AGENDA NASIONAL (2008-2015) DAN RENCANA AKSI (2008-2009) PENGURANGAN EMISI GAS RUMAH KACA SEKTOR PERTANIAN






DEPARTEMEN PERTANIAN
2007

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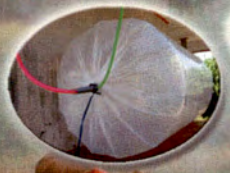

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Agenda Nasional [2008 – 2015]
Rencana Aksi [2008 – 2009]

Pengurangan Emisi Gas Rumah Kaca
Sektor Pertanian

Departemen Pertanian
2007

Kata Pengantar

Bumi kita mengalami peningkatan suhu yang signifikan pada dekade akhir-akhir ini, yang oleh para ilmuan dinyatakan bahwa hal tersebut disebabkan oleh aktivitas manusia. Penyebab utama pemanasan global adalah pembakaran bahan bakar fosil, seperti batu bara, minyak bumi, dan gas alam, yang melepas karbondioksida dan gas-gas lainnya yang dikenal sebagai gas rumah kaca ke atmosfer.

Gas-gas rumah kaca yang dinyatakan paling berkontribusi terhadap gejala pemanasan global adalah CO_2, CH_4, N_2O, NO_X, CO, PFC dan SF_6. Namun, untuk Indonesia dua gas yang disebut terakhir masih sangat kecil emisinya, sehingga tidak diperhitungkan. Dari kelima gas-gas rumah kaca tersebut di atas, Karbon dioksida (CO_2) memberikan kontribusi terbesar terhadap pemanasan global diikuti oleh gas methan (CH_4).

Tahun 1994 tingkat emisi CO_2 di Indonesia sudah lebih tinggi dari tingkat penyerapannya. Artinya Indonesia sudah menjadi ***net emitter***. Hasil perhitungan sebelumnya, pada tahun 1990, Indonesia masih sebagai ***net sink*** atau tingkat penyerapan lebih tinggi dari tingkat emisi. Berapapun besarannya, Indonesia sudah memberikan kontribusi bagi meningkatnya konsentrasi gas-gas rumah kaca secara global di atmosfer. Adanya peningkatan gas rumah kaca (GRK) telah menyebabkan terjadinya pemanasan global dan perubahan iklim.

Mengingat iklim adalah unsur utama dalam sistem metabolisme dan fisiologi tanaman, maka perubahan iklim akan berdampak buruk

terhadap keberlanjutan pembangunan pertanian. Perubahan iklim global akan mempengaruhi setidaknya tiga unsur iklim dan komponen alam yang sangat erat kaitannya dengan pertanian, yaitu: (a) naiknya suhu udara yang juga berdampak terhadap unsur iklim lain, terutama kelembaban dan dinamika atmosfer, (b) berubahnya pola curah hujan dan makin meningkatnya intensitas kejadian iklim ekstrim (anomali iklim) seperti El-Nino dan La-Nina, dan (c) naiknya permukaan air laut akibat pencairan gunung es di kutub utara.

Pada skala global, pemanfaatan lahan pertanian telah berkontribusi sekitar 15% dari seluruh emisi gas rumah kaca (GRK). Dan saat ini diperkirakan sepertiga dari semua emisi karbon berasal dari alih fungsi lahan (penebangan hutan, perubahan pertanaman dan intensifikasi pertanian). Kira-kira dua pertiga emisi methana dan sebagian besar nitrogen dioksida berasal dari pertanian.

Mengingat besarnya dampak terhadap suhu dan iklim global yang diakibatkan oleh adanya emisi gas rumah kaca tersebut, dimana sektor pertanian juga mempunyai potensi kontribusi yang cukup besar, maka perlu adanya suatu Agenda Nasional dan Rencana Aksi untuk mengurangi Emisi Gas Rumah Kaca Sektor Pertanian.

Tujuan agenda nasional dan rencana aksi tersebut tentunya adalah untuk megurangi emisi gas rumah kaca yang ditimbulkan oleh kegiatan-kegiatan di sektor pertanian sekaligus meningkatkan peranan pertanian sebagai penyerap gas rumah kaca terutama CO_2.

Adapun sasaran yang ingin dicapai sampai pada tahun 2015 adalah termanfaatkannya 80% potensi gas methan dari kotoran ternak

ruminansia besar dan babi, tertutupinya 50% lahan terbuka terbengkalai dengan vegetasi permanen atau campuran, diterapkannya secara luas sistem pertanian organik untuk berbagai komoditi pertanian dan peternakan, serta diterapkannya secara luas teknologi pertanian dan agroindustri yang ramah lingkungan *(eco-agribisnis)* oleh para pelaku di seluruh Indonesia.

Agenda Nasional dan Rencana Aksi ini merupakan acuan bagi semua pihak terkait baik di pusat maupun di daerah untuk menyusun langkah-langkah operasional yang diperlukan guna pencapaian sasaran tersebut di atas.

Semoga dapat terlaksana dengan baik.

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Daftar Isi

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Bab 1.
Pendahuluan

Gas yang dikategorikan sebagai gas rumah kaca (GRK) adalah gas-gas yang berpengaruh secara langsung maupun tidak langsung terhadap efek rumah kaca yang akan menyebabkan perubahan iklim. Dalam konvensi PBB mengenai Perubahan Iklim (*United Nation Framework Convention On Climate Change*-UNFCCC), ada enam jenis yang digolongkan sebagai GRK yaitu karbondioksida (CO_2), gas metan (CH_4), dinitrogen oksida (N_2O), sulfurheksafluorida (SF_6), perfluorokarbon (PFC_S) dan hidrofluorokarbon (HFC_S). Selain itu ada beberapa gas yang juga termasuk dalam GRK yaitu karbonmonoksida (CO), nitrogen oksida (NO_X), clorofluorocarbon (CFC), dan gas-gas organik non metal volatil lainnya.

Di Indonesia kontribusi terbesar GRK berasal dari karbondioksida, metan dan dinitrogen oksida. Bagian terbesar emisi ini dihasilkan oleh sektor kehutanan (khususnya karena deforestasi) dan energi. Gas terbesar kedua dalam mempengaruhi pemanasan global adalah gas metan yang mayoritas berasal dari sektor pertanian termasuk didalamnya kegiatan peternakan.

Hasil penelitian PPLH-IPB menyatakan bahwa secara sektoral, kehutanan merupakan penyumbang emisi GRK terbesar di Indonesia. Pada tahun 1990, sektor kehutanan dan tata guna lahan menghasilkan 42,5 % dari total emisi GRK, sedangkan sektor pertanian menyumbang 99.515,24 Gg CO_2-eq atau setara dengan 13,4 % dari keseluruhan emisi GRK.

Tabel 1. Perbandingan Total Emisi GRK Sektoral di Indonesia tahun 1990

Sektor	Emisi GRK Equivalen CO_2 (Gg)	%
Kehutanan & Tata Guna Lahan	315.290,19	42,5
Energi & Transportasi	303.829,95	40,9
Pertanian	99.515,24	13,4
Proses Industri	17.900,50	2,4
Limbah	6.039,39	0,8
Total	742.575,26	100

Sumber: Hasil penelitian PPLH-IPB dimuat pada ALGAS National Workshop Proceedings, Maret 1997, dalam ALGAS (1997)

Selain sebagai salah satu sektor yang menyebabkan dampak perubahan iklim karena menyumbang emisi GRK, sektor pertanian juga terkena dampak dari perubahan iklim tersebut. Perubahan iklim yang terjadi saat ini secara umum merugikan semua pihak, namun dampak yang cukup besar akan mengenai sektor pertanian. Salah satu dampak besar adalah perubahan siklus musim kemarau dan penghujan, dan perubahan curah hujan. Kedua perubahan ini akan menimbulkan potensi tingginya kegagalan panen, selain itu petani akan kesulitan untuk menentukan waktu memulai bercocok tanam karena ketidakpastian musim kemarau dan musim hujan.

Dampak lainnya adalah tingginya erosi tanah karena curah hujan yang tinggi. Dalam ALGAS (1997) dilaporkan sebuah penelitian dari ADB *(Asian Development Bank)* mengenai adanya penurunan hasil tanaman dataran tinggi seperti kedelai dan jagung sebanyak 20% dan 40%, dan padi sebanyak 2,5% karena erosi tanah akibat curah hujan yang tinggi

tersebut. Dampak ekonomi dari penurunan hasil tanaman tersebut adalah kerugian sebesar 42 billiun rupiah pertahunnya.

Bab 2.
Sumber dan Potensi
Emisi GRK Sektor Pertanian

Gas Rumah Kaca (GRK) yang diemisikan dari sektor pertanian antara lain berasal dari 5 (lima) sumber yaitu:

1. Peternakan, berasal dari aktivitas pencernaan hewan dan pengelolaan kotoran ternak *(domestic livestock: enteric fermentation and manure management)*.
2. Budidaya padi, khusus untuk budidaya padi sawah *(rice cultivation: flooded rice fields)*.
3. Pembakaran padang sabana *(prescribed burning of savannas)*.
4. Pembakaran limbah pertanian *(field burning of agriculture residues)*.
5. Tanah pertanian *(agricultural soil)*.

(Sumber: IPCC, 1994)

Selain kelima sumber tersebut terdapat kegiatan kehutanan-pertanian yang berkontribusi pada emisi GRK yaitu perubahan tata guna lahan dan pembakaran biomassa. Perubahan tata guna lahan dari kehutanan ke pertanian mengakibatkan hilangnya sumber penyerap *(sink)* karbon yaitu tanaman/pohon-pohon di hutan yang biasanya diperparah dengan proses pembakaran biomassa sisa-sisa hutan (batang, cabang dan daun). Berdasarkan penelitian di hutan Kalimantan, jumlah biomassa hasil tebangan dari pohon-pohon berdiameter lebih besar dari 10 cm berkisar antara 424-512 ton per hektar (ALGAS, 1997).

Emisi GRK Indonesia, khususnya sektor pertanian pada tahun 1994 berdasarkan laporan Kementerian Lingkungan Hidup adalah sebagai berikut :

- Emisi CH_4 sebesar 3,2 kT.
- Emisi N_2O sebesar 52,86 kT.

Bila dikonversi dalam satuan setara CO_2 maka emisi total adalah 71,35 kT CO_2 eq. Kontribusi emisi GRK Pertanian terhadap emisi GRK secara nasional adalah 8,05% (KLH, 1999).

Data lainnya yang dimuat dalam laporan ADB-GEF-UNDP (1998) menyatakan bahwa total emisi GRK Indonesia pada tahun 1990 adalah negatif sekitar 90 Tg CO_2-equivalent, hal ini karena masih adanya hutan yang mampu menyerap CO_2 yang diemisikan dari kegiatan energi maupun non energi *(energy and non energy sector)*. Masih dalam laporan tersebut, sektor pertanian menyumbang emisi sebesar 75.332,22 Gg CO_2-equivalent yang berasal dari kegiatan peternakan, pertanaman/ budidaya padi, tanah pertanian, pembakaran sabana dan pembakaran limbah pertanian. Dari jumlah emisi tersebut, ALGAS (1997) menyatakan bahwa gas metan yang diemisikan dari sektor pertanian setara dengan setengah emisi gas metan di Indonesia.

Tabel 2. Emisi GRK Sektor Pertanian Pada Tahun 1990 (Gg)

Kegiatan	CH_4	N_2O	NOx	CO	CO_2 eq
Peternakan	798,39				16.766,19
Budidaya Padi	2.543,00				53.403,00
Tanah Pertanian		12,67			3.927,70
Pembakaran Sabana	19,52	0,24	512	8,74	484,32
Pembakaran Limbah Pertanian	26,61	0,62	559,00	22,22	751,01
Total	**3.387,52**	**13,53**	**1.071,00**	**30.96**	**75.332,22**

Sumber: ADB-GEF-UNDP, 1998

Berdasarkan tabel di atas, kegiatan budidaya padi (khususnya padi sawah) menyumbang emisi GRK sektor pertanian sebesar 70,9%. Untuk itu, penanganan yang serius terhadap emisi yang dihasilkan dari budidaya padi dapat secara signifikan menurunkan pencemaran GRK pertanian.

Secara khusus, sumber dan potensi emisi GRK dari masing masing kegiatan dipaparkan pada uraian berikutnya.

2.1. Peternakan

Emisi GRK dari peternakan berasal dari dua aktivitas yaitu: *pertama*, aktivitas pencernaan hewan *(enteric fermentation)* dan; *kedua*, pengelolaan kotoran ternak *(manure management)*. GRK yang diemisikan adalah gas metan.

Gas metan dari aktivitas pencernaan dihasilkan oleh hewan herbivora yang dalam proses pencernaannya melakukan pemecahan

Berdasarkan data ADB-GEF-UNDP (1998) pada tahun 1990 peternakan menyumbang 23% emisi gas metan yaitu sebesar 798,39 Gg. Aktivitas pencernaan hewan merupakan sumber yang harus ditangani serius karena menyumbang 94% dari emisi metan ternak, sedangkan sisanya sejumlah 6% berasal dari pengelolaan kotoran ternak.

Laporan Ecosolve Ltd. (2002) menyatakan bahwa pada tahun 2000 emisi metan dari kegiatan peternakan dapat mencapai 846,46 Gg bila aktivitas pencernaan ternak dan kotoran ternak tidak dikelola.

2.2. Budidaya Padi

Budidaya padi sawah *(rice cultivation: flooded rice fields)* berkontribusi pada peningkatan emisi GRK berupa gas metan dan N_2O. Berdasarkan laporan ADB-GEF-UNDP (1998) padi sawah menyumbang 76% dari total gas metan yang diemisikan sektor pertanian.

Sumber gas metan dari budidaya padi sawah dihasilkan karena terjadi kondisi anaerobik pada lahan sawah akibat penggenangan air yang terlalu tinggi dan lama. Untuk menghitung gas metan yang diemisikan dari budidaya padi, pola penggenangan air menjadi faktor utama karena perbedaan pola penggenangan akan menyebabkan jumlah emisi yang berbeda. Pola penggenagan terbagi menjadi penggenangan terus menerus *(continuously flooded)*, dan penggenangan berkala *(intermittently flooded)*.

Berdasarkan pola penggenangan air tersebut, faktor lainnya yang turut mempengaruhi jumlah gas metan yang diemisikan adalah:

- tinggi penggenangan dan sejarahnya dalam sistem budidaya,
- suhu tanah,

- penggunaan pupuk kimia,
- jenis tanah,
- cultivar,
- cara budidaya (IPCC, 1994)

Budidaya padi menghasilkan gas metan terbanyak, yaitu 2,57 Tg/tahun. Secara geografis gas metan tersebut 21,2% disumbangkan oleh lahan budidaya padi dari Jawa Barat; 20,9% dari Jawa Timur; 15,9% dari Jawa Tengah; dan 8% dari Sulawesi Selatan. Dengan kondisi ini maka 58% emisi gas metan dari budidaya padi sawah berasal dari pulau Jawa (ALGAS, 1997).

2.3. Pembakaran Padang Sabana

Pembakaran padang sabana akan menghasilkan gas CH_4, N_2O, NO_x dan CO. Pembakaran ini biasanya terjadi karena lahan tersebut akan digunakan sebagai lahan pertanian dengan sistem pertanian berpindah.

Jumlah gas yang diemisikan bergantung pada luas lahan yang dibakar dan jumlah biomass yang terbakar pada padang sabana tersebut. Selain itu jenis biomassa hidup atau mati juga mempengaruhi jumlah gas yang diemisikan karena perbedaan kondisi kelembaban/kekeringan bahannya.

Berdasarkan laporan ADB-GEF-UNDP (1998), emisi dari kegiatan pembakaran sabana di Indonesia pada tahun 1990 adalah CH_4 19,52 Gg, N_2O 0,24 Gg, NO_x 512 Gg dan CO 8,74 Gg atau sebesar 484,32 CO_2 eq.

2.4. Pembakaran Limbah Pertanian

Kegiatan pertanian budidaya *(on-farm)* dan pengolahan hasil *(off-farm)* menghasilkan limbah berupa sisa panen, pasca panen dan pengolahan hasil yang relatif besar. Secara umum limbah pertanian adalah bahan organik yang mudah membusuk sehingga akan mengemisikan gas metan. Selain itu, limbah pertanian berupa sisa panen banyak dibakar oleh petani untuk mereduksi volume atau menghasilkan residu hasil pembakaran untuk pupuk yang akan mengemisikan gas CH_4, N_2O, NO_x dan CO.

Membakar limbah pertanian adalah aktivitas yang sering dilakukan oleh petani, khususnya di negara-negara berkembang. Berdasarkan data, lebih dari 40% limbah pertanian di negara berkembang dibakar oleh petani di lahan pertanian. Pembakaran limbah pertanian sebagai sumber energi tidak dimasukan dalam kategori ini.

Untuk menghitung emisi GRK yang berasal dari pembakaran limbah pertanian diperlukan informasi mengenai rasio limbah terhadap hasil panen, fraksi dari pembakaran residu, berat kering bahan, dan kandungan karbon serta nitrogen dalam limbah. Sebagai contoh, data dari limbah padi adalah:

- rasio limbah terhadap hasil panen 1,4
- fraksi berat kering 0,78-0,88
- fraksi karbon 0,4144
- rasio nitrogen-karbon 0,014 (IPCC, 1994)

Beberapa data terkait dengan emisi GRK dari aktivitas perlakuan terhadap limbah pertanian adalah sebagai berikut:

- 1 ton sampah padat organik yang mengalami fermentasi tidak terkontrol *(uncontrolled fermentation)* menghasilkan 50 kg gas metan (Bratasida dkk, 2004).
- Limbah pertanian yang dibakar akan mengemisikan gas metan (CH_4), karbonmonoksida (CO), nitrogen oksida (N_2O) dan NO_X.

Berdasarkan laporan ADB-GEF-UNDP (1998), emisi dari kegiatan pembakaran limbah pertanian di Indonesia pada tahun 1990 adalah CH_4 26,61 Gg, N_2O 0,62 Gg, NOx 559 Gg dan CO 22,22 Gg atau sebesar 751,01 CO_2 eq.

Laporan Ecosolve. Ltd (2002) menyatakan bahwa pada tahun 2000 emisi GRK dari pembakaran residu tanaman padi dan jagung berupa CH_4 31,35 Gg, N_2O 5,45 Gg, NOx 685,32 Gg dan CO 19,68 Gg. Secara lengkap emisi pembakaran residu pertanian (padi dan jagung) ditampilkan pada tabel berikut.

Tabel. 3. Emisi Gas Rumah Kaca (GRK) dari Pembakaran Residu Padi dan Jagung Tahun 2000

Kegiatan	Emisi (Gg)			
	CH_4	N_2O	NOx	CO
Pembakaran Residu Padi	29,69	4,90	17,70	623,40
Pembakaran Residu Jagung	1,66	0,55	1,98	34,92

2.5. Tanah Pertanian

Tanah pertanian menjadi sumber emisi N_2O dengan mekanisme pelepasan atom N untuk bereaksi dengan udara. Pelepasan N_2O diakibatkan kegiatan pengolahan tanah. Tingkat emisi ini meningkat apabila tanah pertanian tersebut dipupuk dengan pupuk nitrogen seperti urea.

Emisi nitrogen oksida lainnya dari tanah adalah karena penggunaan pupuk kimia (chemical fertilizer). Nitrogen yang terdapat di pupuk urea dan ammonium sulfat (AS) menjadi N_2O dan NO_2 dengan tingkat emisi 1 dan 1,57% (IPCC, 1994 dan Ecosolve, Ltd., 2002). Pada tahun 1998/1999 emisi nitrogen dari penggunaan pupuk kimia di Indonesia sebesar 14,15 Gg N_2O dan 22,23 Gg NO_2.

Bab 3.
Sumber dan Potensi
Pengurangan Emisi GRK Sektor Pertanian

Setiap usaha pengurangan emisi harus mempertimbangkan nilai ekonomis dari penghasil emisi tersebut. Karena itu alternatif pengurangan emisi diupayakan untuk tidak menghambat faktor produksi dan nilai ekonomis dari produk yang dihasilkan. Beberapa alternatif pengurangan emisi GRK dari kegiatan pertanian dan peternakan dapat dilaksanakan secara bersamaan. Hal ini karena alternatif tersebut menjangkau kedua sub sistem itu secara bersamaan, selain itu juga akan meningkatkan efektifitas dan sinergi dalam pencapaian tujuan.

Dari sisi kebijakan, terdapat dua langkah yang dapat dilakukan terkait dangan pengurangan emisi GRK sektor pertanian yaitu :

Pertama, menginventarisir, melatih dan menyebarluaskan paket-paket teknologi untuk digunakan oleh petani dan peternak sebagai bagian perubahan pola bertani/beternak untuk mengurangi GRK. Pelatihan dan penyebarluasan paket teknologi tersebut dilakukan berdasarkan karakteristik dan spesifikasi kegiatan yang ada di lokasi.

Kedua, mengembangkan kebijakan insentif untuk mempercepat adopsi dari paket-paket teknologi tersebut. Kebijakan insentif diterapkan secara berkesinambungan untuk program-program terpilih dan secara gradual diupayakan menurun untuk menghindari efek negatif dari insentif yang berkepanjangan.

Pengurangan emisi GRK dapat dijalankan secara sendiri-sendiri atau secara terpadu antar berbagai alternatif yang ada. Berikut ini ditampilkan beberapa alternatif pengurangan emisi GRK dari kegiatan pertanian dan peternakan, yaitu:

a. Pengelolaan air

   Pengelolaan air *(watershed management)* atau pengaturan irigasi *(control irigation)* berkaitan dengan budidaya padi yang berkontribusi pada emisi gas metan. Pengelolaan air atau pengaturan irigasi difokuskan pada proses penggenangan secara berkala dan terkendali sehingga air hanya mengalir dan tergenang pada saat tertentu saja.

b. Pengelolaan tanah

   Pengelolaan tanah berkaitan dengan manajemen kesuburan tanah yang diupayakan dengan cara penggunaan bahan organik (kompos) dan mengurangi penggunaan pupuk kimia sintetis seperti urea karena akan meningkatkan emisi N_2O ke atmosfer.

   Selain itu pupuk urea menyebabkan emisi metan. Untuk jangka panjang dapat diupayakan penggunaan pupuk berbahan dasar ammonium seperti sulfic-ammonium ($[NH_3]_2SO_4$) yang tetap dapat menjaga produktivitas tanaman namun rendah emisi metan.

c. Pemilihan varietas

   Penggunaan varietas yang unggul dan adaptif terhadap praktek pertanian terpadu akan mengurangi input pupuk kimia. Aktivitas ini akan mengurangi emisi N_2O dari pupuk kimia dengan tetap mempertahankan kualitas produk pertanian.

d. Pengelolaan pakan ternak

   Pada sektor peternakan, pola dan jenis pakan ternak akan mempengaruhi emisi GRK. Kualitas pakan yang baik akan

mengurangi proses fermentasi dalam sistem pencernaan ternak, sehingga gas metan yang dihasilkan akan berkurang.

Hal lain yang dapat dilakukan adalah mengubah mikroba pada rumen ternak. Pencampuran bahan ionophores pada pakan ternak dalam jangka pendek akan meningkatkan efisiensi pencernaan tenak sebanyak 20 hingga 30% (ALGAS, 1997).

Secara umum pengelolaan pakan juga bermanfaat untuk meningkatkan produktivitas dan kesehatan ternak.

e. Inseminasi buatan dan pemuliaan galur

Alternatif ini dilakukan untuk menghasilkan ternak yang memiliki kualitas lebih baik dari sebelumnya, lebih tahan penyakit, kemampuan reproduksi yang baik dan metabolisme yang lebih sempurna. Ternak yang memiliki kualitas baik akan meningkatkan produksi dan mengurangi emisi gas metan.

f. Pemanfaatan kotoran ternak

Kotoran ternak yang tidak dikelola akan menghasilkan emisi gas metan. Pemanfaatan kotoran ternak dapat dilakukan dengan cara diolah menjadi biogas atau pupuk organik (kompos).

g. Pemanfaatan limbah pertanian

Limbah pertanian dihasilkan dari kegiatan budidaya *(on-farm)* dan pengolahan hasil *(off-farm)*. Limbah pertanian yang tidak dikelola dengan baik akan mengemisi gas CH_4, CO, N_2O dan NO_X. Limbah pertanian dapat dimanfaatkan sebagai pakan ternak, biogas, pupuk organik dan bahan bakar nabati (biomass)

h. Diversifikasi pangan

Keragaman bahan pangan akan memperkuat ketahanan pangan nasional. Selain itu, keragaman pangan akan memberikan efek positif pada pengurangan emisi GRK karena penyediaan pangan

tidak tergantung pada padi yang dalam proses budidayanya berkontribusi besar pada peningkatan emisi gas metan.

Alternatif pengurangan emisi GRK dapat dijalankan secara bertahap mengikuti pola pembangunan yang ada. Dalam laporannya, ADB-GEF-UNDP (1998) menyatakan bahwa pelaksanaan inisiatif pengurangan GRK dapat dilaksanakan mengikuti 3 tahapan waktu yaitu jangka pendek (lima tahun pertama), jangka menengah (lima tahun kedua), dan jangka panjang (setelah lima tahun ke dua). Dalam perencanaan, pelaksanaan pengurangan GRK untuk tiap sektor beserta pilihan pengurangan GRK tersebut memiliki peluang pelaksanaan dan pembiayaan yang berbeda-beda. Gambaran peluang dan jenis kegiatan yang dapat dilakukan di sektor pertanian untuk mengurangi GRK, khususnya gas metan menurut ADB-GEF-UNDP (1998) ditampilkan pada tabel berikut.

Tabel 4. Jenis Kegiatan dan Peluang Pengurangan Emisi GRK Dari Kegiatan Budidaya Padi dan Ternak

Kegiatan	Waktu	Investasi Unit Biaya	Potensi Pengurangan	Economic Attactiveness
A. Budidaya Padi		**US $/ha**	**Kg CH_4/ha**	
Tanpa Pengolahan Tanah	Jangka Panjang	0	10,8	Rendah
Substitusi urea dgn sulficsulfuric ammonium	Jangka Panjang	0	10	Rendah
Substitusi urea tabur dengan urea tablet	Jangka Pendek	0	18	Tinggi
Pembibitan langsung	Jangka Pendek	0	37	Tinggi
Pengaturan irigasi	Jangka Pendek	0	55,5	Tinggi

Kegiatan	Waktu	Investasi Unit Biaya	Potensi Pengurangan	Economic Attactiveness
Substitusi varietas dengan IR 64	Jangka Pendek	0	90	Tinggi
B. Ternak		**US $/10 ekor**	**%**	
Pemberian mineral	Jangka Panjang	4.000	40	Rendah
Penggunaan pakan dari residu pertanian lokal	Jangka Pendek	4.000	30	Tinggi
Pembangunan biogas	Jangka Panjang	6.000	70	Rendah
Inseminasi buatan	Jangka Pendek	4.000	15	Tinggi
Modifikasi rumen	Jangka Menengah	4.000	25	Tinggi
Peningkatan daya cerna	Jangka Menengah	6.400	15	Tinggi

Sumber: ADB-GEF-UNDP (1998)

Pengurangan emisi gas metan dari sektor pertanian harus menjadi prioritas utama pengurangan GRK pertanian karena berdasarkan hasil inventarisasi GRK, pada tahun 1990 mmisi gas metan dari pertanian mencapai 71.137,92 Gg CO_2eq atau mencapai 94,4% dari keseluruhan emisi GRK sektor pertanian yang meliputi CH_4, N_2O, NOx dan CO.

Berdasarkan hasil studi mengenai berbagai skenario untuk pengurangan GRK, didapatkan kegiatan-kegiatan yang berpotensi untuk dapat mengurangi GRK pada masing-masing sektor. Salah satu pertimbangan pelaksanaan pengurangan GRK adalah tersedianya berbagai pilihan kegiatan yang berbiaya murah *(least-cost)*.

Pada sektor pertanian terdapat tiga kegiatan yang memiliki kenaikan biaya negatif *(negatif incremental cost)* untuk pengurangan GRK yaitu kegiatan budidaya padi tanpa pengolahan tanah, pengawasan irigasi dan pembibitan langsung.

Tabel 5. Biaya dan Potensi Pengurangan Emisi GRK Dari Kegiatan Budidaya Padi dan Ternak

Kegiatan	Pengurangan GRK Tg CO_2-eq	Rata-rata Kenaikan Biaya US$/ton CO_2
A. Budidaya Padi		
Tanpa Pengolahan Tanah	270,14	-199,00
Pengaturan irigasi	849,45	-6,00
Pembibitan langsung	436,21	-4,00
Substitusi varietas dengan IR 64	1.379,95	0,00
Substitusi urea prill dengan urea tablet	436,21	5,00
Substitusi urea dgn ammonium sulfat	132,86	10,00
B. Ternak		
Inseminasi buatan	133,46	8,00
Penggunaan pakan dari residu pertanian lokal	266,93	8,00
Pembangunan biogas	622,84	22,00
Pemberian mineral	355,91	38,00
Modifikasi rumen	222,44	48,00
Peningkatan daya cerna	133,46	64,00

Sumber: ADB-GEF-UNDP (1998)

Tabel diatas memperlihatkan bahwa pilihan yang tersedia bagi pengurangan GRK pertanian dari yang berbiaya murah hingga berbiaya tinggi adalah sebagai berikut:

a. Budidaya padi tanpa melakukan pengolahan tanah;
b. Pengelolaan pengairan;

c. Merubah metode penanaman dari *transplanting* menjadi pembibitan langsung *(direct seeding)*;
d. Melakukan substitusi varietas padi;
e. Mengganti urea bubuk *(prill)* dengan urea tablet;
f. Melakukan inseminasi buatan;
g. Penggunaan residu tanaman sebagai suplemen pakan ternak;
h. Melakukan substitusi sebagian pupuk urea dengan pupuk berbasis ammonium sulfat;
i. Pembangunan unit biogas;
j. Pemberian mineral sebagai tambahan pakan;
k. Pemberian bahan untuk memodifikasi rumen *(rument modifier agent)*; dan
l. Peningkatan daya cerna ternak.

Bab 4.
Agenda Nasional

Agenda Nasional (2008-2015) pengurangan GRK pertanian yang diagendakan untuk dapat dicapai sampai pada tahun 2015 adalah:

- Termanfaatkannya 80 % potensi gas methan dari kotoran ternak ruminansia besar dan babi.
- Tertutupinya 50 % lahan terbuka terbengkalai dengan vegetasi permanen atau campuran.
- Diterapkannya secara luas sistem pertanian organik untuk berbagai komoditi pertanian dan peternakan.
- Diterapkannya pengaturan irigasi dan penggenangan air pada budidaya padi.
- Diterapkannya manajemen kesuburan tanah yang diupayakan dengan cara penggunaan bahan-bahan organik (kompos) dan mengurangi penggunaan pupuk kimia sintetis.
- Digunakannya varietas yang unggul dan adaptif terhadap praktek pertanian terpadu.
- Diterapkannya pola dan jenis pakan ternak yang berkualitas.
- Dihasilkannya ternak yang memiliki kualitas lebih baik dari sebelumnya, lebih tahan penyakit, kemampuan reproduksi yang baik dan metabolisme yang lebih sempurna.
- Dimanfaatkannya kotoran ternak dan limbah pertanian menjadi biogas dan kompos.
- Dilaksanakannya diversifikasi pangan.
- Diterapkannya teknologi pertanian dan agroindustri yang ramah lingkungan (eco-agribisnis) oleh para pelaku di seluruh Indonesia.

Bab 5.
Rencana Aksi

Rencana aksi pengurangan emisi GRK dari kegiatan pertanian meliputi berbagai aktivitas mitigasi untuk mengurangi secara signifikan emisi CH_4, N_2O, NO_x dan CO yang ditimbulkan dan sekaligus meningkatkan peranan pertanian sebagai penyerap gas rumah kaca terutama CO_2.

Upaya-upaya (langkah-langkah operasional) disusun dalam kerangka waktu tahun 2008 dan 2009, dengan melaksanakan rencana aksi sebagai berikut:

No	Rencana Aksi	Tujuan
1.	Pengembangan biogas dari kotoran ternak	Mengurangi emisi CH_4
2.	Penerapan sistem irigasi intermitten	Mengurangi emisi CH_4 dan N_2O
3.	Pengembangan Pertanian Organik	Mengurangi emisi N_2O dan NO_2
4.	Pengembangan dan penggunaan pakan ternak rendah emisi	Mengurangi emisi CH_4
5.	Pengolahan kompos dari limbah pertanian dan agroindustri	Mengurangi emisi CH_4 dan CO_2
6.	Penggunaan pupuk organik untuk mengurangi penggunaan pupuk nitrogen kimia	Mengurangi emisi N_2O dan NO_2
7.	Pengembangan sistem budidaya untuk efisiensi pemupukan	Mengurangi emisi N_2O dan NO_2

No	Rencana Aksi	Tujuan
8.	Pengembangan dan penggunaan varietas yang lebih resposif terhadap pemupukan dan rendah emisi	Mengurangi emisi N_2O, NO_2, CH_4 dan CO_2
9.	Penghijauan lahan kawasan budidaya pertanian terbengkalai	Mengurangi emisi CO_2, meningkatkan penyerapan CO_2 di udara
10.	Pengembangan dan penggunaan bioenergi	Mengurangi emisi CO_2 dari bahan bakar fosil
11.	Pemanfaatan input dari sumber daya lokal dan pemenuhan konsumsi pada tingkat lokal	Mengurangi emisi CO_2 yang dihasilkan oleh transportasi/ distribusi input dan bahan konsumsi
12.	Penerapan sistem pembukaan lahan tanpa membakar dan menerapkan pengolahan tanah minimum	Mengurangi emisi CO_2

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Lampiran 1.

Undang-undang Republik Indonesia Nomor 17 Tahun 2004 tentang Pengesahan *Kyoto Protocol To The United Nations Framework Convention On Climate Change* (Protokol Kyoto Atas Konvensi Kerangka Kerja Perserikatan Bangsa-Bangsa Tentang Perubahan Iklim)

PRESIDEN
REPUBLIK INDONESIA

UNDANG-UNDANG REPUBLIK INDONESIA
NOMOR 17 TAHUN 2004

TENTANG

PENGESAHAN *KYOTO PROTOCOL TO THE UNITED NATIONS FRAMEWORK C'ONVENTION ON CLIMATE CHANGE* (PROTOKOL KYOTO ATAS KONVENSI KERANGKA KERJA PERSERIKATAN BANGSA-BANGSA
TENTANG PERUBAHAN IKLIM)
DENGAN RAHMAT TUHAN YANG MAHA ESA,

PRESIDEN REPUBLIK INDONESIA

Menimbang :

a. bahwa tujuan nasional negara Republik Indonesia sebagaimana dicantumkan dalam Pembukaan Undang-Undang Dasar Negara Republik Indonesia Tahun 1945 adalah untuk melindungi segenap bangsa dan seluruh tumpah darah Indonesia dan untuk memajukan kesejahteraan umum, mencerdaskan kehidupan bangsa dan ikut melaksanakan ketertiban dunia yang berdasarkan kemerdekaan, perdamaian abadi, dan keadilan sosial;
b. bahwa Indonesia dengan Undang-Undang Nomor 6 Tahun 1994 telah mengesahkan *United Nations Framework Convention on*

Mengingat :

1. Pasal 5 ayat (1), Pasal 11, Pasa1 20 ayat (1), (2), (4), (5), Pasal 22A, dan Pasal 33 ayat (3) dan (4) Undang-Undang Dasar Negara Republik Indonesia Tahun 1945;
2. Undang-Undang Nomor 6 Tahun 1994 tentang Pengesahan *United Nations Framework Convention on Climate Change* (Konvensi Kerangka Kerja Perserikatan Bangsa-Bangsa tentang Perubahan Iklim) (Lembaran Negara Republik Indonesia Tahun 1994 Nomor 42, Tambahan Lembaran Negara Nomor 3557);
3. Undang-Undang Nomor 23 Tahun 1997 tentang Pengelolaan Lingkungan Hidup (Lembaran Negara Republik Indonesia Tahun 1997 Nomor 68, Tambahan Lembaran Negara Nomor 3699);
4. Undang-Undang Nomor 24 Tahun 2000 tentang Perjanjian Internasional (Lembaran Negara Republik Indonesia Tahun 2000 Nomor 185, Tambahan Lembaran Negara Republik Indonesia Nomor 4012);

Dengan persetujuan bersama antara

DEWAN PERWAKILAN RAKYAT REPUBLIK INDONESIA
dan
PRESIDEN REPUBLIK INDONESIA

MEMUTUSKAN:

Menetapkan :

UNDANG-UNDANG TENTANG PENGESAHAN *KYOTO PROTOCOL TO THE UNITED NATIONS FRAMEWORK CONVENT/ON ON CLIMATE CHANGE* (PROTOKOL KYOTO ATAS KONVENSI KERANGKA KERJA PERSERIKATAN BANGSA-BANGSA TENTANG PERUBAHAN IKLIM).

Pasal 1

Mengesahkan *Kyoto Protocol to the United Nations Framework Convention on Climate Change* (Protokol Kyoto atas Konvensi Kerangka Kerja Perserikatan Bangsa-Bangsa tentang Perubahan Iklim) yang salinan naskah aslinya dalam bahasa Inggris dan terjemahannya dalam bahasa Indonesia sebagaimana terlampir merupakan bagian yang tidak terpisahkan dari Undang-undang ini.

Pasal 2

Undang-Undang ini mulai berlaku pada tanggal diundangkan. Agar setiap orang mengetahuinya, memerintahkan pengundangan Undang-undang ini dengan penempatannya dalam Lembaran Negara Republik Indonesia.

Telah sah
pada tanggal 28 Juli 2004

Diundangkan di Jakarta
pada tanggal 28 Juli 2004

SEKRETARIS NEGARA REPUBLIK INDONESIA,
ttd.
BAMBANG KESOWO

LEMBARAN NEGARA REPUBLIK INDONESIA TAHUN 2004 NOMOR 72

PENJELASAN
ATAS
UNDANG-UNDANG REPUBLIK INDONESIA
NOMOR 17 TAHUN 2004
TENTANG
PENGESAHAN *KYOTO PROTOCOL TO THE UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE* (PROTOKOL KYOTO ATAS KONVENSI KERANGKA KERJA PERSERIKATAN BANGSA-BANGSA TENTANG PERUBAHAN IKLIM)

I. UMUM

Perubahan iklim adalah fenomena global yang disebabkan oleh kegiatan manusia dalam penggunaan energi bahan bakar fosil serta kegiatan alih-guna-lahan dan kehutanan. Kegiatan tersebut merupakan sumber utama Gas Rumah Kaca (GRK) terutama karbon dioksida (CO_2) yang kontribusi terbesar berasal dari negara industri Gas ini memiliki kemampuan menyerap panas yang berasal dari radiasi matahari yang dipancarkan kembali oleh bumi. Penyerapan ini telah menyebabkan pemanasan atmosfer atau kenaikan suhu dan perubahan iklim.

Negara industri telah lama menghasilkan emisi GRK yang terakumulasi di atmosfer dalam jumlah yang besar. Oleh karena itu, sangat beralasan jika mereka berkewajiban menurunkan emisi GRK dan mengatasi dampak perubahan iklim. Sementara itu, negara berkembang yang tidak berkewajiban menurunkan emisi GRK berhak mendapatkan bantuan dari negara industri dalam rangka berpartisipasi

secara sukarela untuk menurunkan emisi GRK dan mengatasi dampak perubahan iklim.

Protokol Kyoto atas Konvensi Kerangka Kerja Perserikatan Bangsa-Bangsa tentang Perubahan Iklim mengatur penurunan emisi GRK akibat kegiatan manusia sehingga dapat menstabilkan konsentrasi GRK di atmosfer dan tidak membahayakan sistem iklim bumi. Protokol Kyoto menetapkan aturan mengenai tata cara, target, mekanisme penurunan emisi, kelembagaan, serta prosedur penaatan dan penyelesaian sengketa .

Sebagai negara kepulauan yang berciri nusantara dan mempunyai garis pantai terpanjang kedua di dunia, dengan jumlah penduduk yang besar dan kemampuan ekonomi yang terbatas, Indonesia berada pada posisi yang sangat rentan terhadap dampak perubahan iklim bagi lingkungan dan kehidupan bangsa Indonesia. Dampak tersebut meliputi turunnya produksi pangan, terganggunya ketersediaan air, tersebarnya hama dan penyakit tanaman serta manusia, naiknya permukaan laut, tenggelamnya pulau-pulau kecil, dan punahnya keanekaragaman hayati.

Sebagai negara berkembang yang sedang membangun, Indonesia perlu mempercepat pengembangan industri dan transportasi dengan tingkat emisi rendah melalui pemanfaatan teknologi bersih dan efisien serta pemanfaatan energi terbarukan *(renewable energy)*.Di samping itu, Indonesia perlu meningkatkan kemampuan lahan dan hutan untuk menyerap GRK. Protokol Kyoto menjamin bahwa teknologi yang akan dialihkan ke negara berkembang harus memenuhi kriteria tersebut

melalui Mekanisme Pembangunan Bersih (MPB) atau *Clean Development Mechanism (CDM)* yang diatur oleh Protokol Kyoto.

Mekanisme Pembangunan Bersih (MPB) merupakan bentuk investasi baru di negara berkembang yang bertujuan mendorong negara industri untuk melaksanakan kegiatan penurunan emisi di negara berkembang guna mencapai target penurunan emisi GRK dan membantu negara berkembang untuk mencapai tujuan pembangunan berkelanjutan.

Sehubungan dengan hal tersebut, dan mengingat Indonesia telah mengesahkan Konvensi Kerangka Kerja Perserikatan Bangsa-Bangsa tentang Perubahan Iklim (Konvensi Perubahan Iklim) melalui Undang-Undang Nomor 6 Tahun 1994, sangatlah penting bagi Indonesia untuk mengesahkan Protokol Kyoto. Dengan mengesahkan Protokol tersebut, Indonesia mengadopsi hukum internasional sebagai hukum nasional untuk dijabarkan dalam kerangka peraturan dan kelembagaan.

1. Latar Belakang dan Tujuan Protokol Kyoto

Gagasan dan program untuk menurunkan emisi GRK secara internasional telah dilakukan sejak tahun 1979. Program itu memunculkan sebuah gagasan dalam bentuk perjanjian internasional, yaitu Konvensi Perubahan Iklim, yang diadopsi pada tanggal 14 Mei 1992 dan berlaku sejak tanggal 21 Maret 1994, Pemerintah Indonesia turut menandatangani perjanjian tersebut dan telah mengesahkannya melalui Undang-Undang Nomor 6 Tahun 1994.

Agar Konvensi tersebut dapat dilaksanakan oleh Para Pihak, dipandang penting adanya komitmen lanjutan, khususnya untuk negara pada *Annex* I (negara industri atau negara penghasil GRK) untuk menurunkan GRK sebagai unsur utama periyebab perubahan iklim. Namun, mengingat lemahnya komitmen Para Pihak dalam Konvensi Perubahan Iklim, *Conference of the Parties (COP)* III yang diselenggarakan di Kyoto pada bulan Desember tahun 1997 menghasilkan kesepakatan Protokol Kyoto yang mengatur dan mengikat Para Pihak negara industri secara hukum untuk melaksanakan upaya penurunan emisi GRK yang dapat dilakukan secara individu atau bersama-sama.

Protokol Kyoto bertujuan menjaga konsentrasi GRK di atmosfer agar berada pada tingkat yang tidak membahayakan sistem iklim bumi. Untuk mencapai tujuan itu, Protokol mengatur pelaksanaan penurunan emisi oleh negara industri sebesar 5 % di bawah tingkat emisi tahun 1990 dalam periode 2008-2012 melalui mekanisme Implementasi Bersama *(Joint Implementation),* Perdagangan Emisi *(Emission Trading),* dan Mekanisme Pembangunan Bersih *(Clean Development Mechanism).*

2. Manfaat Pengesahan Protokol Kyoto

Dengan mengesahkan Protokol Kyoto, Indonesia mengadopsi Protokol tersebut sebagai hukum nasional untuk dijabarkan dalam kerangka peraturan dan kelembagaan sehingga dapat :

a. mempertegas komitmen pada Konvensi Perubahan Iklim berdasarkan prinsip tanggung jawab bersama yang dibedakan *(common but differentiated responsibilities principle)* ;

b. melaksanakan pembangunan berkelanjutan khususnya untuk menjaga kestabilan konsentrasi GRK di atmosfer sehingga tidak membahayakan iklim bumi;
c. membuka peluang investasi baru dari negara industri ke Indonesia melalui MPB;
d. mendorong kerja sama dengan negara industri melalui MPB guna memperbaiki dan memperkuat kapasitas, hukum, kelembagaan, dan alih teknologi penurunan emisi GRK;
e. mempercepat pengembangan industri dan transportasi dengan tingkat emisi rendah melalui pemanfaatan teknologi bersih dan efisien serta pemanfaatan energi terbarukan;
f. meningkatkan kemampuan hutan dan lahan untuk menyerap GRK.

3. Materi Pokok Protokol Kyoto

Protokol Kyoto disusun berdasarkan prinsip tanggung jawab bersama yang dibedakan, sebagaimana tercantum dalam prinsip ketujuh Deklarasi Rio, yang berarti bahwa semua negara mempunyai semangat yang sama untuk menjaga dan melindungi kehidupan manusia dan integritas ekosistem bumi, tetapi dengan kontribusi yang berbeda sesuai dengan kemampuan negara masing-masing. Protokol Kyoto terdiri atas 28 Pasal dan 2 *Annex* :

- *Annex* A : Gas Rumah Kaca dan kategori sektor/sumber.
- *Annex* B : Kewajiban penurunan emisi yang ditentukan untuk Para Pihak.

Materi pokok yang terkandung dalam Protokol Kyoto, antara lain hal-hal berikut.

a. Definisi

Protokol Kyoto mendefinisikan beberapa kelembagaan Konvensi dan Protokol, diantaranya *Conference of the Parties* (COP) dan *Intergovernmental Panel on Climate Change* (IPCC) beserta fungsinya dalam pelaksanaan Konvensi dan Protokol. Ditetapkan juga bahwa Para Pihak pada *Annex* I Konvensi (negara industri, termasuk Rusia dan negara Eropa Timur lain yang ekonominya berada dalam transisi menuju pasar bebas) wajib menurunkan emisi sesuai dengan *Annex* B.

b. Kebijakan dan Tata Cara

Pasal 2 Protokol Kyoto mengatur kebijakan dan tata cara dalam mencapai komitmen pembatasan dan penurunan emisi oleh negara pada *Annex* I serta kewajiban untuk mencapai batas waktu komitmen tersebut. Di samping itu, Protokol juga mewajibkan negara industri untuk melaksanakan kebijakan dan mengambil tindakan untuk meminimalkan dampak yang merugikan dari perubahan iklim terhadap pihak lain, khususnya negara berkembang.

c. Target Penurunan Emisi

Target penurunan emisi yang dikenal dengan nama *Quantified Emission Limitation and Reduction Objectives* (QELROs) yang dijelaskan dalam Pasal 3 dan 4 Protokol Kyoto adalah ketentuan pokok dalam Protokol Kyoto. Emisi GRK menurut *Annex* A Protokol Kyoto meliputi : *Carbon Dioxide* (CO2), *Methane* (CH4), *Nitrous Oxide* (N2O), *Hydrofluorocarbon* (HFC), *Perfluorocarbon* (PFC), dan *Sulfurhexafluoride* (SF6) .Target penurunan emisi GRK bagi negara pada *Annex* I Konvensi diatur dalam *Annex* B Protokol Kyoto. Ketentuan ini merupakan pasal yang mengikat bagi negara pada *Annex* I. Protokol juga mengatur tata cara

penurunan emisi GRK secara bersama-sama. Jumlah emisi GRK yang harus diturunkan tersebut dapat meringankan negara yang emisinya tinggi, sedangkan negara yang emisinya rendah atau bahkan karena kondisi tertentu tidak mengeluarkan emisi dapat meringankan beban kelompok negara yang emisinya tinggi.

d. Implementasi Bersama

Implementasi Bersama adalah mekanisme penurunan emisi yang dapat dilaksanakan antarnegara industri yang diuraikan dalam Pasal 6 Protokol Kyoto. Implementasi Bersama itu mengutamakan cara-cara yang paling murah atau yang paling menguntungkan. Kegiatan Implementasi Bersama tersebut akan menghasilkan unit penurunan emisi atau *Emission Reduction Units* (ERU).

e. Tanggung Jawab Bersama yang Dibedakan

Kewajiban bersama antara negara industri yang termasuk pada *Annex* I dengan negara berkembang disesuaikan dengan prinsip tanggung jawab bersama yang dibedakan. Hal ini dijabarkan dalam Pasal 10 dan 11 Protokol Kyoto. Pasal 10 merupakan penekanan kembali kewajiban tersebut tanpa komitmen baru bagi Para Pihak, baik negara industri maupun negara berkembang seperti dimaksud dalam Pasal 4 ayat (1) Konvensi Perubahan Iklim. Pasal 11 menekankan kewajiban negara industri yang menjadi Pihak dalam Protokol Kyoto serta terrnasuk pada *Annex* II Konvensi untuk menyediakan dana baru dan dana tambahan, termasuk alih teknologi untuk melaksanakan komitmen Pasal 10 Protokol Kyoto.

f. Mekanisme Pembangunan Bersih

Mekanisme Pembangunan Bersih yang diuraikan dalam Pasal 12 Protokol Kyoto merupakan prosedur penurunan emisi GRK dalam rangka kerja sama negara industri dengan negara berkembang.

Negara industri melakukan investasi di negara berkembang untuk mencapai target penurunan emisinya. Sementara itu, negara berkembang berkepentingan dalam mencapai tujuan utama Konvensi dan tujuan pembangunan berkelanjutan. Kegiatan penurunan emisi melalui MPB harus disertifikasi oleh entitas operasional yang ditunjuk oleh *Conference of the Parties serving as the Meeting of the Parties (COP/MOP).*

g. Kelembagaan

Lembaga-lembaga yang berfungsi melaksanakan Protokol Kyoto adalah .COP/MOP sebagai lembaga tertinggi pengambil keputusan Protokol (Pasal 13); Sekretariat Protokol juga berfungsi sebagai Sekretariat Konvensi melakukan tugas-tugas administrasi Protokol (Pasal 14); dan *Subsidiary Body for Scientific and Technological Advice* (SBSTA), sebagai Badan Pendukung yang memberi masukan ilmiah kepada COP/MOP untuk membuat keputusan (Pasal 15).

h. Perdagangan Emisi

Perdagangan Emisi sebagaimana diatur dalam pasal 17 merupakan mekanisme perdagangan emisi yang hanya dapat dilakukan antarnegara industri untuk menghasilkan *Assigned Amounts Unit* (AAU). Negara industri yang emisi GRK-nya di bawah batas yang diizinkan dapat memperdagangkan kelebihan jatah emisinya dengan negara industri lain yang tidak dapat memenuhi kewajibannya. Namun, jumlah emisi GRK yang diperdagangkan dibatasi agar negara pembeli tetap memenuhi kewajibannya.

i. Prosedur Penaatan dan Penyelesaian Sengketa

Ketidaktaatan *(non compliance)* atas kewajiban yang ditentukan dalam Protokol diselesaikan sesuai dengan prosedur dan

mekanisme penaatan yang ada dalam ketentuan Pasal 18 Protokol Kyoto. Sesuai dengan Pasal 19 Protokol .Kyoto, apabila terjadi perselisihan di antara Para Pihak, proses penyelesaian sengketa *(dispute settlement)* mengacu Pasal 14 Konvensi.

4. Peraturan Perundang-undangan Nasional yang Berkaitan dengan Protokol Kyoto.

Indonesia memiliki peraturan perundang-undangan yang berkaitan dan mendukung proses pelaksanaan Protokol Kyoto. Peraturan perundang-undangan yang terkait, antara lain sebagai berikut :

1. Undang-Undang Nomor 11 Tahun 1967 tentang Ketentuan-ketentuan Pokok Pertambangan (Lembaran Negara Republik Indonesia Tahun 1967 Nomor 22, Tambahan Lembaran Negara Nomor 2831);
2. Undang-Undang Nomor 5 Tahun 1990 tentang Konservasi Sumber Daya Alam Hayati dan Ekosistemnya (Lembaran Negara Republik Indonesia Tahun 1990 Nomor 49, Tambahan Lembaran Negara Nomor 3419);
3. Undang-Undang Nomor 24 Tahun 1992 tentang Penataan Ruang (Lembaran Negara Republik Indonesia Tahun 1992 Nomor 115, Tambahan Lembaran Negara Nomor 3501);
4. Undang-Undang Nomor 6 Tahun 1994 tentang Pengesahan *United Nations. Framework Convention on Climate Change* (Konvensi Kerangka Kerja Perserikatan Bangsa-Bangsa tentang Perubahan Iklim) (Lembaran Negara Republik Indonesia Tahun 1994 Nomor 42, Tambahan Lembaran Negard Nomor 3557);
5. Undang-Undang Nomor 23 Tahun 1997 tentang Pengelolaan Lingkungan Hidup (Lembaran Negara Republik Indonesia Tahun 1997 Nomor 68, Tambahan Lembaran Negara Nomor 3699);

6. Undang-Undang Nomor 41 Tahun 1999 tentang Kehutanan (Lembaran Negara Republik Indonesia Tahun 1999 Nomor 167, Tambahan Lembaran Negara Nomor 3888).

5. Tindak Lanjut Pengesahan Protokol Kyoto

Ketentuan dalam peraturan perundang-undangan yang berlaku tersebut mempunyai kaitan dengan ketentuan dalam Protokol Kyoto. Namun, pengesahan Protokol Kyoto masih memerlukan pengembangan peraturan dan kelembagaan untuk melaksanakan dan memanfaatkan peluang yang ada dalam Protokol. Agar peluang yang ada dalam Konvensi dan Protokol dapat dimanfaatkan secara optimal, upaya sosialisasi perlu dilakukan secara efektif dan terintegrasi melalui koordinasi antarsektor yang diatur oleh perangkat peraturan dan kelembagaan yang jelas sehingga dampak negatif perubahan iklim terhadap lingkungan dan kehidupan manusia dapat diminimalkan.

II. PASAL DEMI PASAL

Pasal 1

Apabila terjadi perbedaan penafsiran terhadap terjemahannya dalam bahasa Indonesia, maka dipergunakan salinan naskah aslinya dalam bahasa Inggris .

Pasal 2

Cukup jelas.

TAMBAHAN LEMBARAN NEGARA REPUBLIK INDONESIA NOMOR 4403

KYOTO PROTOCOL TO THE UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE

UNITED NATIONS

1998

4. "Montreal Protocol" means the Montreal Protocol on Substances that Deplete the Ozone Layer, adopted in Montreal on 16 September 1987 and as subsequently adjusted and amended.
5. "Parties present and voting" means Parties present and casting an affirmative or negative vote.
6. "Party" means, unless the context otherwise indicates, a Party to this Protocol.
7. "Party included in Annex I" means a Party included in Annex I to the Convention, as may be amended, or a Party which has made a notification under Article 4, paragraph 2 (g), of the Convention.

Article 2

1. Each Party included in Annex I, in achieving its quantified emission limitation and reduction commitments under Article 3, in order to promote sustainable development, shall:
   (a) Implement and/or further elaborate policies and measures in accordance with its national circumstances, such as:
      (i) Enhancement of energy efficiency in relevant sectors of the national economy;
      (ii) Protection and enhancement of sinks and reservoirs of greenhouse gases not controlled by the Montreal Protocol, taking into account its commitments under relevant international environmental agreements; promotion of sustainable forest management practices, afforestation and reforestation;

(iii) Promotion of sustainable forms of agriculture in light of climate change considerations;

(iv) Research on, and promotion, development and increased use of, new and renewable forms of energy, of carbon dioxide sequestration technologies and of advanced and innovative environmentally sound technologies;

(v) Progressive reduction or phasing out of market imperfections, fiscal incentives, tax and duty exemptions and subsidies in all greenhouse gas emitting sectors that run counter to the objective of the Convention and application of market instruments;

(vi) Encouragement of appropriate reforms in relevant sectors aimed at promoting policies and measures which limit or reduce emissions of greenhouse gases not controlled by the Montreal Protocol;

(vii) Measures to limit and/or reduce emissions of greenhouse gases not controlled by the Montreal Protocol in the transport sector;

(viii) Limitation and/or reduction of methane emissions through recovery and use in waste management, as well as in the production, transport and distribution of energy;

(b) Cooperate with other such Parties to enhance the individual and combined effectiveness of their policies and measures adopted under this Article, pursuant to Article 4, paragraph 2 (e) (i), of the Convention. To this end, these Parties shall take steps to share their experience and exchange information on

such policies and measures, including developing ways of improving their comparability, transparency and effectiveness. The Conference of the Parties serving as the meeting of the Parties to this Protocol shall, at its first session or as soon as practicable thereafter, consider ways to facilitate such cooperation, taking into account all relevant information.

2. The Parties included in Annex I shall pursue limitation or reduction of emissions of greenhouse gases not controlled by the Montreal Protocol from aviation and marine bunker fuels, working through the International Civil Aviation Organization and the International Maritime Organization, respectively.

3. The Parties included in Annex I shall strive to implement policies and measures under this Article in such a way as to minimize adverse effects, including the adverse effects of climate change, effects on international trade, and social, environmental and economic impacts on other Parties, especially developing country Parties and in particular those identified in Article 4, paragraphs 8 and 9, of the Convention, taking into account Article 3 of the Convention. The Conference of the Parties serving as the meeting of the Parties to this Protocol may take further action, as appropriate, to promote the implementation of the provisions of this paragraph.

4. The Conference of the Parties serving as the meeting of the Parties to this Protocol, if it decides that it would be beneficial to coordinate any of the policies and measures in paragraph 1 (a) above, taking into account different national circumstances and potential effects,

shall consider ways and means to elaborate the coordination of such policies and measures.

Article 3

1. The Parties included in Annex I shall, individually or jointly, ensure that their aggregate anthropogenic carbon dioxide equivalent emissions of the greenhouse gases listed in Annex A do not exceed their assigned amounts, calculated pursuant to their quantified emission limitation and reduction commitments inscribed in Annex B and in accordance with the provisions of this Article, with a view to reducing their overall emissions of such gases by at least 5 per cent below 1990 levels in the commitment period 2008 to 2012.
2. Each Party included in Annex I shall, by 2005, have made demonstrable progress in achieving its commitments under this Protocol.
3. The net changes in greenhouse gas emissions by sources and removals by sinks resulting from direct human-induced land-use change and forestry activities, limited to afforestation, reforestation and deforestation since 1990, measured as verifiable changes in carbon stocks in each commitment period, shall be used to meet the commitments under this Article of each Party included in Annex I. The greenhouse gas emissions by sources and removals by sinks associated with those activities shall be reported in a transparent and verifiable manner and reviewed in accordance with Articles 7 and 8.

4. Prior to the first session of the Conference of the Parties serving as the meeting of the Parties to this Protocol, each Party included in Annex I shall provide, for consideration by the Subsidiary Body for Scientific and Technological Advice, data to establish its level of carbon stocks in 1990 and to enable an estimate to be made of its changes in carbon stocks in subsequent years. The Conference of the Parties serving as the meeting of the Parties to this Protocol shall, at its first session or as soon as practicable thereafter, decide upon modalities, rules and guidelines as to how, and which, additional human-induced activities related to changes in greenhouse gas emissions by sources and removals by sinks in the agricultural soils and the land-use change and forestry categories shall be added to, or subtracted from, the assigned amounts for Parties included in Annex I, taking into account uncertainties, transparency in reporting, verifiability, the methodological work of the Intergovernmental Panel on Climate Change, the advice provided by the Subsidiary Body for Scientific and Technological Advice in accordance with Article 5 and the decisions of the Conference of the Parties. Such a decision shall apply in the second and subsequent commitment periods. A Party may choose to apply such a decision on these additional human-induced activities for its first commitment period, provided that these activities have taken place since 1990.
5. The Parties included in Annex I undergoing the process of transition to a market economy whose base year or period was established pursuant to decision 9/CP.2 of the Conference of the Parties at its second session shall use that base year or period for the

implementation of their commitments under this Article. Any other Party included in Annex I undergoing the process of transition to a market economy which has not yet submitted its first national communication under Article 12 of the Convention may also notify the Conference of the Parties serving as the meeting of the Parties to this Protocol that it intends to use an historical base year or period other than 1990 for the implementation of its commitments under this Article. The Conference of the Parties serving as the meeting of the Parties to this Protocol shall decide on the acceptance of such notification.

6. Taking into account Article 4, paragraph 6, of the Convention, in the implementation of their commitments under this Protocol other than those under this Article, a certain degree of flexibility shall be allowed by the Conference of the Parties serving as the meeting of the Parties to this Protocol to the Parties included in Annex I undergoing the process of transition to a market economy.

7. In the first quantified emission limitation and reduction commitment period, from 2008 to 2012, the assigned amount for each Party included in Annex I shall be equal to the percentage inscribed for it in Annex B of its aggregate anthropogenic carbon dioxide equivalent emissions of the greenhouse gases listed in Annex A in 1990, or the base year or period determined in accordance with paragraph 5 above, multiplied by five. Those Parties included in Annex I for whom land-use change and forestry constituted a net source of greenhouse gas emissions in 1990 shall include in their 1990 emissions base year or period the aggregate anthropogenic carbon

dioxide equivalent emissions by sources minus removals by sinks in 1990 from land-use change for the purposes of calculating their assigned amount.

8. Any Party included in Annex I may use 1995 as its base year for hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride, for the purposes of the calculation referred to in paragraph 7 above.
9. Commitments for subsequent periods for Parties included in Annex I shall be established in amendments to Annex B to this Protocol, which shall be adopted in accordance with the provisions of Article 21, paragraph 7. The Conference of the Parties serving as the meeting of the Parties to this Protocol shall initiate the consideration of such commitments at least seven years before the end of the first commitment period referred to in paragraph 1 above.
10. Any emission reduction units, or any part of an assigned amount, which a Party acquires from another Party in accordance with the provisions of Article 6 or of Article 17 shall be added to the assigned amount for the acquiring Party.
11. Any emission reduction units, or any part of an assigned amount, which a Party transfers to another Party in accordance with the provisions of Article 6 or of Article 17 shall be subtracted from the assigned amount for the transferring Party.
12. Any certified emission reductions which a Party acquires from another Party in accordance with the provisions of Article 12 shall be added to the assigned amount for the acquiring Party.
13. If the emissions of a Party included in Annex I in a commitment period are less than its assigned amount under this Article, this

difference shall, on request of that Party, be added to the assigned amount for that Party for subsequent commitment periods.

14. Each Party included in Annex I shall strive to implement the commitments mentioned in paragraph 1 above in such a way as to minimize adverse social, environmental and economic impacts on developing country Parties, particularly those identified in Article 4, paragraphs 8 and 9, of the Convention. In line with relevant decisions of the Conference of the Parties on the implementation of those paragraphs, the Conference of the Parties serving as the meeting of the Parties to this Protocol shall, at its first session, consider what actions are necessary to minimize the adverse effects of climate change and/or the impacts of response measures on Parties referred to in those paragraphs. Among the issues to be considered shall be the establishment of funding, insurance and transfer of technology.

Article 4

1. Any Parties included in Annex I that have reached an agreement to fulfil their commitments under Article 3 jointly, shall be deemed to have met those commitments provided that their total combined aggregate anthropogenic carbon dioxide equivalent emissions of the greenhouse gases listed in Annex A do not exceed their assigned amounts calculated pursuant to their quantified emission limitation and reduction commitments inscribed in Annex B and in accordance with the provisions of Article 3. The respective emission level

allocated to each of the Parties to the agreement shall be set out in that agreement.

2. The Parties to any such agreement shall notify the secretariat of the terms of the agreement on the date of deposit of their instruments of ratification, acceptance or approval of this Protocol, or accession thereto. The secretariat shall in turn inform the Parties and signatories to the Convention of the terms of the agreement.
3. Any such agreement shall remain in operation for the duration of the commitment period specified in Article 3, paragraph 7.
4. If Parties acting jointly do so in the framework of, and together with, a regional economic integration organization, any alteration in the composition of the organization after adoption of this Protocol shall not affect existing commitments under this Protocol. Any alteration in the composition of the organization shall only apply for the purposes of those commitments under Article 3 that are adopted subsequent to that alteration.
5. In the event of failure by the Parties to such an agreement to achieve their total combined level of emission reductions, each Party to that agreement shall be responsible for its own level of emissions set out in the agreement.
6. If Parties acting jointly do so in the framework of, and together with, a regional economic integration organization which is itself a Party to this Protocol, each member State of that regional economic integration organization individually, and together with the regional economic integration organization acting in accordance with Article 24, shall, in the event of failure to achieve the total combined level

of emission reductions, be responsible for its level of emissions as notified in accordance with this Article.

Article 5

1. Each Party included in Annex I shall have in place, no later than one year prior to the start of the first commitment period, a national system for the estimation of anthropogenic emissions by sources and removals by sinks of all greenhouse gases not controlled by the Montreal Protocol. Guidelines for such national systems, which shall incorporate the methodologies specified in paragraph 2 below, shall be decided upon by the Conference of the Parties serving as the meeting of the Parties to this Protocol at its first session.
2. Methodologies for estimating anthropogenic emissions by sources and removals by sinks of all greenhouse gases not controlled by the Montreal Protocol shall be those accepted by the Intergovernmental Panel on Climate Change and agreed upon by the Conference of the Parties at its third session. Where such methodologies are not used, appropriate adjustments shall be applied according to methodologies agreed upon by the Conference of the Parties serving as the meeting of the Parties to this Protocol at its first session. Based on the work of, *inter alia*, the Intergovernmental Panel on Climate Change and advice provided by the Subsidiary Body for Scientific and Technological Advice, the Conference of the Parties serving as the meeting of the Parties to this Protocol shall regularly review and, as appropriate, revise such methodologies and adjustments, taking fully

into account any relevant decisions by the Conference of the Parties. Any revision to methodologies or adjustments shall be used only for the purposes of ascertaining compliance with commitments under Article 3 in respect of any commitment period adopted subsequent to that revision.

3. The global warming potentials used to calculate the carbon dioxide equivalence of anthropogenic emissions by sources and removals by sinks of greenhouse gases listed in Annex A shall be those accepted by the Intergovernmental Panel on Climate Change and agreed upon by the Conference of the Parties at its third session. Based on the work of, *inter alia*, the Intergovernmental Panel on Climate Change and advice provided by the Subsidiary Body for Scientific and Technological Advice, the Conference of the Parties serving as the meeting of the Parties to this Protocol shall regularly review and, as appropriate, revise the global warming potential of each such greenhouse gas, taking fully into account any relevant decisions by the Conference of the Parties. Any revision to a global warming potential shall apply only to commitments under Article 3 in respect of any commitment period adopted subsequent to that revision.

Article 6

1. For the purpose of meeting its commitments under Article 3, any Party included in Annex I may transfer to, or acquire from, any other such Party emission reduction units resulting from projects aimed at reducing anthropogenic emissions by sources or enhancing

anthropogenic removals by sinks of greenhouse gases in any sector of the economy, provided that:

(a) Any such project has the approval of the Parties involved;

(b) Any such project provides a reduction in emissions by sources, or an enhancement of removals by sinks, that is additional to any that would otherwise occur;

(c) It does not acquire any emission reduction units if it is not in compliance with its obligations under Articles 5 and 7; and

(d) The acquisition of emission reduction units shall be supplemental to domestic actions for the purposes of meeting commitments under Article 3.

2. The Conference of the Parties serving as the meeting of the Parties to this Protocol may, at its first session or as soon as practicable thereafter, further elaborate guidelines for the implementation of this Article, including for verification and reporting.

3. A Party included in Annex I may authorize legal entities to participate, under its responsibility, in actions leading to the generation, transfer or acquisition under this Article of emission reduction units.

4. If a question of implementation by a Party included in Annex I of the requirements referred to in this Article is identified in accordance with the relevant provisions of Article 8, transfers and acquisitions of emission reduction units may continue to be made after the question has been identified, provided that any such units may not be used by a Party to meet its commitments under Article 3 until any issue of compliance is resolved.

Article 7

1. Each Party included in Annex I shall incorporate in its annual inventory of anthropogenic emissions by sources and removals by sinks of greenhouse gases not controlled by the Montreal Protocol, submitted in accordance with the relevant decisions of the Conference of the Parties, the necessary supplementary information for the purposes of ensuring compliance with Article 3, to be determined in accordance with paragraph 4 below.
2. Each Party included in Annex I shall incorporate in its national communication, submitted under Article 12 of the Convention, the supplementary information necessary to demonstrate compliance with its commitments under this Protocol, to be determined in accordance with paragraph 4 below.
3. Each Party included in Annex I shall submit the information required under paragraph 1 above annually, beginning with the first inventory due under the Convention for the first year of the commitment period after this Protocol has entered into force for that Party. Each such Party shall submit the information required under paragraph 2 above as part of the first national communication due under the Convention after this Protocol has entered into force for it and after the adoption of guidelines as provided for in paragraph 4 below. The frequency of subsequent submission of information required under this Article shall be determined by the Conference of the Parties serving as the meeting of the Parties to this Protocol,

taking into account any timetable for the submission of national communications decided upon by the Conference of the Parties.

4. The Conference of the Parties serving as the meeting of the Parties to this Protocol shall adopt at its first session, and review periodically thereafter, guidelines for the preparation of the information required under this Article, taking into account guidelines for the preparation of national communications by Parties included in Annex I adopted by the Conference of the Parties. The Conference of the Parties serving as the meeting of the Parties to this Protocol shall also, prior to the first commitment period, decide upon modalities for the accounting of assigned amounts.

Article 8

1. The information submitted under Article 7 by each Party included in Annex I shall be reviewed by expert review teams pursuant to the relevant decisions of the Conference of the Parties and in accordance with guidelines adopted for this purpose by the Conference of the Parties serving as the meeting of the Parties to this Protocol under paragraph 4 below. The information submitted under Article 7, paragraph 1, by each Party included in Annex I shall be reviewed as part of the annual compilation and accounting of emissions inventories and assigned amounts. Additionally, the information submitted under Article 7, paragraph 2, by each Party included in Annex I shall be reviewed as part of the review of communications.

2. Expert review teams shall be coordinated by the secretariat and shall be composed of experts selected from those nominated by Parties to the Convention and, as appropriate, by intergovernmental organizations, in accordance with guidance provided for this purpose by the Conference of the Parties.
3. The review process shall provide a thorough and comprehensive technical assessment of all aspects of the implementation by a Party of this Protocol. The expert review teams shall prepare a report to the Conference of the Parties serving as the meeting of the Parties to this Protocol, assessing the implementation of the commitments of the Party and identifying any potential problems in, and factors influencing, the fulfilment of commitments. Such reports shall be circulated by the secretariat to all Parties to the Convention. The secretariat shall list those questions of implementation indicated in such reports for further consideration by the Conference of the Parties serving as the meeting of the Parties to this Protocol.
4. The Conference of the Parties serving as the meeting of the Parties to this Protocol shall adopt at its first session, and review periodically thereafter, guidelines for the review of implementation of this Protocol by expert review teams taking into account the relevant decisions of the Conference of the Parties.
5. The Conference of the Parties serving as the meeting of the Parties to this Protocol shall, with the assistance of the Subsidiary Body for Implementation and, as appropriate, the Subsidiary Body for Scientific and Technological Advice, consider:

(a) The information submitted by Parties under Article 7 and the reports of the expert reviews thereon conducted under this Article; and

(b) Those questions of implementation listed by the secretariat under paragraph 3 above, as well as any questions raised by Parties.

6. Pursuant to its consideration of the information referred to in paragraph 5 above, the Conference of the Parties serving as the meeting of the Parties to this Protocol shall take decisions on any matter required for the implementation of this Protocol.

Article 9

1. The Conference of the Parties serving as the meeting of the Parties to this Protocol shall periodically review this Protocol in the light of the best available scientific information and assessments on climate change and its impacts, as well as relevant technical, social and economic information. Such reviews shall be coordinated with pertinent reviews under the Convention, in particular those required by Article 4, paragraph 2 (d), and Article 7, paragraph 2 (a), of the Convention. Based on these reviews, the Conference of the Parties serving as the meeting of the Parties to this Protocol shall take appropriate action.

2. The first review shall take place at the second session of the Conference of the Parties serving as the meeting of the Parties to this Protocol. Further reviews shall take place at regular intervals and in a timely manner.

Article 10

All Parties, taking into account their common but differentiated responsibilities and their specific national and regional development priorities, objectives and circumstances, without introducing any new commitments for Parties not included in Annex I, but reaffirming existing commitments under Article 4, paragraph 1, of the Convention, and continuing to advance the implementation of these commitments in order to achieve sustainable development, taking into account Article 4, paragraphs 3, 5 and 7, of the Convention, shall:

(a) Formulate, where relevant and to the extent possible, cost-effective national and, where appropriate, regional programmes to improve the quality of local emission factors, activity data and/or models which reflect the socio-economic conditions of each Party for the preparation and periodic updating of national inventories of anthropogenic emissions by sources and removals by sinks of all greenhouse gases not controlled by the Montreal Protocol, using comparable methodologies to be agreed upon by the Conference of the Parties, and consistent with the guidelines for the preparation

of national communications adopted by the Conference of the Parties;

(b) Formulate, implement, publish and regularly update national and, where appropriate, regional programmes containing measures to mitigate climate change and measures to facilitate adequate adaptation to climate change:

(i) Such programmes would, *inter alia*, concern the energy, transport and industry sectors as well as agriculture, forestry and waste management. Furthermore, adaptation technologies and methods for improving spatial planning would improve adaptation to climate change; and

(ii) Parties included in Annex I shall submit information on action under this Protocol, including national programmes, in accordance with Article 7; and other Parties shall seek to include in their national communications, as appropriate, information on programmes which contain measures that the Party believes contribute to addressing climate change and its adverse impacts, including the abatement of increases in greenhouse gas emissions, and enhancement of and removals by sinks, capacity building and adaptation measures;

(c) Cooperate in the promotion of effective modalities for the development, application and diffusion of, and take all practicable steps to promote, facilitate and finance, as appropriate, the transfer of, or access to, environmentally

sound technologies, know-how, practices and processes pertinent to climate change, in particular to developing countries, including the formulation of policies and programmes for the effective transfer of environmentally sound technologies that are publicly owned or in the public domain and the creation of an enabling environment for the private sector, to promote and enhance the transfer of, and access to, environmentally sound technologies;

(d) Cooperate in scientific and technical research and promote the maintenance and the development of systematic observation systems and development of data archives to reduce uncertainties related to the climate system, the adverse impacts of climate change and the economic and social consequences of various response strategies, and promote the development and strengthening of endogenous capacities and capabilities to participate in international and intergovernmental efforts, programmes and networks on research and systematic observation, taking into account Article 5 of the Convention;

(e) Cooperate in and promote at the international level, and, where appropriate, using existing bodies, the development and implementation of education and training programmes, including the strengthening of national capacity building, in particular human and institutional capacities and the exchange or secondment of personnel to train experts in this field, in particular for developing countries, and facilitate at the national level public awareness of, and public access to

information on, climate change. Suitable modalities should be developed to implement these activities through the relevant bodies of the Convention, taking into account Article 6 of the Convention;

(f) Include in their national communications information on programmes and activities undertaken pursuant to this Article in accordance with relevant decisions of the Conference of the Parties; and

(g) Give full consideration, in implementing the commitments under this Article, to Article 4, paragraph 8, of the Convention.

Article 11

1. In the implementation of Article 10, Parties shall take into account the provisions of Article 4, paragraphs 4, 5, 7, 8 and 9, of the Convention.
2. In the context of the implementation of Article 4, paragraph 1, of the Convention, in accordance with the provisions of Article 4, paragraph 3, and Article 11 of the Convention, and through the entity or entities entrusted with the operation of the financial mechanism of the Convention, the developed county Parties and other developed Parties included in Annex II to the Convention shall:

   (a) Provide new and additional financial resources to meet the agreed full costs incurred by developing country Parties in advancing the implementation of existing commitments under

Article 4, paragraph 1 (a), of the Convention that are covered in Article 10, subparagraph (a); and

(b) Also provide such financial resources, including for the transfer of technology, needed by the developing country Parties to meet the agreed full incremental costs of advancing the implementation of existing commitments under Article 4, paragraph 1, of the Convention that are covered by Article 10 and that are agreed between a developing country Party and the international entity or entities referred to in Article 11 of the Convention, in accordance with that Article. The implementation of these existing commitments shall take into account the need for adequacy and predictability in the flow of funds and the importance of appropriate burden sharing among developed country Parties. The guidance to the entity or entities entrusted with the operation of the financial mechanism of the Convention in relevant decisions of the Conference of the Parties, including those agreed before the adoption of this Protocol, shall apply *mutatis mutandis* to the provisions of this paragraph.

3. The developed country Parties and other developed Parties in Annex II to the Convention may also provide, and developing country Parties avail themselves of, financial resources for the implementation of Article 10, through bilateral, regional and other multilateral channels.

Article 12

1. A clean development mechanism is hereby defined.
2. The purpose of the clean development mechanism shall be to assist Parties not included in Annex I in achieving sustainable development and in contributing to the ultimate objective of the Convention, and to assist Parties included in Annex I in achieving compliance with their quantified emission limitation and reduction commitments under Article 3.
3. Under the clean development mechanism:
   (a) Parties not included in Annex I will benefit from project activities resulting in certified emission reductions; and
   (b) Parties included in Annex I may use the certified emission reductions accruing from such project activities to contribute to compliance with part of their quantified emission limitation and reduction commitments under Article 3, as determined by the Conference of the Parties serving as the meeting of the Parties to this Protocol.
4. The clean development mechanism shall be subject to the authority and guidance of the Conference of the Parties serving as the meeting of the Parties to this Protocol and be supervised by an executive board of the clean development mechanism.
5. Emission reductions resulting from each project activity shall be certified by operational entities to be designated by the Conference of the Parties serving as the meeting of the Parties to this Protocol, on the basis of:

(a) Voluntary participation approved by each Party involved;

(b) Real, measurable, and long-term benefits related to the mitigation of climate change; and

(c) Reductions in emissions that are additional to any that would occur in the absence of the certified project activity.

6. The clean development mechanism shall assist in arranging funding of certified project activities as necessary.

7. The Conference of the Parties serving as the meeting of the Parties to this Protocol shall, at its first session, elaborate modalities and procedures with the objective of ensuring transparency, efficiency and accountability through independent auditing and verification of project activities.

8. The Conference of the Parties serving as the meeting of the Parties to this Protocol shall ensure that a share of the proceeds from certified project activities is used to cover administrative expenses as well as to assist developing country Parties that are particularly vulnerable to the adverse effects of climate change to meet the costs of adaptation.

9. Participation under the clean development mechanism, including in activities mentioned in paragraph 3 (a) above and in the acquisition of certified emission reductions, may involve private and/or public entities, and is to be subject to whatever guidance may be provided by the executive board of the clean development mechanism.

10. Certified emission reductions obtained during the period from the year 2000 up to the beginning of the first commitment period can be

used to assist in achieving compliance in the first commitment period.

Article 13

1. The Conference of the Parties, the supreme body of the Convention, shall serve as the meeting of the Parties to this Protocol.
2. Parties to the Convention that are not Parties to this Protocol may participate as observers in the proceedings of any session of the Conference of the Parties serving as the meeting of the Parties to this Protocol. When the Conference of the Parties serves as the meeting of the Parties to this Protocol, decisions under this Protocol shall be taken only by those that are Parties to this Protocol.
3. When the Conference of the Parties serves as the meeting of the Parties to this Protocol, any member of the Bureau of the Conference of the Parties representing a Party to the Convention but, at that time, not a Party to this Protocol, shall be replaced by an additional member to be elected by and from amongst the Parties to this Protocol.
4. The Conference of the Parties serving as the meeting of the Parties to this Protocol shall keep under regular review the implementation of this Protocol and shall make, within its mandate, the decisions

necessary to promote its effective implementation. It shall perform the functions assigned to it by this Protocol and shall:

(a) Assess, on the basis of all information made available to it in accordance with the provisions of this Protocol, the implementation of this Protocol by the Parties, the overall effects of the measures taken pursuant to this Protocol, in particular environmental, economic and social effects as well as their cumulative impacts and the extent to which progress towards the objective of the Convention is being achieved;

(b) Periodically examine the obligations of the Parties under this Protocol, giving due consideration to any reviews required by Article 4, paragraph 2 (d), and Article 7, paragraph 2, of the Convention, in the light of the objective of the Convention, the experience gained in its implementation and the evolution of scientific and technological knowledge, and in this respect consider and adopt regular reports on the implementation of this Protocol;

(c) Promote and facilitate the exchange of information on measures adopted by the Parties to address climate change and its effects, taking into account the differing circumstances, responsibilities and capabilities of the Parties and their respective commitments under this Protocol;

(d) Facilitate, at the request of two or more Parties, the coordination of measures adopted by them to address climate change and its effects, taking into account the differing

circumstances, responsibilities and capabilities of the Parties and their respective commitments under this Protocol;

(e) Promote and guide, in accordance with the objective of the Convention and the provisions of this Protocol, and taking fully into account the relevant decisions by the Conference of the Parties, the development and periodic refinement of comparable methodologies for the effective implementation of this Protocol, to be agreed on by the Conference of the Parties serving as the meeting of the Parties to this Protocol;

(f) Make recommendations on any matters necessary for the implementation of this Protocol;

(g) Seek to mobilize additional financial resources in accordance with Article 11, paragraph 2;

(h) Establish such subsidiary bodies as are deemed necessary for the implementation of this Protocol;

(i) Seek and utilize, where appropriate, the services and cooperation of, and information provided by, competent international organizations and intergovernmental and non-governmental bodies; and

(j) Exercise such other functions as may be required for the implementation of this Protocol, and consider any assignment resulting from a decision by the Conference of the Parties.

5. The rules of procedure of the Conference of the Parties and financial procedures applied under the Convention shall be applied *mutatis mutandis* under this Protocol, except as may be otherwise decided by

consensus by the Conference of the Parties serving as the meeting of the Parties to this Protocol.

6. The first session of the Conference of the Parties serving as the meeting of the Parties to this Protocol shall be convened by the secretariat in conjunction with the first session of the Conference of the Parties that is scheduled after the date of the entry into force of this Protocol. Subsequent ordinary sessions of the Conference of the Parties serving as the meeting of the Parties to this Protocol shall be held every year and in conjunction with ordinary sessions of the Conference of the Parties, unless otherwise decided by the Conference of the Parties serving as the meeting of the Parties to this Protocol.

7. Extraordinary sessions of the Conference of the Parties serving as the meeting of the Parties to this Protocol shall be held at such other times as may be deemed necessary by the Conference of the Parties serving as the meeting of the Parties to this Protocol, or at the written request of any Party, provided that, within six months of the request being communicated to the Parties by the secretariat, it is supported by at least one third of the Parties.

8. The United Nations, its specialized agencies and the International Atomic Energy Agency, as well as any State member thereof or observers thereto not party to the Convention, may be represented at sessions of the Conference of the Parties serving as the meeting of the Parties to this Protocol as observers. Any body or agency, whether national or international, governmental or non-governmental, which is qualified in matters covered by this Protocol

and which has informed the secretariat of its wish to be represented at a session of the Conference of the Parties serving as the meeting of the Parties to this Protocol as an observer, may be so admitted unless at least one third of the Parties present object. The admission and participation of observers shall be subject to the rules of procedure, as referred to in paragraph 5 above.

Article 14

1. The secretariat established by Article 8 of the Convention shall serve as the secretariat of this Protocol.
2. Article 8, paragraph 2, of the Convention on the functions of the secretariat, and Article 8, paragraph 3, of the Convention on arrangements made for the functioning of the secretariat, shall apply *mutatis mutandis* to this Protocol. The secretariat shall, in addition, exercise the functions assigned to it under this Protocol.

Article 15

1. The Subsidiary Body for Scientific and Technological Advice and the Subsidiary Body for Implementation established by Articles 9 and 10 of the Convention shall serve as, respectively, the Subsidiary Body for Scientific and Technological Advice and the Subsidiary Body for Implementation of this Protocol. The provisions relating to the functioning of these two bodies under the Convention shall apply *mutatis mutandis* to this Protocol. Sessions of the meetings of the

Subsidiary Body for Scientific and Technological Advice and the Subsidiary Body for Implementation of this Protocol shall be held in conjunction with the meetings of, respectively, the Subsidiary Body for Scientific and Technological Advice and the Subsidiary Body for Implementation of the Convention.

2. Parties to the Convention that are not Parties to this Protocol may participate as observers in the proceedings of any session of the subsidiary bodies. When the subsidiary bodies serve as the subsidiary bodies of this Protocol, decisions under this Protocol shall be taken only by those that are Parties to this Protocol.
3. When the subsidiary bodies established by Articles 9 and 10 of the Convention exercise their functions with regard to matters concerning this Protocol, any member of the Bureaux of those subsidiary bodies representing a Party to the Convention but, at that time, not a party to this Protocol, shall be replaced by an additional member to be elected by and from amongst the Parties to this Protocol.

Article 16

The Conference of the Parties serving as the meeting of the Parties to this Protocol shall, as soon as practicable, consider the application to this Protocol of, and modify as appropriate, the multilateral consultative process referred to in Article 13 of the Convention, in the light of any relevant decisions that may be taken by the Conference of the Parties. Any multilateral consultative process that may be applied to this Protocol shall

operate without prejudice to the procedures and mechanisms established in accordance with Article 18.

Article 17

The Conference of the Parties shall define the relevant principles, modalities, rules and guidelines, in particular for verification, reporting and accountability for emissions trading. The Parties included in Annex B may participate in emissions trading for the purposes of fulfilling their commitments under Article 3. Any such trading shall be supplemental to domestic actions for the purpose of meeting quantified emission limitation and reduction commitments under that Article.

Article 18

The Conference of the Parties serving as the meeting of the Parties to this Protocol shall, at its first session, approve appropriate and effective procedures and mechanisms to determine and to address cases of non-compliance with the provisions of this Protocol, including through the development of an indicative list of consequences, taking into account the cause, type, degree and frequency of non-compliance. Any procedures and mechanisms under this Article entailing binding consequences shall be adopted by means of an amendment to this Protocol.

Article 19

The provisions of Article 14 of the Convention on settlement of disputes shall apply *mutatis mutandis* to this Protocol.

Article 20

1. Any Party may propose amendments to this Protocol.
2. Amendments to this Protocol shall be adopted at an ordinary session of the Conference of the Parties serving as the meeting of the Parties to this Protocol. The text of any proposed amendment to this Protocol shall be communicated to the Parties by the secretariat at least six months before the meeting at which it is proposed for adoption. The secretariat shall also communicate the text of any proposed amendments to the Parties and signatories to the Convention and, for information, to the Depositary.
3. The Parties shall make every effort to reach agreement on any proposed amendment to this Protocol by consensus. If all efforts at consensus have been exhausted, and no agreement reached, the amendment shall as a last resort be adopted by a three-fourths majority vote of the Parties present and voting at the meeting. The adopted amendment shall be communicated by the secretariat to the Depositary, who shall circulate it to all Parties for their acceptance.
4. Instruments of acceptance in respect of an amendment shall be deposited with the Depositary. An amendment adopted in accordance with paragraph 3 above shall enter into force for those

Parties having accepted it on the ninetieth day after the date of receipt by the Depositary of an instrument of acceptance by at least three fourths of the Parties to this Protocol.

5. The amendment shall enter into force for any other Party on the ninetieth day after the date on which that Party deposits with the Depositary its instrument of acceptance of the said amendment.

Article 21

1. Annexes to this Protocol shall form an integral part thereof and, unless otherwise expressly provided, a reference to this Protocol constitutes at the same time a reference to any annexes thereto. Any annexes adopted after the entry into force of this Protocol shall be restricted to lists, forms and any other material of a descriptive nature that is of a scientific, technical, procedural or administrative character.
2. Any Party may make proposals for an annex to this Protocol and may propose amendments to annexes to this Protocol.
3. Annexes to this Protocol and amendments to annexes to this Protocol shall be adopted at an ordinary session of the Conference of the Parties serving as the meeting of the Parties to this Protocol. The text of any proposed annex or amendment to an annex shall be communicated to the Parties by the secretariat at least six months before the meeting at which it is proposed for adoption. The secretariat shall also communicate the text of any proposed annex or

amendment to an annex to the Parties and signatories to the Convention and, for information, to the Depositary.

4. The Parties shall make every effort to reach agreement on any proposed annex or amendment to an annex by consensus. If all efforts at consensus have been exhausted, and no agreement reached, the annex or amendment to an annex shall as a last resort be adopted by a three-fourths majority vote of the Parties present and voting at the meeting. The adopted annex or amendment to an annex shall be communicated by the secretariat to the Depositary, who shall circulate it to all Parties for their acceptance.

5. An annex, or amendment to an annex other than Annex A or B, that has been adopted in accordance with paragraphs 3 and 4 above shall enter into force for all Parties to this Protocol six months after the date of the communication by the Depositary to such Parties of the adoption of the annex or adoption of the amendment to the annex, except for those Parties that have notified the Depositary, in writing, within that period of their non-acceptance of the annex or amendment to the annex. The annex or amendment to an annex shall enter into force for Parties which withdraw their notification of non-acceptance on the ninetieth day after the date on which withdrawal of such notification has been received by the Depositary.

6. If the adoption of an annex or an amendment to an annex involves an amendment to this Protocol, that annex or amendment to an annex shall not enter into force until such time as the amendment to this Protocol enters into force.

7. Amendments to Annexes A and B to this Protocol shall be adopted and enter into force in accordance with the procedure set out in Article 20, provided that any amendment to Annex B shall be adopted only with the written consent of the Party concerned.

Article 22

1. Each Party shall have one vote, except as provided for in paragraph 2 below.
2. Regional economic integration organizations, in matters within their competence, shall exercise their right to vote with a number of votes equal to the number of their member States that are Parties to this Protocol. Such an organization shall not exercise its right to vote if any of its member States exercises its right, and vice versa.

Article 23

The Secretary-General of the United Nations shall be the Depositary of this Protocol.

Article 24

1. This Protocol shall be open for signature and subject to ratification, acceptance or approval by States and regional economic integration organizations which are Parties to the Convention. It shall be open for signature at United Nations Headquarters in New York from 16

March 1998 to 15 March 1999. This Protocol shall be open for accession from the day after the date on which it is closed for signature. Instruments of ratification, acceptance, approval or accession shall be deposited with the Depositary.

2. Any regional economic integration organization which becomes a Party to this Protocol without any of its member States being a Party shall be bound by all the obligations under this Protocol. In the case of such organizations, one or more of whose member States is a Party to this Protocol, the organization and its member States shall decide on their respective responsibilities for the performance of their obligations under this Protocol. In such cases, the organization and the member States shall not be entitled to exercise rights under this Protocol concurrently.

3. In their instruments of ratification, acceptance, approval or accession, regional economic integration organizations shall declare the extent of their competence with respect to the matters governed by this Protocol. These organizations shall also inform the Depositary, who shall in turn inform the Parties, of any substantial modification in the extent of their competence.

Article 25

1. This Protocol shall enter into force on the ninetieth day after the date on which not less than 55 Parties to the Convention, incorporating Parties included in Annex I which accounted in total for at least 55 per cent of the total carbon dioxide emissions for 1990 of the Parties

included in Annex I, have deposited their instruments of ratification, acceptance, approval or accession.

2. For the purposes of this Article, "the total carbon dioxide emissions for 1990 of the Parties included in Annex I" means the amount communicated on or before the date of adoption of this Protocol by the Parties included in Annex I in their first national communications submitted in accordance with Article 12 of the Convention.
3. For each State or regional economic integration organization that ratifies, accepts or approves this Protocol or accedes thereto after the conditions set out in paragraph 1 above for entry into force have been fulfilled, this Protocol shall enter into force on the ninetieth day following the date of deposit of its instrument of ratification, acceptance, approval or accession.
4. For the purposes of this Article, any instrument deposited by a regional economic integration organization shall not be counted as additional to those deposited by States members of the organization.

Article 26

No reservations may be made to this Protocol.

Article 27

1. At any time after three years from the date on which this Protocol has entered into force for a Party, that Party may withdraw from this Protocol by giving written notification to the Depositary.
2. Any such withdrawal shall take effect upon expiry of one year from the date of receipt by the Depositary of the notification of withdrawal, or on such later date as may be specified in the notification of withdrawal.
3. Any Party that withdraws from the Convention shall be considered as also having withdrawn from this Protocol.

Article 28

The original of this Protocol, of which the Arabic, Chinese, English, French, Russian and Spanish texts are equally authentic, shall be deposited with the Secretary-General of the United Nations.

DONE at Kyoto this eleventh day of December one thousand nine hundred and ninety-seven.

IN WITNESS WHEREOF the undersigned, being duly authorized to that effect, have affixed their signatures to this Protocol on the dates indicated.

Annex A

Greenhouse gases

Carbon dioxide (CO_2)

Methane (CH_4)

Nitrous oxide (N_2O)

Hydrofluorocarbons (HFCs)

Perfluorocarbons (PFCs)

Sulphur hexafluoride (SF6)

Sectors/source categories

Energy

- Fuel combustion
  - Energy industries
  - Manufacturing industries and construction
  - Transport
  - Other sectors
  - Other
- Fugitive emissions from fuels
  - Solid fuels
  - Oil and natural gas
  - Other

Industrial processes

- Mineral products

Chemical industry

Metal production

Other production

Production of halocarbons and sulphur hexafluoride

Consumption of halocarbons and sulphur hexafluoride

Other

Solvent and other product use

Agriculture

Enteric fermentation

Manure management

Rice cultivation

Agricultural soils

Prescribed burning of savannas

Field burning of agricultural residues

Other

Waste

Solid waste disposal on land

Wastewater handling

Waste incineration

Other

Annex B

Party	Quantified emission limitation or reduction commitment (percentage of base year or period)
Australia	108
Austria	92
Belgium	92
Bulgaria*	92
Canada	94
Croatia*	95
Czech Republic*	92
Denmark	92
Estonia*	92
European Community	92
Finland	92
France	92
Germany	92
Greece	92
Hungary*	94
Iceland	110
Ireland	92
Italy	92
Japan	94
Latvia*	92

Liechtenstein	92
Lithuania*	92
Luxembourg	92
Monaco	92
Netherlands	92
New Zealand	100
Norway	101
Poland*	94
Portugal	92
Romania*	92
Russian Federation*	100
Slovakia*	92
Slovenia*	92
Spain	92
Sweden	92
Switzerland	92
Ukraine*	100
United Kingdom of Great Britain and Northern Ireland	92
United States of America	93

* Countries that are undergoing the process of transition to a market economy.
