

Working Paper 1999:13

# **Burden Differentiation: Fairness Principles and Proposals**

The joint CICERO-ECN project on sharing the burden of greenhouse gas  
reduction among countries

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February 2000

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## **Abstract**

This report is the second working paper of the joint CICERO (Center for International Climate and Environmental Research, Oslo) and ECN (Netherlands Energy Research Foundation) project 'Rules for Burden Differentiation of Greenhouse Gas Reduction'. The funding of this research project by the Research Council of Netherlands is gratefully acknowledged. We are grateful to our ECN partners Remko Ybema, Jaap Jansen and Frank Ormel, and to Benito Müller, for useful comments and suggestions.

Beginning in the late 1980, a series of international negotiations has been conducted with the explicit objective of preventing a negative change of the global climate system due to increasing concentrations of anthropogenic greenhouse gases in the earth's atmosphere. These on-going international negotiations therefore aim at the provision of an international public or collective good by a group of countries.

The international public good in question – protection of the global climate system – is to be provided through a process of international negotiated cooperation. The good therefore is not provided by a single predominant actor who either supplies the good to itself and others, or who uses its power – understood in an economic or military sense – to force others to assist in providing the good. But, unsurprisingly, finding a way to distribute the costs within the group of countries involved has been a major obstacle in these negotiations. International negotiators have, in other words, been faced with the challenge of reaching an agreement on burden sharing among countries. In this context, burden sharing refers to the way in which a group of countries benefiting from a public good agrees to share the costs of providing that good. In the future, it will be important that international climate negotiations succeed to distribute the costs of protecting this international public good in a way that is widely seen as fair and just. Thus, developing a burden sharing scheme that is generally recognized as 'fair' is an essential condition for agreement on policy measures.

Chapter 2 in this report makes a first attempt to identify those fairness and justice principles that are widely accepted by states and seem relevant for burden differentiation in future international climate policy negotiations. As this report points out, it seems quite clear that in order to be acceptable to a critical mass of parties a burden sharing scheme will have to *combine* two or more principles of fairness. No single principle can meet the full range of requirements. This report discusses in particular three different notions; equality, equity and exemption. Those notions or principles, if translated into operational rules that can be widely accepted by states, seem to create a normative platform upon which a fair burden sharing agreement could be fleshed out. Moving from theory to practice, chapter 3 presents a summary analysis of burden differentiation proposals and methods presented by governments in the course of the recently completed negotiations resulting in the Kyoto Protocol. It shows that there is a rather broad-based support for indicators applying the egalitarian principle as well as the 'polluter pays' principle. There also seems to exist a need to distinguish those real national economic and natural resource circumstances that are responsible for large part of the observed emissions asymmetries existing across countries. Chapter 4 offers a brief summary of implications for the design of more specific burden sharing rules.



## Contents

1	INTRODUCTION.....	7
2	ANALYSIS OF FAIRNESS PRINCIPLES RELEVANT FOR BURDEN DIFFERENTIATION .....	8
2.1	Principles, formulas and indicators.....	8
2.2	The role of fairness principles in international negotiations.....	8
2.3	Principles of distributive fairness.....	9
2.4	Notions of 'rights' .....	14
2.5	Inclusion of Damage Costs in Burden Sharing Rules .....	15
2.6	Conclusion.....	15
3	BURDEN SHARING PROPOSALS AND METHODS PRESENTED DURING THE KYOTO PROTOCOL NEGOTIATIONS.....	16
3.1	Review of differentiation proposals from the AGBM negotiations .....	16
3.1.1	Group: Need-based convergence .....	19
3.1.2	Group: 'Guilt', interpreted as historical responsibility.....	21
3.1.3	Group: Multi-criteria formulae .....	22
3.1.4	Group: Fossil fuel dependency .....	23
3.1.5	Group: Menu-approach .....	24
3.1.6	Group: Sectoral approach .....	25
3.1.7	Group: Capacity (GDP per capita) .....	26
3.1.8	Group: Cost-effectiveness.....	28
4	CONCLUSIONS.....	29
5	REFERENCES.....	31

## List of Tables

TABLE 1. SELECTED EQUITY PRINCIPLES AND RELATED BURDEN SHARING RULES.....	10
TABLE 2. KEY PRINCIPLES OF EQUITY .....	11
TABLE 3. DOMAINS OF DIFFERENT PRINCIPLES OF FAIRNESS .....	14
TABLE 4. GROUPING OF BURDEN SHARING PROPOSALS FROM THE AGBM PROCES .....	17
TABLE 5 SUMMARY OF PROPOSALS FOR BURDEN-SHARING METHODS MADE BY PARTIES IN THE AD HOC GROUP ON THE BERLIN MANDATE (AGBM) NEGOTIATIONS.....	18
TABLE 6. THE FRENCH CONVERGENCE PROPOSAL.....	20



# 1 Introduction

This report consists of the two chapters. In chapter 1 we analyze fairness principles relevant for burden differentiation. In chapter 2 we present a survey of burden sharing proposals and methods presented during the Kyoto Protocol negotiations.<sup>1</sup> The report ends with an attempt at identifying the critical requirements that a burden sharing scheme will have to meet.

The survey and assessment build on contributions from recent academic literature. In relation to the assessment of fairness principles, some useful literature references are Ringius et al. (1998), Rose et al. (1997), Rose (1992), and Barrett (1992). A number of papers and reports have focused on methods for initial distribution of tradable quotas (e.g. grandfathering). The analysis in chapter 2 focuses on two main questions. First, can we identify any widely shared principles of fairness, and if so which? Second, could these principles serve as useful keys in future climate policy negotiations?

In chapter 2, seventeen specified proposals for burden sharing suggested by governments in the Kyoto protocol negotiations are presented in a catalogue style. Proposals advocating flat-rate (equal percentage) emission reductions are not included. As the range of the proposals is wide, we have tried to find a suitable organizing principle for the survey. The first option was to try to identify one or more fairness principles supported by the proposals. However, since such principles rarely are explicitly formulated, identifying fairness principles that support specific proposals turned out to be a demanding task. Moreover, there is no simple one-to-one relation between fairness principles and equity formulae. Thus we ended up with 8 categories of proposals based on important common features, where the category name reflects the main feature.

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<sup>1</sup> In this report we use the concepts burden differentiation and burden sharing interchangeably. Most burden sharing schemes will involve some kind of differentiation.

## 2 Analysis Of Fairness Principles Relevant For Burden Differentiation

### 2.1 Principles, formulas and indicators

When examining issues of justice and fairness in burden sharing, it is important that different concepts and notions are defined and used in a consistent and systematic manner. We propose to distinguish between three different levels of analysis: (i) general principles of fairness and justice, (ii) burden sharing formulae or rules, and (iii) criteria or operational indicators developed with specific reference to the particular problem at hand. These distinctions are based on different levels of normative content, levels of generality or specificity, and degree of formalization and operationalization.

By *principles* of fairness and justice we refer to generally acknowledged norms of justice and fairness. Such principles are general in the sense that they are assumed to be valid across a wide range of issue-areas and at different levels – from interpersonal to international relations. If translated into more specific burden sharing rules or formulas, these general principles can be brought to bear on particular policy problems, such as global climate change.

Burden sharing *formulas* or *rules* are explicitly specified functions that generate a specific scheme of obligations when fed with appropriate input data. In this context, such formulas will most often be used to determine ‘national emissions entitlements, or changes from the status quo’ (Parson and Zeckhauser, 1995:99). Burden sharing formulas and rules therefore reflect, more or less explicitly, one or more fairness principles. In addition, they identify one or more operational indicators.

*Operational criteria or indicators* specify precisely the kind of ‘hard’ data that are to be used to estimate costs (obligations) and/or benefits in a given context. (Changes in) CO<sub>2</sub> emissions per capita and GDP per capita are two of the most frequently used indicators in connection with burden sharing rules in the climate policy area.

### 2.2 The role of fairness principles in international negotiations

The interest in burden sharing formulas is premised on two basic assumptions. One is that the negotiating behavior of at least some of the parties is to at least some degree based on normative considerations concerning distributive fairness or justice. In its weakest form this seems to be a safe assumption; a quick look at the arguments exchanged in international negotiations would strongly indicate that at least some actors pay some attention to norms of fairness. To conclude that such norms provide important clues to understanding behavior we must, however, demonstrate not only that they are sometimes *invoked* but also that they are *recognized* as important decision *premises* for a *critical mass* of significant actors even when their implications are *not* in one’s own favor, or at least serve to strengthen the motivation of parties who invoke them. This is a non-trivial and much stronger claim. Negotiation theory most often assumes that actor behavior is motivated primarily by self-interest, and that general principles of fairness are invoked only to promote or defend one’s own interests. In this study we take a more moderate position. More precisely, we assume that actor behavior is based primarily, but not exclusively, on self-interest. Considerations of fairness will, we believe, serve (a) as a source of motivational strength for actors who consider themselves being treated ‘unfairly’; (b) as a framework of *soft constraints* upon the pursuit of self-interest, and (c) as decision premises in situations where self-interest provide no clear guidance. This is certainly far from claiming that actors behave exclusively or even primarily according to what March and Olsen

(1990) label ‘the logic of appropriateness’. What we do assume is only that notions of distributive fairness are sufficiently salient in the minds of decision-makers to warrant systematic analysis as criteria that parties use to evaluate alternative policy options.

Now, for burden sharing formulas to serve as premises for international *agreements* it is not sufficient to demonstrate that a critical mass of actors do in fact recognize the validity of such norms. Norms of fairness can be a source of conflict as well as a platform for agreement. Notions of fairness can provide a basis for an international regime only if there is a certain minimum of *consensus* among its members about what is fair and what is unfair; a critical mass of actors must, in other words, subscribe to the *same* norms. For global regimes meeting this latter requirement can be a tall order indeed. Again, we take an intermediate position. Studying international negotiations we can observe that there are at least some rather general norms that are frequently invoked and very rarely disputed – at least on principled grounds. We shall assume that these do indeed constitute a soft core of widely, though perhaps not universally, accepted ideas about distributive fairness. This is certainly not to suggest that international diplomacy has come up with anything even remotely resembling a precise consensual formula for distributing costs and gains; at best we are talking about a rather loose and elastic framework. Moreover, in most cases more than one principle can legitimately be invoked, and quite often the implications of the most salient principles will diverge. To resolve such conflicts one could either work towards some differentiation of domains or assign relative ‘weights’ to various principles. Although frequently used, neither of these tools has been developed into a precise and generally applicable formula. As a consequence, there will in most cases be ample scope for (interest-based) bargaining within a rather wide *zone* of legitimate arguments. It also follows that normative ‘clout’ will be generated particularly where salient principles *converge*. Our first priority should therefore be to search for burden sharing rules located at the *intersection* between two or more salient principles.

*Which principles can serve as a basis for burden sharing agreements?*

Assuming that norms of distributive fairness ‘matter’ and that a soft core of widely accepted principles exists, the next question becomes *which* principles belong to this ‘core’? Unfortunately, there is a surprising dearth of systematic empirical research addressing this question. What follows below should therefore be read as a rather tentative interpretation of the scant evidence available to us at this stage.

## **2.3 Principles of distributive fairness**

Some studies have identified a fairly large number of distributive fairness principles and rules for the distribution of costs or benefits (Table 1, p. 9, gives some prominent examples). Some analysts (see e.g. Rose et al., 1998) in addition distinguish among different types of principles: principles concerned primarily with the initial allocation of behavioral obligations (allocation-based criteria), principles concerned primarily with the final costs of measures (outcome-based criteria), and principles primarily concerned with the fairness of the process of, or institutional arrangement for, allocation as such (process-based criteria). Since some of these typologies seem to operate at different levels of generality, the overall picture can be somewhat confusing.

In this section we will adopt a different approach. Instead of making another comprehensive inventory of principles or criteria for burden sharing we will try to identify a few basic norms that seem – on the basis of the evidence we have from other similar instances – to constitute the core on which most of the discussion is focused. Each of these basic norms raises a set of sub-questions. Answers to these sub-questions provide a basis for formulating more specific rules or criteria. We will indicate how some of the basic principles can spawn multiple specific criteria. Nevertheless, our principal objective in this section is limited to identifying the main general principles from which



such formulas are derived. Our focus will be limited to *substantive* (as distinguished from procedural) principles. Moreover, we will make no attempt to examine the *legal* status of various principles or rules; our question is simply whether and to what extent they can serve as consensual premises for international agreements on climate policy measures.

**Table 1. Selected Equity Principles and Related Burden Sharing Rules**

<b>Equity principle</b>	<b>Interpretation</b>	<b>Example of implied burden sharing rule</b>
Egalitarian	Every individual has an equal right to pollute or to be protected from pollution	Allow or reduce emissions in proportion to population
Sovereignty	All nations have an equal right to pollute or to be protected from pollution; current level of emissions constitutes a status quo right	Allow or reduce emissions proportionally across all countries to maintain relative emission levels between them
Horizontal	Countries with similar economic circumstances have similar emission rights and burden sharing responsibilities	Equalize net welfare change across countries (net cost of abatement as a proportion of GDP is equal for each country)
Vertical	The greater the ability to pay the greater the economic burden	Net cost of abatement is directly correlated with per capita GDP
Polluter pays	The economic burden is proportional to emissions (eventually including historical emissions)	Share abatement costs across countries in proportion to emission levels

We interpret available evidence as indicating that the norms of distributive fairness that actors relate to in international negotiations constitute a rather complex framework, *combining* at least three different notions: equality, equity and exemption. Let us first try to specify each of these notions and then explore how they are combined.

### *Equal obligations*

The default option in international negotiations seems to be the norm that all parties should have *equal obligations*. In saying that this is the default option we do not imply that it is the one most frequently used. Rather, we suggest that this is where discussions will normally *start*, and that the burden of proof tends to rest with anyone who wants to argue for a differentiated approach. The principle of equal obligations is open to different interpretations. One important question is whether obligations should be defined in *absolute* or *relative* terms. Given the range of variance in size and capabilities among countries, the former is hardly a serious option in negotiations on global regimes (except for procedural obligations and some commitments to ban completely the release of “non-essential” substances). Attention therefore tends to focus on obligations defined in terms of *relative* contributions. In the context of pollution control this typically translates into standardized regulations of the format ‘all parties shall reduce emissions of substance S by X per cent relative to a given baseline (emission level at time  $t_0$ )’. The first LRTAP regulations dealing with ‘acid rain’ are good examples. In the climate change negotiations many governments initially argued in favor of applying such a ‘flat rate’ or across-the-board approach to all industrialized countries.<sup>2</sup>

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<sup>2</sup> Note, though, that the proponents of flat rate reductions did *not* necessarily argue that this principle would yield the fairest distribution of costs. For at least some parties, considerations of political feasibility seem to have been at least as important, one main argument being that bargaining over differentiated obligations would prove intractable and lead into prolonged deadlock.

The principle of equal obligations has a firm normative basis if all parties involved are equal in all relevant respects. This condition is, however, never met in global negotiations. Even in a more narrow regional setting we will often find a substantial range of variance along important dimensions. When the range of variance exceeds a certain threshold (and the issue is not one of establishing a complete ban on certain activities), parties most often shift from the principle of equal obligations to some notion of *equity*.

*Equity*

The common denominator for equity norms is that costs and/or benefits be distributed in (rough) proportion to actor scores on some dimension considered to be important.<sup>3</sup> A fairly large number of such dimensions can be identified, but in international negotiations attention seems to focus primarily on two. One is the role of each party in creating a problem or providing a good. If some parties have played a significantly or ‘disproportionably’ larger role than others have in causing a problem – e.g. through emissions – it seems fair that they should also take a corresponding responsibility for ‘cleaning up the mess’. Similarly, if some parties have contributed more to a particular good, it seems fair that they get a corresponding share of the benefits, everything else constant. The other dimension refers to the consequences that a particular obligation or project would have for the various parties. A common notion of fairness requires that burdens be shared in some proportion to capacity and that scarce goods be distributed in proportion to needs. This gives us a matrix with four key principles, summarized in Table 2.

**Table 2. Key principles of equity**

<b>Focus on</b>	<b>Object to be distributed</b>	
	<b><i>Costs (obligations)</i></b>	<b><i>Benefits (goods)</i></b>
↓		
<b><i>Cause of state of problem</i></b>	‘Guilt’, responsibility (for causing the problem)	Contribution (to solving problem or providing good)
<b><i>Consequences for actors</i></b>	Capacity (ability to pay) {Benefit derived from project}	Need

Burden sharing is, of course, a matter of distributing *costs*. However, as we shall see criteria for distributing costs can be derived indirectly also from principles pertaining to the distribution of benefits. We therefore need to examine both columns.

The principle of ‘*guilt*’ says, in essence, that the costs of solving or alleviating a problem should be distributed in proportion to a party’s share of responsibility for causing that problem. This norm finds substantial support in previous conventions. Thus, in a somewhat different form it was one of the cornerstones of agreement concluded at the first global conference on the environment in Stockholm in 1972. It is also the backbone of the Polluter Pays Principle (although this principle was initially applied to international environmental problems primarily as a policy tool for enhancing efficiency rather than as a norm of fairness). Applied to the climate change issue the principle of guilt would imply that countries with the largest emissions per capita would have to make the largest cutbacks (other things being equal). In the climate change negotiations the developing countries have based much of their argumentation upon this norm (see e.g. the Brazilian proposal, described in chapter 3).

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<sup>3</sup> Note that also the principle of equity imply equal obligations in cases where actor scores on these dimensions are equal or close to equal.

The principle of *capacity* requires that costs be distributed in proportion to 'ability to pay'. The conventional yardstick for determining capacity would be wealth measured in terms of GDP/cap.

If the benefits derived from a particular project vary substantially, the idea might come up that costs be distributed in proportion to (expected) benefits. Applied to problems of global environmental change, however, this notion would tend to run against other salient principles. More specifically, it would often lead us to impose the heaviest costs upon the most vulnerable countries. These would often be poor 'victims' of pollution emitted by richer and more fortunate countries. We therefore expect the idea of distributing abatement costs in proportion to benefits – although often referred to in everyday life – to be overruled by other norms in this particular context. We have bracketed this principle in table 2 to indicate that we expect it to be subordinate to the other principal norms.

The corresponding equity norms for distributing *benefits* would be the principles of *contribution* and *need*, respectively. The former says that a party's share of a certain good should be proportional to its contribution to 'producing' that particular good. Applied to pollution issues this norm most often translates into an argument that countries should be given *credit* for past achievements in terms of emission reductions.

In the climate change context the principle of *need* is the more salient and interesting of the two. It can be translated into somewhat different burden sharing rules, but a minimal requirement is that all human beings be granted the 'pollution permits' needed to secure basic human needs, including a decent standard of living. The most simple and 'primitive' rule building upon this requirement would be that all individuals be given equal pollution 'permits' (allowing for some period of adjustment). More 'sophisticated' rules would take into account the fact that even though all human beings may have equal rights to the benefits of the global commons, differences in living conditions related to e.g. climate and natural resource endowments may well justify differentiation of pollution 'permits'. The principle of need allows and even requires such differentiation if it is based on differences in (basic) human needs. The latter interpretation says that emissions needed to secure a decent standard of living are permitted while emissions stemming from the production or consumption of 'luxury' goods should be subject to restrictive measures if total emissions exceed a certain threshold. The norm that pollution 'permits' be based on needs has been invoked not only by developing countries; in somewhat different interpretations it is also the basic principle behind the early French proposal and the EU Triptych approach.<sup>4</sup>

Norms requiring that the distribution of costs or benefits be related to the role that actors have played in causing a problem or creating a common good are *conditional* in the sense that they are considered compelling only when certain conditions are fulfilled. Consider, for example, the principle of 'guilt'. Two recurring questions are whether 'guilt' presumes *intent* or at least *knowledge* about the harmful consequences of one's behavior. In the context of international environmental diplomacy, the consensual answers seem to be that an actor can be considered 'guilty' *without* (proof of) malicious intent, but *not* if he could not have known – on the basis of the state of (scientific) knowledge at the time – that his behavior was causing (substantial) damage.<sup>5</sup> Moreover, for 'guilt' to serve as key to burden sharing one would normally require that an actor has the capacity required to fulfill the obligations derived from the principle; it would not be fair to demand of someone something he cannot deliver (without intolerable sacrifice). Thus, 'guilt' becomes a

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<sup>4</sup> In the Triptych approach the concept of 'need' is, though, given a rather liberal interpretation, extending far beyond basic human needs, including also what is considered necessary in order to sustain major economic activities on 'reasonably equal' terms.

<sup>5</sup> *Subjective* ignorance or 'good faith' does not necessarily qualify for acquittal; the critical question is whether the 'objective' state of knowledge at the time warranted serious concern. Note that even when 'objective' ignorance can justify *past* behavior that is now considered harmful, it does not (necessarily) justify the *continuation* of that behavior beyond the period of ignorance. New knowledge may well imply new obligations.

relevant notion only for regulating behavior that is not inextricably linked to the fulfillment of basic human needs.

The same questions about intent and knowledge can be raised also with respect to the principle of 'contribution'. Can, for example, a country (like France) claim credit for emission reductions obtained as an unintended side-effect of measures undertaken for purposes that have nothing whatsoever to do with climate change? There is no consensual answer to the latter kind of questions, but the prevailing mood seems inclined to require at least some element of positive intent before accepting claims for 'credit'. In this respect, the principle of 'contribution' seems to be subject to stricter requirements than the principle of 'guilt'.

In moving from the level of general norms and principles to burden sharing formulas a host of other questions will have to be answered. One of these pertains to the specification of the notion of '*proportionality*' – a defining characteristic of 'equity'. A strict interpretation would require a linear relationship between a party's score on the criterion in question and its obligation to contribute. This is, however, *not* the interpretation we would expect to find in international environmental negotiations. Instead of continuous differentiation we would expect parties to be sorted into a small set of discrete categories (such as e.g. industrialized vs. developing countries). Norms of equity would then be applied to differentiate obligations *between* but not within categories. Furthermore, instead of cardinal scale linearity we would expect differentiation to be made in terms of a crude – and perhaps not entirely consistent – ordinal scale. Even a cursory glance at the reports from the climate change negotiations would suffice to indicate that we are dealing with such modified interpretations of proportionality.

A second question deals with *time horizons*. Any application of notions such as 'guilt' or 'contribution' requires that we specify at what time or for what period these variables are to be measured. Does 'guilt' accumulate, and if so for how long? Can 'credit' for past achievements be claimed only for a certain time period? Similarly, how do we balance present against future 'needs'? If regulations require substantial and costly change of behavior how much time should be allowed for adjustments? These are the kinds of questions for which the general principles themselves provide no clear answers. Since the actual distribution of obligations and abatement costs may depend significantly on the time horizon adopted, we can easily understand why these questions often become subject to hard interest-based bargaining. As the climate change negotiations clearly indicate, consensus at the level of general principles is no guarantee that parties will also reach agreement on specific formulas.

A related, but analytically different, question is whether to frame regulations as *static* or *dynamic* instruments. A dynamic regime includes provisions for reassessment at specified intervals, whereas a static regime does not. In practice, the difference may not be all that great. No regime is designed for eternity, and at some point reassessment will occur whether explicitly provided for or not. The distinction nonetheless tends to be important; quite often at least some actors – particularly those subject to the most demanding obligations – would like to obtain an explicit promise from their partners that the distribution will be reconsidered and changed if scores on the critical variables change. In the climate change negotiations this concern has been expressed primarily in a demand – most strongly articulated by the US – that also developing countries undertake a commitment to contribute, at least at some future point where they presumably will enjoy a higher level of prosperity (and thus have acquired greater 'capacity') and contribute more to world emissions ('guilt').

### *Exemption*

Particularly in a global setting, the range of variance in terms of the dimensions such as 'guilt' or 'capacity' is most often so great that even the notion of soft proportionality would lead to 'unfair' burdens upon the poorest 'victims'. When the latter threshold is reached, attention tends to shift

from norms of equity to the simple principle of *exemption*; more precisely, exemption from any substantive obligation for which a party is not (fully) compensated. We see this pattern clearly in the global climate change negotiations. Even those who argue that developing countries should make a commitment to contribute, at least in the future, do accept that (temporary) exemptions are required for the poorest countries. Any pressure upon these countries to sign would at this stage have to be a request for moral support rather than material contributions involving net costs.

### *Combining principles*

In the analysis above we have assumed that the three basic notions of fairness have different *domains*. The principle of equality applies *within* groups or subsets that are considered sufficiently homogenous in important respects. The principle of equity applies where the critical differences exceed that threshold – except for the most ‘disadvantaged’ parties, from whom no material contribution will be required. The general structure of this framework is summarized in Table 3.

**Table 3. Domains of different principles of fairness**

<b>Principle</b>	<b>Domain</b>
Equal obligations	Relevant differences $\leq x$
Equity	$x < \text{relevant differences} \leq y$ (assumption: $x < y$ )
Exemption	Relevant differences $> y$

Now, in multilateral negotiations this specification of domains could easily lead to inconsistent prescriptions, with the ‘solution’ depending on exactly which comparisons are made. This problem is most often resolved by defining a more or less arbitrary baseline that can be used as a general standard of reference, and/or by defining a small set of groups (e.g. developed vs. developing countries) and then apply the principle of equal obligations *within* each group and one of the other principles to differentiate between groups.

It remains, then, to determine the critical thresholds (indicated by ‘x’ and ‘y’ in table 3). International diplomacy has produced no general and precise guidelines, leaving again a considerable scope for hard bargaining. Even so, we suggest that in order to qualify as ‘fair’ a burden sharing formula will have to correspond to this general format. Moreover, within the domain of equity, it will have to differentiate obligations according to the principles outlined above – not necessarily responding to all, but at the very least to one. What gives these principles clout in the climate change context is the fact that their implications to a large extent *converge*. In particular, the principles of ‘guilt’, ‘capacity’ and ‘need’ all place the bulk of responsibility for mitigation measures squarely with the wealthy, industrialized countries.

## **2.4 Notions of ‘rights’**

In discussions about the distribution of costs or benefits reference is sometimes made to ‘rights’. In legal discourse, a ‘right’ usually refers to a claim that can be justified by law (and upheld in court). In international negotiations it seems that claims are often framed in terms of ‘rights’ in order to bolster their moral status; while a ‘principle’ or ‘norm’ has to be justified, a ‘right’ speaks largely for itself and translates more immediately into a corresponding duty. In practice, however, this broader notion of ‘rights’ becomes hard to distinguish from that of ‘principles’.

There seems to be two basic notions of rights that are often invoked in international environmental negotiations. One refers to what might be called *basic human rights*, including the right to a ‘decent’ standard of living and to a ‘healthy’ environment. The notion of basic human rights is rarely, if ever,

explicitly challenged. On the other hand, there is no general consensus on precise specifications. This kind of rights is clearly relevant to the global climate change negotiations. It often serves as a pillar of the principles of need and also for the norm of exemption for the most disadvantaged parties. The other category may be referred to as *acquired rights*. Such notions play a prominent role in negotiations on resource management. For example, in international fisheries management 'historic catch' is often considered an important criterion for distributing quotas. Within OPEC 'historic production volume' serves a similar function. In the climate change negotiations, the so-called 'grandfathering' principle considers current emissions as a claim justified by established usage and custom. Again, the basic idea seems to be broadly accepted, but in this case subject to certain conditions about the legitimacy of the behavior in question, and to how a particular position was acquired. Most importantly, only *legitimate* behavior can serve as a basis for claiming 'rights'. In the context of climate change past emissions will probably *not* be accepted as a legitimate basis for claiming 'rights' to *continue* polluting since it collides head on with the principle of guilt. Bartsch and Müller (2000) choose another approach since they combine grandfathering with equal per capita emissions (invoking the Need equity principle) in a universal burden sharing formula. Records of past emissions would, though, probably be accepted as a relevant parameter when it comes to determining *time for adjustment*. Moreover, a country's current emission level is an important determinant of adjustment *costs*.

## **2.5 Inclusion of Damage Costs in Burden Sharing Rules**

In the analysis above, we have – with one exception – considered principles of burden sharing without considering the distribution of damage costs. This has been a deliberate choice, based on two main reasons. One is that as long as we focus only on the costs of controlling emissions of greenhouse gases, the only direct link would be a rule suggesting that costs be distributed in proportion to (expected) benefits. However, as those who stand to gain the most from abatement measures are likely to be poor, developing countries, this rule would – if it were applied to the climate change problem – run counter to the principles of guilt and capacity. In such a clash, it seems clear that the latter would prevail. The other reason is that even if the general rule of distributing costs in proportion to benefits were to be applied, the present state of knowledge about who will be affected how much by human-induced climate change is much too poor to serve as a consensual basis for negotiations about distributive schemes. This situation is not likely to change substantially over the next 5-10 years.

Damage costs would, however, be most relevant to schemes of *compensation* (for damage that cannot be prevented) or *adaptation assistance*. The notion of compensation is intimately linked to the notion of damage or harm. A fair scheme of compensation would therefore have to differentiate the allocation of *benefits* on the basis of harm. With regard to the distribution of *costs*, however, the principles that we have analyzed above would apply also when 'burdens' are extended to include also the costs of compensation.

## **2.6 Conclusion**

This brief overview indicates that decision-makers have a real menu for choice. No single principle stands out as *the* clue to distributive fairness. We can therefore expect at least most of these, and perhaps others as well, to be invoked with some legitimacy in particular contexts. We now turn to the climate change negotiations themselves in order to see which principles and more specific burden sharing rules have in fact been suggested. These negotiations started with the so-called Berlin mandate from the first Conference of Parties to the Climate Convention in Berlin in the spring of 1995. Our survey ends with the Kyoto Protocol of December 1997.

### **3 Burden Sharing Proposals and Methods Presented During The Kyoto Protocol Negotiations<sup>6</sup>**

In this survey we employ two sources. The first is proposals from the Ad Hoc Group on the Berlin Mandate (AGBM) process that was initiated by the Berlin Mandate at the first Conference of the Parties (COP1) to the UNFCCC in the spring of 1995, and ended up in the Kyoto Protocol in December 1997.<sup>7</sup> From this negotiation process we identified and selected all proposals that implied some type of differentiation of targets. Consequently we left out all proposals for flat-rate targets (i.e. where parties should reduce their emissions by the same percentage). Altogether this came to 17 proposals made by a single party or groups of parties. The second source is the European Community's Triptique approach for differentiation of targets among its member states. The proposals are presented in a catalogue style.

#### **3.1 Review of differentiation proposals from the AGBM negotiations**

Based on common features among the proposals we have organized the 17 proposals from the AGBM process into 8 groups. In addition there were numerous proposals based on flat percentage reductions. These are, however, not examined further in this report. The grouping is shown in Table 4, where the proposals are given a reference number. The main common feature of a group of proposals is emphasized. One of the features to be considered is the explicit or implicit reference to one or more fairness principles. Furthermore, a more detailed summary of the reviewed proposals is shown in table 5. Here we specify operational criteria as well as basic principles. We should like to point out that in some cases the arguments submitted or criteria proposed are compatible with more than one principle of fairness. In particular, it is often difficult to distinguish arguments pertaining to need from arguments invoking (basic) rights. Moreover, it is often hard to determine whether arguments in favor of convergence towards a common level of emissions per capita is based (only) on the notion of need or (also) on considerations pertaining to capacity. The overview below should be read with this caveat in mind. Having said that, we would like to add that we take some comfort in the fact that when such ambiguity occurs the principles in question will pull largely in the same direction, meaning that they can be expressed in similar (perhaps even identical) operational rules.

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<sup>6</sup> This survey of differentiation proposals builds on Torvanger and Godal (1999).

<sup>7</sup> An interesting survey of possible methods for differentiation from the early phase of the negotiations is found in UNFCCC (1996), FCCC/AGBM/1996/7. This document was prepared for the 4<sup>th</sup> AGBM meeting in Geneva in July 1996.

**Working Paper 1999:13**  
Burden Differentiation: Fairness Principles and Proposals

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**Table 4. Grouping of burden sharing proposals from the AGBM proces**

<b>Group</b>	<b>Proposals</b>
Convergence	1. France 2. Switzerland 3. EU
Historical responsibility	4. Brazil 5. Brazil-RIVM
Multi-criteria formula	6. Norway 7. Iceland
Fossil fuel dependency	8. Australia 9. Iran
Menu approach	10. Japan I 11. Japan II
Sector approach	12. EU's Triptique approach
Gross Domestic Product (GDP) per capita	13. Poland et al. 14. Estonia 15. Poland and Russia 16. Korea
Cost-effectiveness	17. New Zealand



**Table 5 Summary of proposals for burden-sharing methods made by parties in the Ad Hoc Group on the Berlin Mandate (AGBM) negotiations.**

Proposal	When proposed	Fairness principle	Main features	Indicators										
				CDE	CDE/Pop	CDE/GDP	GDP/Pop	ΣCDE	CDEexp/CDEtot	dPop/dt	EXP/FF	CDE/km <sup>2</sup>	Other	
France	Dec. 96	Need (rights) (undifferentiated)	Progressive burdens compared to emissions. Convergence		X									
Switzerland	Dec. 96	Need (rights) (+ equal obligations for parties with similar per capita emissions)	Progressive burdens compared to emissions. Convergence		X					(X)				
EU	Mar. 97	Need (rights)	Convergence		X	X								
Brazil	May 97	Guilt (polluter pays)	Burdens correspond to cumulative emissions					X						
Brazil-RIVM	Nov. 98	Guilt (polluter pays)	Burdens correspond to cumulative emissions					X						
Norway	Nov. 96	<b>Need, guilt and capacity</b>	<b>Multi-criteria formula</b>		X	X	X							
Iceland	Jan. 97	Need, guilt and capacity	<b>Multi-criteria formula</b>		X	X	X							RE/TE
Australia	Jan. 97	Need (rights), capacity, and guilt	Unweighted set of 5 indicators			X	X (Proj.)			X	X (Proj.)	X		
Iran	Mar. 97	Mixture; need + acquired rights	Unweighted set of 8 indicators					X				X		More <sup>1</sup>
Japan I	Dec. 96	Equal obligations	Parties can choose 1 out of 2 indicators	X	X									
Japan II	Oct. 97	Equal obligations, modified by guilt	Parties can choose 1 out of 3 indicators		X	X					X			
The Netherlands	1997	Need, on a sector-specific basis	Multiple set of indicators											
Poland et al.	Mar. 97	Guilt and capacity	Unweighted set of 4 indicators	X	X	X	X							
Estonia	Mar. 96	Guilt and capacity	Two possible indicators				X	(X)						
Poland and the Russian Fed.	Aug. 95	Capacity and guilt	Unweighted set of 7 indicators		X		X					X		More <sup>2</sup>
South Korea	Feb. 97	Guilt and capacity	Unweighted set of 3 indicators			X	X	X						
New Zealand	Nov. 96	Not specified	Global least cost (equal marginal costs)											Eq. marg. abatem. costs

<sup>1</sup> Economic growth, historical share, dependency on fossil fuels income, access to renewable energy, defence budget, population growth, special circumstances, and international trade share.  
<sup>2</sup> Net emissions from sinks per capita and per unit of territory, and energy per capita.  
Abbreviations: CDE: level of CO<sub>2</sub> equivalent emissions; CDE/Pop: CO<sub>2</sub> equivalent emissions per gross domestic product; GDP/Pop: gross domestic product per capita; Σ CDE: the cumulative historical emissions contributing to global warming; CDEexp/CDEtot: the share of emissions resulting from production of goods for export (primarily the energy intensive industrial sector) relative to total national emissions; dPop/dt: population growth; EXP/FF: fossil fuel intensity of export; CDE/km<sup>2</sup>: CO<sub>2</sub> equivalent emissions per square kilometre of a country's territorial basis; RE/TE: a country's consumption of renewable energy compared to total energy consumption in the country; (Proj): projected; (X): subsidiary to X, i.e. X is the main criterion, but (X) could also be taken into consideration.  
Polluter pays: share abatement costs across countries in proportion to emission levels.  
Equal obligations: reduce emissions proportionally across all countries.

From table 5 we can see that at least 10 of the 17 proposals refer to the principle of *guilt* (polluter pays), at least 8 build on the principle of *capacity*, and at least 8 refer to the concept of *need* (or, in an alternative interpretation, some notion of ‘rights’). Moreover, we can see that all proposals invoking the norm that burdens be distributed in proportion to capacity also refer to the principle of guilt, and that at least 8 out of the 10 proposals invoking the principle of guilt also include the notion of capacity. At the level of basic principles, this indicates a fairly high degree of consensus, at least when we take into account that we are talking about negotiations with global participation. At the same time we can see, however, that different operational rules are in some cases ‘derived’ from the same principle. For example, the principle of guilt is sometimes related to emissions per capita, sometimes to emissions per unit of GDP, and in one proposal to emissions per unit of territory. Moreover, we can see that the pattern of divergence is not a random one; thus, it is hardly by accident that Japan refers to emissions per capita and per unit of GDP, while Russia finds the notion of emissions per unit of territory a more attractive option. This all suggests that it will be primarily at the level of more specific burden sharing rules that most of the really hard bargaining will occur.

The catalogue format chosen for the review of differentiation methods proposed during the AGBM negotiation process is the following:

- a. Name and reference of proposal.
- b. Who made the proposal, when, and on what occasion.
- c. The main features of the proposal.
- d. Summary. Could the method potentially be helpful for future negotiations, possibly in a further developed version.

In addition EU’s Triptique approach is included.

### **3.1.1 Group: Need-based convergence**

The principal common feature of proposal 1 (France), 2 (Switzerland), and 3 (EU) is convergence of per capita emissions over time. This means that those countries that have high 1990 per capita emissions must reduce their emissions more than countries that have relatively low per capita emissions. In the long run, by year 2100 according to the French proposal, all countries would meet at the same per capita emission level.

#### *1. France*

- a) French contribution to the AGBM before EU developed a joint position. Source: FCCC/AGBM/1997/MISC.1, p. 25.
- b) France prepared the following proposal in December 1996 for the 6<sup>th</sup> session of the AGBM, Bonn, 3-7 March 1997.
- c) The French proposal is based on a reduction in emissions to reach an atmospheric concentration of 550 ppmv of CO<sub>2</sub> as a future goal, and has a “per capita” approach as the main element for burden sharing. According to IPCC’s second assessment report, this concentration level can be obtained if average per capita level of CO<sub>2</sub> and other GHGs emissions are in the range of 1 to 2.7 tons of carbon equivalent within the Annex I Group by the end of the next century. On this basis, France proposes that burdens should be distributed so that the emission pathways converge to similar per capita or per unit of GDP levels by the end of the next century. Numerically, the proposal is designed as follows:

$$E_{i,2010} = E_{i,2000}^{9/10} \times X^{1/10}$$

Where:

$E_{i,2010}$  = carbon dioxide equivalent emissions in year 2010 for country  $i$

$E_{i,2000}$  = carbon dioxide equivalent emissions in year 2000 for country  $i$

$X$  = Emission goal per capita for all countries in 2100

The resulting commitments in 2010 given some levels of per capita emissions in year 2000 are shown in 5.

**Table 6. The French convergence proposal**

<b>Per capita emission in 2000</b>	<b>Per capita emission objective for 2010</b>	<b>Average percentage reduction 2000-2010</b>
3 teC/cap	2.8-2.9 teC/cap	5,0%
4 teC/cap	3.7-3.8 teC/cap	6,3%
5 teC/cap	4.5-4.6 teC/cap	9,0%
6 teC/cap	5.3-5.4 teC/cap	10,8%

The burdens are in other words defined so that countries with high per capita emissions must undertake a larger percentage reduction in emissions.

- d) The French proposal is interesting as a method of implementing a long-term atmospheric stabilization target, and due to its focus on convergence of per capita emissions in all countries. But, even with 100 years time horizon the proposal might seem idealistic when aiming for complete convergence.

## 2. Switzerland

- a) Switzerland. Source: FCCC/AGBM/1997/MISC.1.
- b) The Swiss proposal was prepared in December 1996 for the 5<sup>th</sup> session of the AGBM in December 1996.
- c) The Swiss proposal addresses the emissions of CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O and targets a 10% reduction of the total GHG emissions of Annex I Parties by the year 2010 compared to the 1990 levels. It states that countries should be grouped in categories differentiated by increments of 5 tons of annual CO<sub>2</sub>-equivalent emissions per capita. Burdens should then be distributed so that countries with the highest CO<sub>2</sub>-emissions would be obliged to achieve the biggest emission reduction. The proposal opens for adjustments to this rule if a Party has a large energy-intensive exporting industrial sector.
- d) The Swiss proposal is in general simple to handle. It shows some similarities to the French proposal. Exactly how the different groups of emitters shall be treated is however not explicitly defined.

## 3. EU

- a) Framework compilation of proposals from Parties for the elements of a protocol or another legal instrument. Source: FCCC/AGBM/1997/2, p. 31.
- b) France and Spain made the proposal, in submission by the EU. The proposal was prepared for the 6<sup>th</sup> session of the AGBM, Bonn, 3-7 March 1997.

- c) Annex I Parties would adopt greenhouse gas emissions paths converging eventually to similar levels of emissions per capita or per unit of GDP leading to an overall emissions reduction within specified time frames.
- d) This proposal is difficult to evaluate since the level of specification is low.

### 3.1.2 Group: 'Guilt', interpreted as historical responsibility

The main common feature of proposal 4 (Brazil) and 5 (Brazil-RIVM) is the emphasis on historical responsibility for global warming, in terms of accumulated contribution to radiative forcing or temperature increase in the atmosphere since the industrial revolution.

#### 4. Brazil

- a) The Brazilian contribution to the AGBM.
- b) Source: FCCC/AGBM/1997/MISC.1/Add.3, p. 3.
- c) Brazil prepared the following proposal in May 1997 for the 7<sup>th</sup> session of the AGBM, Bonn, 31 July-7 August 1997.
- d) The proposal for burden sharing is designed so that Parties receive a burden that corresponds to the same Party's responsibility for contributing to climate change. In order to quantify this contribution, cumulative historical emissions needs to be estimated, which together with the state of the art knowledge in the natural science field can produce relevant information for this criterion. The proposal is designed in order to be applied to all Parties, including developing countries.
- e) This proposal is interesting since it includes accumulated historical emissions by a country and calculates the its responsibility in terms of atmospheric warming. One limitation is that only fossil fuel based CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O is included. Responsibility of the present generation for past emissions when global warming was unknown is a disputable principle.

#### 5. Brazil-RIVM

- a) The Brazilian proposal and other options for international burden sharing. Source: Berk and Elzen, (1998).
- b) The Netherlands National Institute for Public Health and the Environment (RIVM) at the COP-4 in Buenos Aires, November 1998 presented the proposal. The proposal is in general a technical revision of the previous Brazilian proposal, giving suggestions for elements that could be improved.
- c) After the proposal was presented at the AGBM in August 1997, Berk and Elzen (1998) at the RIVM, carried out a more in depth study of the technical parts of the proposal, which was presented as a discussion paper in Buenos Aires, 1998. Among the conclusions it is worth mentioning that the technical methodology in the original Brazilian proposal was incorrect and needed to be improved. It overestimated the contribution of the Annex I to temperature change relative to non-Annex I. It would be preferable to use a multi-gas approach, including all sources and sinks. Furthermore, it seemed preferable to estimate the contribution to concentrations or radiative forcing rather than temperature changes. Finally they considered it more equitable to use the per capita contribution rather than using the absolute contribution to temperature or concentration increase.

- d) This is an improved version of the Brazilian proposal under number 4. Some weaknesses are reduced due to new data and better models, making the method preferable to the original Brazilian proposal.

### 3.1.3 Group: Multi-criteria formulae

The Norwegian (no. 6) and Icelandic (no. 7) proposals are to a large extent overlapping. They are multi-criteria rules containing indicators for Ability to pay (GDP per capita), Egalitarian (emissions per capita), and 'energy efficiency' (emissions per unit of GDP). Deviations from average value (of the group of countries) of one or more of these indicators generate a burden above the average percentage emission reduction required in the group.

#### Norway

- a) Norwegian contribution to the AGBM negotiation process.<sup>8</sup>  
 b) Norway prepared the following proposal in November 1996 for the 5<sup>th</sup> AGBM session in Geneva in December 1996.  
 c) A formula considers a Party's percentage reductions of greenhouse gas emissions based on the three indicators: CO<sub>2</sub> equivalent emissions per unit of GDP (indicator for emission intensity), and GDP per capita and CO<sub>2</sub> equivalent emissions per capita are included to induce an equitable outcome. The formula is:

$$Y_i = A[x(B_i/B)+y(C_i/C)+z(D_i/D)]$$

Where  $Y_i$  is percentage reduction if emissions for Party  $i$ .  $B_i$  is CO<sub>2</sub> equivalent emissions per unit of GDP for country  $i$ , and  $B$  is the equivalent average for the group of countries (i.e. the Annex I countries). Likewise  $C_i$  and  $C$  are GDP per capita for country  $i$  and for the average of the group, and  $D_i$  and  $D$  are CO<sub>2</sub> equivalent emissions per capita for country  $i$  and the average of the group.  $x$ ,  $y$  and  $z$  are weights that add up to one.  $A$  is a scale factor to ensure that the desired overall reduction in emissions for the group of countries is achieved.

- d) The Norwegian multi-criteria formula is relatively simple, but has quite some capacity built into it to handle countries with different emission, population and economic development structures, in particular due to its multi-criteria nature. However, it is a top-down approach of a relatively static approach. Thus is not sensitive to differences between economic sectors as driving forces for emissions and potential for future reduction of emissions.

#### 7. Iceland

- a) Submission made by the Government of Iceland to the UNFCCC, AGBM. Source: FCCC/AGBM/1997/MISC.1, p. 28.  
 b) Iceland prepared the following proposal in January 1997 for the 6<sup>th</sup> session of the AGBM, Bonn, 3-7 March 1997.  
 c) The Icelandic proposal is expressed as a formula consisting of the following four elements.  
 - GHG emission intensity (measured per capita) (+)<sup>9</sup>

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<sup>8</sup> FCCC/AGBM/1996/MISC.2/Add.2, p. 25. The formula was developed in a research project documented in Torvanger et al. (1996).

- GDP per capita (+)
- Level of GHG emissions (+)
- Share of renewable energy sources (-)

All GHGs should be included; counting both sources and sinks. The proposal does not specify the weights of each element, nor the aggregate reduction in emissions for all Parties. In a later proposal by Iceland dated October 1997 the criteria “level of GHG emissions” is replaced by “CO<sub>2</sub> emissions in industrial processing as a share of party’s total CO<sub>2</sub>-emissions (-)”.

- d) This proposal is very similar to the Norwegian proposal, the main difference being inclusion of the share of renewable energy sources as a fourth component.

### **3.1.4 Group: Fossil fuel dependency**

The most important common feature of proposal 8 (Australia) and 9 (Iran) is dependency of income on fossil fuel exports. In addition both proposals include economic growth and population growth.

#### *8. Australia*

- a) Further submission by Australia, dated 15 January 1997.<sup>10</sup>
- b) The Australian paper is dated 15 January 1997.
- c) The Australian proposal for burden differentiation is to be applied to all Annex B countries and includes all GHGs, all sources and sinks. The following set of criteria should be used in order to ensure equal percentage changes in per capita economic welfare across Annex B Parties from mitigation action:
- o Projected population growth. (-)
  - o Projected real GDP per capita growth (-)
  - o Emission intensity of GDP (+)
  - o Emission intensity of exports (-)
  - o Fossil fuel intensity of exports (-)
- d) The Australian proposal is relatively complex since there are 5 criteria that need to be quantified, and since two of them deals with projected figures. The method is not specified in detail; however, it is only meant to function as a framework for negotiations.

#### *9. Iran*

- a) Main elements for inclusion in a protocol or another legal instrument. Submitted by the Islamic Republic of Iran. Source: FCCC/AGBM/1997/MISC.1, p. 30.
- b) Iran prepared the following proposal for the 6<sup>th</sup> session of the AGBM, Bonn, 3-7 March 1997.
- c) The proposal contains a list of criteria that could be considered when differentiating burdens. These criteria are:
- Economic growth
  - Historical share

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<sup>9</sup> The following notation is used throughout the document. (+) indicates that the criteria is positively correlated to the size of the burden. E.g. in the Icelandic proposal, the higher the emissions per capita are, the larger should the Party’s burden become.

<sup>10</sup> FCCC/AGBM/1996/MISC.2/Add.2, p. 3.

- Dependency on income from fossil fuels
- Access to sources of renewable energy
- Defense budget
- Population growth
- Special circumstances
- Share in international trade

There are no specifications on how each element should count.

- d) The proposal is vague. It contains some unique indicators, such as defense budget.

### **3.1.5 Group: Menu-approach**

Even if there are a number of differences between the two Japanese proposals 10 (Japan I) and 11 (Japan II), they have one important common feature, namely the menu-approach. According to these proposals a country may choose one of two or three options that make its emission reduction commitment smallest. The proposals also imply a well-defined upper constraint on commitments.

#### *10. Japan I*

- a) Japan; Proposals on the elements to be included in the Draft Protocol to the UNFCCC. Source: FCCC/AGBM/1996/MISC.2/Add.4, p. 3.
- b) The Japanese proposal was prepared 9 December 1996 for the 5<sup>th</sup> session of the AGBM in December 1996.
- c) The Japanese proposal is to be applied to all Annex I countries, other Parties are to take voluntary measures. The proposal gives an Annex I Party the possibility to choose one out of two paths.
- To maintain its anthropogenic emissions of carbon dioxide over a five year period at an average yearly level not more than  $p$  tons of carbon per capita, or
  - To reduce its anthropogenic emissions of carbon dioxide over a five year period at an average yearly level of not less than  $q$  per cent below the level of the year 1990.
- d) The Japanese proposal is original in the way that Parties can choose between two completely different criteria. Although the values of the parameters  $p$  and  $q$  not are specified, it seems that Parties with high per capita emissions could benefit using the second strategy, were as low per capita emitters could benefit from the first strategy.

#### *11. Japan II*

- a) Japanese proposal as presented in FCCC/AGBM/1997/MISC.1/Add.6, p. 13.
- b) This Japanese proposal was submitted in October 1997 for the 8<sup>th</sup> session of the AGBM, Bonn, 22-31 October 1997.
- c) The Japanese proposal covers the gases CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O. In general, each Annex I country shall reduce emissions by 5% in the first budget period (2008-2012) compared to 1990 levels. However, countries with the following conditions may apply any one of the following alternative reduction rates:
- (a) For a country of which emissions per GDP in 1990 (A) are less than the emissions per GDP of all Annex I countries in 1990 (B):

- Alternative reduction rate (%): =  $5\% \times (A/B)$
- (b) For a country of which emissions per capita in 1990 (C) are less than the emissions per capita of all Annex I countries in 1990 (D):  
Alternative reduction rate (%): =  $5\% \times (C/D)$
- (c) Similar alternative reduction rate for countries with high population growth must be developed.

Under no circumstance shall any country's emissions exceed its 1990 levels.

- d) This Japanese proposal would effectively reduce emissions from Annex I to less than 5% as many countries by definition have lower than average emissions with respect to one of the two variables described above or population growth. Hence, there will be extensive use of the alternative reduction rate options.

### **3.1.6 Group: Sectoral approach**

Among the proposals we have listed, EU's Triptique approach is unique due to the bottom-up approach, where the economy is divided into three sectors. Thus there are no other proposals in this group.

#### *12. EU's Triptique approach*

- a) The Triptique approach was developed by Block et al. (1997) at the University of Utrecht.
- b) The methodology for this burden sharing key was developed on the request of the Netherlands Presidency. The motivation for the request was to develop a method for distributing emission commitments across members of the European Community.
- c) The main motivation for the approach was to develop a method that would take into account the differences in emission-producing activities across the member states. It is important to note that the approach not only determines the distribution of commitments but also the aggregate level of emissions from the member states. As a first step in the Triptique approach, emissions were divided in three groups.
- Emissions from electricity generation
  - Emissions from the internationally oriented energy-intensive industries
  - Emissions from other domestic sectors

Emissions are in general treated differently across the groups, but equally across the member states. No other greenhouse gas (GHG) than carbon dioxide is included in the analysis.

The electricity-generating sector showed large variation across the states regarding emissions of CO<sub>2</sub>. First of all, the total consumption (and production) of electricity in the EU was set to be limited to a growth rate of 1% per year, instead of the 1.5% that was used as the conventional wisdom projection. Some extra allowance was given the cohesion countries.<sup>11</sup> Carbon dioxide emissions were then to be distributed taking into account;

- minimum percentages for the penetration of renewable energies and combined heat and power (CHP)
- limitation of oil and coal use

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<sup>11</sup> Consisting of Greece, Spain, Portugal and Ireland.



- use of nuclear power according to national preferences
- remainder to be supplied using natural gas

The energy-intensive part of the industrial sector was allowed to increase production at a constant rate across all countries.<sup>12</sup> The same energy efficient improvement rate was also applied across the member states for this sector, leading to a fixed reduction factor for CO<sub>2</sub> emissions for all countries.

Emissions from the domestic sectors were distributed on a per capita base.<sup>13</sup> The main rule was that emissions per capita should converge to the same level across all countries at a certain point in the future (e.g. 2030) that is 20 or 30% lower than in 1990. The allowance in 2010 was then calculated using linear interpolation between actual figures in 1990 and desired level in 2030. The emission levels were only corrected for variations in natural climate across the countries.

- d) It is important to remember that the above method is only applied in order to calculate a particular distribution of burdens. How a country satisfies commitments is entirely up to the country itself. This method is one of the few that has actually been used in practice in this field, and should therefore be considered as a possible tool for future burden sharing. However, it is also important to be aware of the relative homogeneity across the members of the European Community in terms of economic structure and output, historical and present responsibility for possible climatic changes, abatement costs and vulnerability to climate changes. For this reason, it is difficult to predict how well this method can be adapted to a broader group of countries.

### **3.1.7 Group: Capacity (GDP per capita)**

The common feature of proposal 13 (Poland et al.), 14 (Estonia), 15 (Poland and the Russian Federation), and 16 (Korea) is the focus on the GDP per capita as an important indicator for distributing commitments. GDP per capita can be interpreted as a proxy variable for Ability to pay. In addition some of these proposals, but not all, have a reference to emissions per capita and/or contribution to global emissions.

#### *13. Poland et al.*

- a) Framework compilation of proposals from Parties for the elements of a protocol or another legal instrument. Source: FCCC/AGBM/1997/MISC.1, p. 75.
- b) The proposal was prepared on behalf of Bulgaria, Estonia, Latvia, Poland and Slovenia for the 6<sup>th</sup> session of the AGBM, Bonn, 3-7 March 1997.
- c) Each Annex I Party should have some flexibility in adopting emission reduction objectives. The following criteria should be used for this purpose:
  - GDP per capita;
  - Contribution to global emissions;
  - Emissions per capita and/or emission intensity of GDP.
- d) This proposal is difficult to evaluate due to a low level of specification.

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<sup>12</sup> Consisting of the following industries: building materials, chemical, iron and steel, non-ferrous metals, pulp and paper, refineries, coke ovens (if they were not a part of the iron and steel industry), gasworks and other energy transformation branches, where electricity generation is excluded.

<sup>13</sup> Consisting of households, services, light industry, agriculture and transportation.

*14. Estonia*

- a) Possible features of a protocol or another legal instrument. Estonia.<sup>14</sup>
- b) The Estonian proposal was prepared 15 January 1996 for the 3<sup>rd</sup> session of the AGBM, Geneva, 5-8 March 1996.
- c) The Estonian proposal should be applied to a “basket” of gases including sinks. The main criteria for differentiation could be GDP per capita. In addition it opens for the incorporating of a Party’s contribution to global warming.
- d) This proposal is difficult to evaluate due to a low level of specification.

*15. Poland and the Russian Federation*

- a) UNFCCC, Implementation of the Berlin Mandate, Poland and Russia.  
Source: FCCC/AGBM/1995/MISC.1/Add.1, p. 54.
- b) The proposal was prepared by Poland and the Russian Federation in August 1995 for the 2<sup>nd</sup> session of the AGBM in Geneva 30 October-3 November 1995.
- c) The proposal states that the criteria used to distribute reduction commitments should reflect social, economic and some climatic parameters relevant in the context of sustainable development. The following criteria were mentioned:
  - GDP per capita;
  - Amount of anthropogenic emissions, first of all of carbon dioxide and methane, per capita and per unit of territory;
  - Amount of sinks and net emissions per capita and per unit of territory;
  - Levels of production and consumption of energy per capita.
- d) The proposal contains similar elements to the ones described above, except for the consideration of a country’s territorial area.

*16. Korea*

- a) A proposal on the Elements in a Draft Protocol or Amendment of the United Nations Framework Convention on Climate Change (UNFCCC) by the Government of the Republic of Korea. Source: FCCC/AGBM/1997/MISC.1/Add.1, p. 13.
- b) The following proposal was prepared by Korea in February 1997, for the 6<sup>th</sup> session of the Ad Hoc Group on the Berlin Mandate (AGBM), Bonn, 3-7 March 1997.
- c) The Korean proposal focuses on three principles that all should be considered when distributing emission reduction commitments: burden sharing based on equity and common but differentiated responsibilities and respective capabilities, cost effectiveness and harmony with economic development and an open international economic system. The equity principle is to be taken care of by distributing emission allowances across Annex I Parties according to cumulative emissions of GHGs since the industrial revolution to a certain target year. The burdens should also be connected to a country’s capability measured in terms of gross domestic product (GDP) per capita and based on the elasticity of emissions of GHG in terms of GDP.
- d) The method contains elements that are common to other proposals, but does not define the exact key for burden sharing.

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<sup>14</sup> FCCC/AGBM/1996/7, p. 15.

### **3.1.8 Group: Cost-effectiveness**

New Zealand (no. 17) has supplied the only proposal in this group. The special feature of this proposal is the emphasis on cost-effectiveness. According to the proposal commitments should be distributed so as to equalize marginal abatement costs across countries.

#### *17. New Zealand*

- a) Greenhouse gas stabilization: Principles to guide the formulation of possible targets & policies and measures. Source: FCCC/AGBM/1996/MISC.2/Add.4, p. 15.
- b) New Zealand prepared the following proposal in November 1996 for the 5<sup>th</sup> session of the AGBM in December 1996.
- c) The key element of the New Zealand position is that emissions reductions should be achieved at global least cost. A least cost approach does not neglect equity; rather, a least cost approach improves the prospects of finding an equitable outcome acceptable to all. If differentiated commitments are considered it is important that this is on the basis of a simple principle that reduces the disparity between Parties in terms of abatement costs implied by uniform targets. One possible option would be to aim to share commitments in a manner consistent with the outcome expected if marginal costs were equalized. Clearly there are a range of options which could reduce cost disparities.
- d) The New Zealand proposal focuses on designing a protocol that ensures a global least cost solution, but not on burden sharing as an issue separated from cost-effectiveness.

In the next and final chapter we sum up the survey of proposals and experience from the negotiation process in terms of implications for future design of burden sharing rules.

## 4 Conclusions

Let us now try to summarize this analysis by addressing two key questions: First, what are the basic principles of fairness that a burden sharing rule will have to satisfy in order to serve as a basis for a global agreement? This is a question about *necessary* conditions; we are not suggesting that consistency with any one particular principle or combination of principles constitutes a *sufficient* condition. Second, assuming that no magic formula of fairness will by itself be sufficient to produce agreement, we have to ask what are the *additional* criteria a specific burden sharing rule and formula will have to meet in order to be adopted.

The answer to the first of these questions can, it seems, be summarized as follows: First, no burden sharing rule that is incompatible with *all* the three main principles of equity relevant to this particular case – the principles of ‘guilt’, ‘capacity’ and ‘need’ – will be accepted. More precisely, a burden sharing rule must be consistent with (a) the general pattern of differentiation outlined in table 2, and (b) with at least one of the three main equity principles – probably with *more than one*. Second, no rule that is clearly incompatible with the principle of ‘need’ – interpreted in terms of basic human needs – will be politically feasible. A rule may violate softer interpretations of ‘need’, but the demand that burden sharing rules respect basic human needs stands even if it runs into conflict with the principles of guilt and/or capacity. Beyond this, it is hard to establish – on ethical grounds – a clear hierarchical order of fairness norms. Moreover, as we have seen, all three are invoked in actual proposals and supported by important groups of actors. Third, in the absence of one unique ‘trump’, a burden sharing rule should somehow *combine* at least two and preferably all three of the main equity norms, plus allow for exemptions. No rule deriving the distribution of obligations from one single principle is likely to be adopted. We should, in other words, be looking for a more complex formula. Fourth, all rules that are ‘dominated’ by some other rule may be eliminated. An option dominates another if, and only if, it is superior according to at least one of the criteria applied and at the same time inferior with respect to no other criterion (principle) in that set. For each ‘dominated’ rule at least one alternative exists that is unambiguously *superior*.

Taken together, these propositions provide some guidance. However, even though the *range* of politically feasible burden sharing rules is reduced, we are still left with an uncomfortably large set of options (in fact, the number is infinite!). In this particular case we are in the fortunate situation that all the three equity principles to a large extent *point in the same general direction*. This means that different formulae may well yield similar substantive implications, applied to this particular case. To the extent that different formulae lead to similar conclusions, one may argue that in so far as actors are concerned with material consequences it does not matter much which of the formulae in question is adopted. This observation suggests that as we move on to develop specific rules, it will be a good idea to examine to what extent their practical implications converge. In the absence of a clear hierarchy of norms, a distribution that can be justified by reference to *multiple* principles or rules will, other things being equal, prevail in a contest with one that has a narrower normative basis.

The latter proposition ‘helps’ by suggesting that the choice of one burden sharing rule instead of another need not be all that important in terms of practical consequences. It does not, however, help us choose. Let us therefore move on to explore whether we can narrow the range of politically feasible rules further by introducing additional criteria that

are not derived from basic principles of fairness. There are at least two sets of such criteria that should be examined; one has to do with the logic of 'realpolitik', the other with concerns of operational feasibility.

In section 2.2, we assumed that actor behavior would be motivated primarily by self-interest, with considerations of fairness acting as motivational sources, soft constraints and/or as clues where interests provide no clear guidance. The basic implication of this assumption is that no burden sharing rule that runs counter to the vital interests of pivotal parties or coalitions of parties can be adopted. This is obviously a most important constraint, but it also one that is hard to specify. One challenge is to specify precisely where the critical threshold lies. What exactly is meant by 'run counter to vital interests'? How much is an actor prepared to sacrifice for the benefit for 'fairness'? Clearly, all equity principles require that some contribute *more* than others, in absolute as well as relative terms. In general form they do not, however, specify exactly *how much* more, nor do they tell us what is the *maximum* net loss that an actor will be prepared to accept to meet norms of fairness. The conventional assumption in negotiation theory is that the latter threshold is *zero*, i.e. that an actor will be prepared to contribute more than others if salient norms of fairness so require, but not to accept a net loss in absolute terms. This may be an overly strict assumption, but we prefer to err on the side of caution and shall therefore take it as our point of departure. The other challenge is do determine who are 'pivotal' actors or groups of actors. A pivotal actor is one without whom others would not be willing or able to undertake a particular project. Determining pivotality can be a rather complex exercise, taking us through multiple steps of analysis, and also lead to complex conclusions (e.g. long lists of *combinations* of actors) (cf. Underdal, 1998). For our purposes it seems sufficient to work with a more sweeping and simplistic requirement. To cut a complex story short, we shall assume that in so far as negotiations focus on obligations only for the industrialized countries, there are three pivotal actors or constellations of actors: the US, the EU, and Japan + a weighted majority of the remaining OECD countries).<sup>15</sup> For negotiations on a *global* scheme of commitments, we shall assume that, in addition, the G-77 and any coalition including China + India or two other major developing countries (e.g. Brazil and Indonesia) are pivotal constellations.

In addition to these political constraints, there are a number of operational requirements to be considered as we move on to develop specific rules and criteria. Listed in decreasing order of importance, we suggest first of all that a formula should be universally *applicable*, i.e. refer to variables that can be used to describe all prospective partners in the agreement. Second, it should be easy to *translate into operational indicators* and feed with reliable data or at least data that are not seriously contested. Third, *simplicity* is desirable (although substantive validity must – in principle – have priority over operational costs). Fourth, the formula should be framed so that it allows for *future refinement* and adjustment. These are considerations that we will deal with in greater depth in the next stage of this project.

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<sup>15</sup> Weights are assigned on the basis of greenhouse gas emissions.

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