control in Ulaanbaatar City is strengthened, paying special attention to the human resource development of the MUB (the Municipality of Ulaanbaatar) and other relevant agencies among other aspects of the capacity development.

In order to achieve the above project objective, the following outputs are planned:

1. Capability of AQDCC and the other relevant agencies to evaluate emission inventory and impacts on air quality is developed;
2. Stack gas measurements are periodically implemented in Ulaanbaatar City;
3. Emission regulatory capacity of AQDCC is strengthened under the cooperation with the relevant agencies;
4. Emission reduction measures to major emission sources are enhanced by AQDCC; and
5. AQDCC and the relevant agencies can integrate the results from output 1 to 4, and take them into the air quality management, and disseminate them to the public.

Activities planned under those outputs are presented in the table 1. Among others, relevant activities for the HOB sector are shadow marked, indicating that the major part of the project is dedicated for the HOB sector as well as for the power plant sector.

Table 1: JICA Capacity Development Project for Air Pollution Control in Ulaanbaatar City - Outputs and Activities Summary Table

(Activities for HOB sector are shadow marked.)

JICA Capacity Development Project for Air Pollution Control in Ulaanbaatar City	
	Duration: Three years, 2010 - 2012 Counterpart: AQDCC Counterpart-Working Group: NAQO, CLEM, NIA, IACC, NUM, MMRE, MNET, TPD, RDCC, PTDCC, PAM, EFDUC, HSUD, UDPMOCC, EPWMD
Estimated Cost of the Project:	JICA: About US\$4M equivalent in-kind contribution (JICA Expert team, equipment and training programs for AQDCC and C/P-WG members on site and in Japan.) AQDCC and C/P-WG: In-kind contributions and technical and logistical supports.
Overall Goal of the Project:	Measures for emission reduction of air pollutants will be strengthened in Ulaanbaatar City
Purpose of the Project:	Capacity for air pollution control in Ulaanbaatar City is strengthened, paying special attention to the human resource development of the MUB (the Municipality of Ulaanbaatar) and other relevant agencies among other aspects of the capacity development.
Output 1	Capability of AQDCC and the other relevant agencies to evaluate emission inventory and impacts on air quality is developed.
Activities	<p>1.1 Existing emission inventories (activity data, emission factor etc.) are analyzed and framework of emission inventory (target pollutants, target emission sources, information items of emission sources etc.) is determined.</p> <p>1.2 Stationary emission source investigation is planned and implemented.</p> <p>1.3 Mobile emission source investigation is planned and implemented.</p> <p>1.4 Investigation methods for fugitive dust, medical waste and open burning etc. are examined and the investigation is implemented.</p> <p>1.5 Emission inventory for the baseline year is elaborated based on the investigation results for stationary, mobile and the other emission sources.</p> <p>1.6 Air quality monitoring data are collected and analyzed to evaluate the adequateness of data.</p> <p>1.7 Simulation is implemented for the baseline year, and accuracy of emission inventory and reproducibility of simulation model is confirmed.</p> <p>1.8 Emission inventories for the target year and air pollution control cases are elaborated and simulations are implemented with the inventories to evaluate Impacts on air quality.</p> <p>1.9 Emission inventory system including database and manual development is designed and established.</p>
Output 2	Stack gas measurements are periodically implemented in Ulaanbaatar City.
Activities	2.1 Trainees learn theory and basics for stack gas measurement by training course in Japan.

	<p>2.2 Feasibility of sampling hole installation is assessed and target boilers for measurement are selected.</p> <p>2.3 Measurement equipment with standard gas is introduced and training for measurement is implemented.</p> <p>2.4 Simplified measurement methods such as Ringelmann chart and measurement methods for Ger stove etc. are investigated.</p> <p>2.5 Target boilers are measured and stack gas status is evaluated.</p> <p>2.6 Guidelines for stack gas measurement (sampling holes, simplified measurements, power plant boilers measurements, Ger stove measurements, instruments operation and boiler test etc.) are elaborated.</p> <p>2.7 Guidelines for stack gas measurement are improved.</p> <p>2.8 Adequateness of emission standard values and measurement methods of MNS is evaluated and improvement is proposed if necessary.</p> <p>2.9 Pilot inspection methodology is elaborated.</p> <p>2.10 Pilot inspections are implemented, and the results are informed, and improvements are requested.</p>
Output 3	Emission regulatory capacity of AQDCC is strengthened under the cooperation with the relevant agencies.
Activities	<p>3.1 Existing information on boilers is collected and compiled, and boiler registration and permission system is designed with reference to Japanese boiler registration system.</p> <p>3.2 Target boilers for registration system are selected and site visit investigation is planned and implemented.</p> <p>3.3 Boiler registration system is designed and developed.</p> <p>3.4 Requirements for the permissions to operate (or good boiler certification) are defined.</p> <p>3.5 All target boilers are registered and the permissions to operate (or good boiler certifications) are issued to the boilers, which satisfy conditions.</p>
Output 4	Emission reduction measures to major emission sources are enhanced by AQDCC.
Activities	<p>4.1 Seminar on MNS and boiler registration system is held.</p> <p>4.2 Lecture on basic information of combustion control and air pollution control is held.</p> <p>4.3 Major emission sources are diagnosed and air pollution control measures are proposed in the aspects of facilities and management.</p> <p>4.4 Proposal of control measures for major air pollutants emission sources is introduced at seminar.</p> <p>4.5 Visits on bad and good practices are implemented.</p> <p>4.6 Tighter controls and institutional arrangements are proposed so that the majority of boilers comply with MNSs such as emissions standards.</p>
Output 5	AQDCC and the relevant agencies can integrate the results from output 1 to 4, and take them into the air quality management, and disseminate them to the public.
Activities	<p>5.1 Knowledge and experiences in Japan are introduced at seminar.</p> <p>5.2 Members of C/P and C/P-WG learn on environmental management at training courses in Japan.</p> <p>5.3 Japanese experts periodically have discussions with members of C/P and C/P-WG and make appropriate advices.</p> <p>5.4 Members of C/P and C/P-WG contribute to citywide air quality management program supported by the donor community.</p>

5.5 C/P holds at least 2 times of seminars for public awareness on air pollution control under the cooperation of C/P-WG.

(Prepared by Taizo Yamada based on PDM of the M/M signed in the 2nd Detailed Planning Survey Mission.)

4. Ideas behind the Outputs and Activities Planned

In the course of a series of Detailed Planning Survey Missions, our assessment of the capacity of the Mongolian side including the government and the HOB sectors revealed the needs to develop the following key capabilities:

- Capability to identify and to assess pollution sources: Abilities to generate technically credible information on emissions such as emission factors of priority pollutants in the UB city such as TSP, PM10, SO₂ and NO_x, and the amount of coal consumed at each of stationary sources are needed for a rational decision making and for building a consensus among the stakeholders involved.
- In doing so, the key elements missing in the country are abilities to perform stack flue gas sampling and measurement according to a standardized protocol, to develop an emission inventory and to keep it continuously updated.
- Capabilities for emission reductions at the both sides of regulators' and HOBs including :
 - Regulatory capacity of the UB city and national government agencies such as AQDCC, NAMHEM and NIA,
 - Awareness of HOB operators and owners for the compliance requirement such as emissions standards defined in the MNS,
 - Technical knowledge for more efficient boiler operations of HOB operators and owners, and
 - Better decision-making capability and incentives at new investments in the HOB sector such as boiler replacement financed by self or external resources.

Those specific aspects are linked to each other. In order to address those, the following technical core elements are planned in the project activities.

(1) Stack gas measurement technical transfer through training and pilot execution of 50 boilers measurements: The Mongolian counterparts and JICA experts will jointly execute

50 boilers measurements as a pilot program. Also coal consumption will be investigated at those boilers. Emission factors of TSP, PM10, SO2 and NO2 will be estimated based on those measurements. Technical manuals and guide lines will be also elaborated to secure Mongolian side measurements continue after the project finishes, including measurement protocols and requirements for HOB sides such as installation of stack sampling holes. Also the HOB stack gas measurements will be utilized to develop and to evaluate emission reduction technical measures at the selected HOB boilers.

(2) Emission Inventory Development: Information from stack gas measurements above will be utilized to develop emission inventory combined with the planned HOB visit survey and the registration information. Also this will be supplemented by the surveys of the other emission sources including mobile sources, Ger area stove emissions and other fugitive sources in the UB City. Based on this emission inventory, basic model simulation will be performed to assess impacts of each of the sources on air quality in the UB City. The Mongolian side is expected to update the emission inventory continuously and to utilize them for a priority setting in their air quality management.

(3) HOB Registration System Development: Through consultation with AQDCC and the relevant UB City authorities, a HOB registration system will be developed. This registration system will be linked with emission inventory above. The emission inventory will provide useful information to design the HOB registration system. On the other hand, the registration system, once in functional, would provide updated information of each of HOBs periodically enabling a low cost updating of the emission inventory in coming years. As a part of this registration system, introduction of permits to operate and/or certificates for good practice will be examined. Importantly the most, the HOB registration system will function as a basis for the regulatory actions and for the awareness building activities as below discussed.

(4) Regulatory Action Enhancement: The three elements above - (1) technical capability of stack gas measurements, (2) emission inventory, and (3) HOB registration system - will form a technical foundation of the regulatory actions by inspectors of the corresponding authorities such as NIA, IACC, NAQO and AQDCC. In addition to those, the project will develop practical and quick methodologies to perform rapid assessment of stack gas for

cost effective inspection activities.

This idea is based on the Japanese air quality control law, which focuses on medium to large-scale stationary emission sources to require those stationary sources to register as a prerequisite for their operations. The regulators, who are local governments in many cases, can grasp and update information on major emission sources in their jurisdiction in a cost effective way.

(5) Support of the HOBs in improving operational efficiency and emission reductions: The JICA project will provide technical supports for selected boilers to identify possible measures for energy efficiency improvements and emissions reductions looking at operational and hardware aspects of the HOBs. As noted above the stack gas measurements will be utilized for developing and evaluating those technical measures at boilers. The learning of this assessment will be utilized for awareness building activities for HOBs and possibly for developing requirements for HOBs for permits to operate and/or certificates for good practices. That technical information combined with regulator's pressures will promote environmentally sustainable operations and investments when boilers are replaced periodically being financed by self-resources or by credits supported by international cooperation in future.

This reflects one of the lessons learned from the Two Step Loan program for environmental conservation in Mongolia by the former Japan Bank for International Cooperation (JBIC, at present JICA after the JBIC and JICA merger in 2008). One category of the TSL eligibilities--investment for environmental regulatory compliance, which could finance emissions control equipment to comply with emissions standards of MNS for example-- did not perform well. The major reasons were considered to be low level of regulatory enforcement activities by the government side as well as of awareness and willingness of the private sector. In JICA project preparatory activities, we observed similar situations in the HOB sector. JICA technical assistance project will address those bottlenecks to accelerate investments for more efficient boiler operation and for better regulatory compliance leading to less emission. Consequently the JICA Project will become complimentary with any credit supports for HOB sector financed by the donor community as well as by JICA funding program in future.

5. Conclusion – Toward Synergy Effects of the Regulatory Capacity Development and the Market Based Instruments for Emission Reductions

As of the end of 2009, the Mongolian side and the donor community have been discussing a possible taxation on the HOBs and the Power Plants to raise a funding for subsidy scheme for the Ger area fuel switching and stove replacement program. This taxation scheme, if implemented, may have significant impacts on the HOBs and the Power Plants financial status and perceptions in emission control, consequently effectiveness of the JICA technical assistance project.

If the taxation scheme were rightly designed, this would generate economic or financial incentives for the HOBs and the Power Plants for improving operational efficiencies and for reducing emissions. In such a case, combined with strengthened regulatory capacity of the government side, which the JICA project will support, synergy effects could be generated as the best-case scenario. On the other hand, considering already tight budgetary and human resource conditions in those sectors, additional financial burdens could generate various negative side effects which could counteract for needed efforts for emission reductions. Thus the challenge is to identify conditions and requirements in order that the best-case scenario would really happen. Although such assessment is out of the JICA project, the following is a preliminary list of the requirements suggested to be examined:

- a. The tax amount should be elastic in relation with the amount of emissions from each of the HOBs and the Power Plants in order to generate financial incentives for emission reductions. This is the most important aspect of the environmental taxation toward emission reductions. In doing do, accurate information on emissions should be generated, to which the JICA project would contribute. In this case, emission reductions if achieved in the HOB sector and the Power Plant sector, the tax revenue would decline. Thus the idea to transfer financial resources from these sectors to the Ger area programs might be reexamined in future.
- b. The tax amount should be high enough to be comparable to the cost of

emission reductions at the HOBs and the Power Plants. If the tax amount is lower than the cost of emissions reduction, the polluters will determine to pay the tax and to do nothing in pollution reduction if regulatory capacity is weak at the government side. A possible obstacle could be a political objection to do so ending up with a low level of levy failing to generate incentives for emission reductions.

- c. The planned taxation shall not increase too much financial burden on the HOBs and the Power Plants. Already those sectors are in tight budgetary and human resource conditions, which are said to be reasons for their limited efforts in emission reductions. Additional tax burden may squeeze financially a room for emission reductions further in those sectors. If it is acceptable politically, the tax burden should be transferred to the end users of the heat and power to generate incentives at the consumers for efficient energy consumption.
- d. The tax payment should not be interpreted as a charge for legitimate pollution right by the HOBs and by the Power Plants. If this happens any regulatory or technical efforts to reduce emissions at those sectors will not work. Namely pollutions from those sectors will continue. This should be avoided by all means especially from the viewpoint of the JICA project.

Some of the points may seem to be contradictory each other. It is important to find a balance among those points. Ideally pollution tax linked with amount of emission could be the best choice. Better information on emissions is needed to which the JICA project will contribute. Nevertheless there may be some years to come to generate accurate information on emissions to design and to monitor the pollution tax rightly. The Second best but more practical approach could be an input tax to be defined according to the amount of coal consumed at each of the boiler. This will avoid technical complication and at any event will generate incentives for efficiency improvements. But still the effects on emission reduction and regulatory compliance are uncertain.

End of note.

