



E3G

Global Public Goods: Conceptual Framework

September 2006



1. What is the conceptual framework for?
2. GPG Conceptual Framework
 - What are GPGs?
 - GPGs and poverty reduction
 - Analysing barriers to producing GPGs
 - Unilateral alternatives to GPGs
3. Developing development agencies' strategies on GPGs

Aims of the Conceptual Framework

- **Principle:** To provide a framework for embedding GPG provision firmly into development agencies organisational strategy for poverty reduction
- **Practice:** To provide a rigorous basis for development agencies to make decisions on their priority involvement and investment in providing GPGs
- **Partnership:** To provide a basis for productive partnerships in the production of priority GPGs

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Defining Global Public Goods (or International Public Goods)



Global Public Goods are commodities, resources, services and systems of rules or policy regimes which provide substantial cross-border public benefits in:

- provision of direct utility;
- risk reduction (or disutility),
- capacity enhancement.

Global public goods can generally only be produced in sufficient supply through cooperation and collective action between countries.

Key Global Public Goods



- **Infectious Diseases:** controlling spread and incidence of infectious diseases
- **Global Climate Stability**
- **Global Financial Stability:** controlling instability and limiting contagion
- **Trade:** rules-based system for liberalising and facilitating trade flows
- **Conflict Prevention and Security:** reducing incidence and impacts of armed conflicts and crises
- **Organised Crime/Corruption:** reducing the incidence and influence of international criminal organisations and lowering incentives for corruption
- **Energy Security:** market-based system for accessing energy resources with low price volatility and low political risk price premium
- **Innovation:** global innovation system that incentivises and spreads the production of knowledge
- **Global Ecosystem Services**

GPGs are undersupplied due to systematic failures of international co-operation

International production of public goods differs from national public goods because it rests on voluntary co-operation. This results in two types of undersupply:

- **Failure to secure available economic benefits:** even when all countries can in principle gain economic benefits from co-operation this may fail because the non-rival and/or non-excludable nature of GPGs encourages destructive free-riding and sanctions are not available. Countries often have some unilateral alternatives to GPGs.
- **Failure to deliver benefits for the poor:** where many benefits of GPGs accrue to poor countries or poor people, they are often unable to persuade or compensate richer countries to take the necessary actions to produce the GPG in a pro-poor manner.

GPGs are mainly produced by co-ordination of national action; often co-produced as part of national development



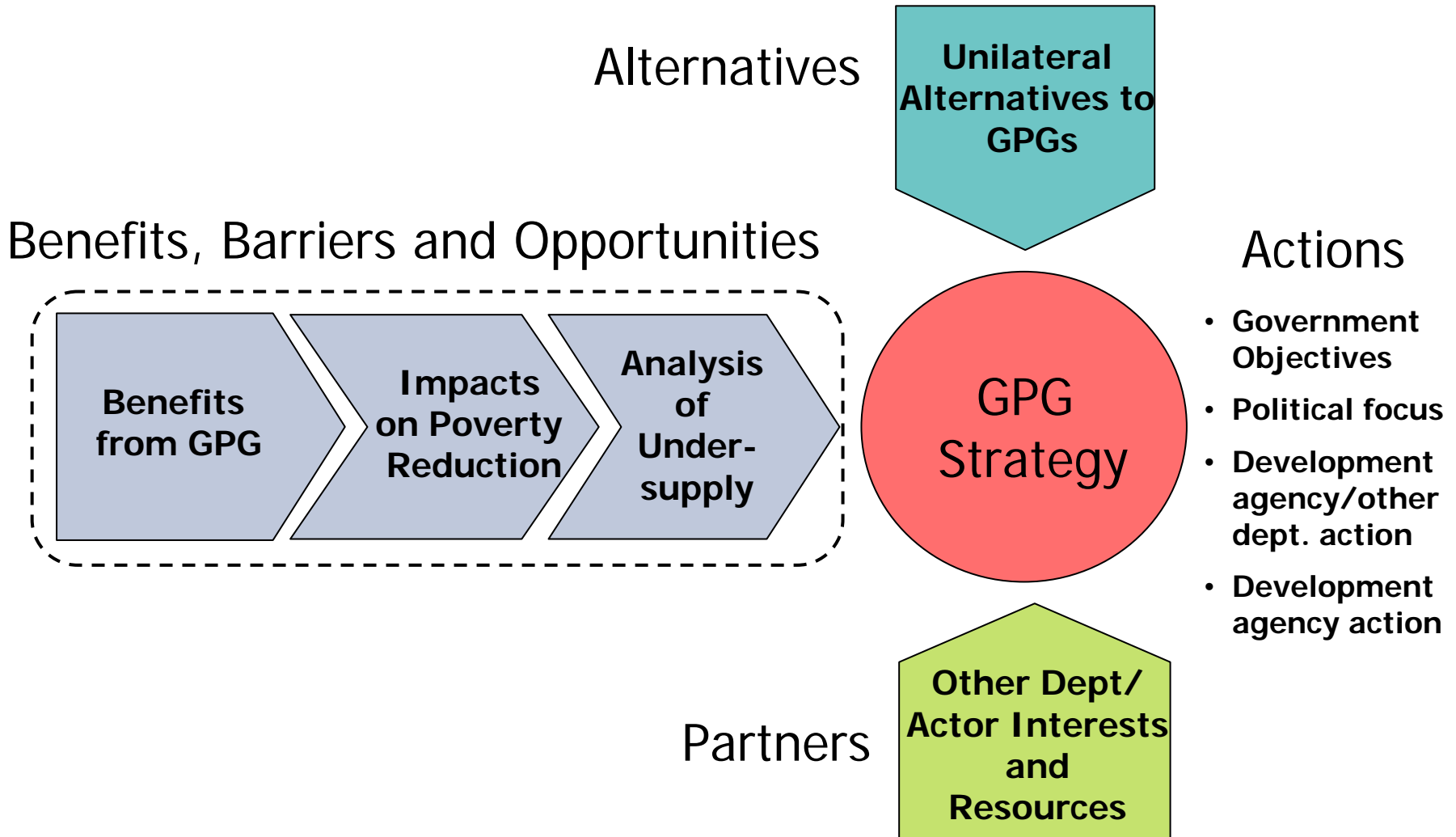
- Most GPGs rely on effective co-ordination of **national actions**, not international spending or production:
 - Monitoring and tackling infectious disease
 - Mitigating carbon emissions
 - Balancing public finances and monitoring markets
- Many GPG actions also produce local poverty reduction benefits and/or national public goods (**NPG co-production**)
- International “production” of GPGs occurs mainly in two areas:
 - **Innovation**: international consortia to develop new technologies e.g. vaccines; low carbon technologies
 - **Reactive capability**: humanitarian response; peacekeeping/peace building; IMF crisis response

What type of action could be part of a strategy on GPGs?



- **Change government objectives:** Development agencies acting to change government objectives on GPG production e.g. making trade policy pro-poor
- **Increase political focus:** working to increase government political focus on producing a GPG e.g. action on climate change
- **Development agencies/Other Departments investment:** joint investment and strategies to produce GPGs e.g. global conflict prevention pools
- **Development agencies investment:** focused investment at national or international level e.g. malaria vaccine

Framework for developing strategy on GPGs





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Many GPGs provide additional impacts on poverty reduction compared to national action



- GPGs can be a more efficient substitute for national action to achieve MDGs e.g. cooperative development of HIV/AIDS vaccine
- GPGs can be vital in creating the long term system conditions for sustainable poverty elimination over the next 10-30 years e.g. conflict prevention; financial stability; climate stability.

Globalisation and shifting geopolitics are increasing the importance of GPGs for poverty reduction



- **From borders to networks:** increased global integration requires less control of borders and more effective networks of governance between and inside states. This increases the number of GPGs by globalising more aspects of national public goods e.g. crime; corruption.
- **Increased Complexity** - governance is becoming more complex - in linkages between issues (e.g. energy security and climate change) and in the variety of significant global actors e.g. public-private partnerships
- **Pace of Change** - emergence of global problems is out pacing governmental responses - non-governmental systems (legal and illegal) are filling void
- **Shifting geo-politics makes cooperation more difficult:** The rise of MICs leading to a more multipolar world increases the difficulty of cooperation with more parties and interests to reconcile.

On current trends relative impact of GPGs on poverty reduction changes over time

GPG	2015	2025	2035
Infectious Disease Control	Red	Orange	Orange
Climate Stability	Yellow	Red	Red
Financial Stability	Orange	Orange	Yellow
Intl Trade System	Red	Yellow	Yellow
Security	Red	Red	Red
Org Crime/corruption	Orange	Red	Red
Energy Security	Orange	Orange	Orange
Innovation	Yellow	Orange	Orange
Ecosystem services	Yellow	Orange	Red

Lower impact Higher impact



GPG Interdependence



Though the benefits of GPGs are often analysed independently, in reality they are often interdependent on two levels:

- **Functional interdependence:** Production of a GPG is undermined or supported by production of other GPGs. For example: reducing corruption and organised crime will improve global stability and security; competition for energy resources undermines efforts to fight corruption and improve stability.
- **Political interdependence:** Production of GPGs is linked at the political level, either because they both require actions through the same institutions (e.g. UN or WTO) or because countries have joint interests they wish to pursue. For example, Russia's linking of accession to the Kyoto protocol with its WTO entry.

Advantages for development agencies of having a cross-cutting approach to GPGs



Organisational Objectives

- Framework comparable to MDG/PRSP/Paris conditions providing a logic for development agency action and prioritisation
- Ability to compare across areas for prioritising impact and investment, including through resource allocation models.
- Consistent framework for engaging with other departments and international organisations in negotiations over effort sharing

Improving the Delivery of Priority GPGs

- Better understanding the functional interdependencies between GPGs e.g. organised crime, corruption and natural resource mgt;
- Analytical framework for understanding and addressing common coordination failures from political and institutional factors
- Framework for analysing political interdependencies and informing cross-cutting lobbying strategies towards countries and international organisations

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Additionality of Supplying GPGs

- Value of cooperation to produce a GPG can be defined as the additional benefits available from international cooperation compared to total benefits available from optimal provision of national public goods in all countries.
- For example, it may not be optimal to totally eliminate polio on a national basis, but the global benefits of elimination in terms of reduced vaccine costs would make this globally optimal.

A GPG can be undersupplied due to production or consumption failures



Production Failures:

- **Economic Failure:** Countries failing to capture all possible transferable economic benefits of cooperation
- **Global Welfare Failure:** Countries failing to maximise global welfare benefits of cooperation

Consumption Failure

- An available GPG is underprovided because countries have not got the capacity to consume an economic or welfare optimising amount e.g. scientific knowledge

Underproduction of GPGs is a result of Systemic Weaknesses in Global Cooperation

International cooperation differs from national level governance as it is:

- **Voluntary** - no requirement for any country to join - all impacting an issue must make choice to participate
- **Lack of public choice system** - no direct accountability to voters or way to trade-off different interests (**treaties not voting**)
- **Lack of external coercive mechanisms** - coercive sanctions must be agreed inside each instrument e.g. force inside UN Security Council; trade sanctions in WTO

No democratic necessity for “winners” to give to “losers”

Relies on ethical choices to give equity not contested politics

Analysing GPG Undersupply

Conditions for effective cooperation

- Core agreement
- Profitability
- Stability

Conditions for effective implementation

- Institutional effectiveness
- International Investment
- Co-production

Conditions for effective cooperation



Effective co-operation to produce optimal levels of a GPG requires the following political economy conditions:

- **Core agreement:** agreement between sufficient key countries needed to give optimal supply of the GPG
- **Profitability:** all countries gain from agreeing to provide a GPG (Additional Benefits > Additional Costs)
- **Stability:** no country can gain by leaving an agreement to provide a GPG

Size of effective **Core Agreement** depends on how the GPG is produced

Production Type	Size of Core
Threshold Goods: Total production of GPG is equal to the largest amount of resources devoted to provision e.g. vaccine development; fusion R&D.	Core agreement requires enough countries to reach threshold.
Summation Goods: Total production of GPG is equal to the sum of global resources devoted to provision e.g. climate change; biodiversity protection; trade liberalisation.	Core agreement requires a sufficient proportion of countries to deliver positive benefits.
Network Goods: Total production of GPG is a non-linear combination of national resources, often defined by strength of “weakest link” e.g. financial stability; infectious disease control; organised crime.	Core agreement requires all countries which have a material impact on the issue

Production Taxonomy of Key GPGs

	Production Taxonomy	Consumption failures
Infectious Disease Vaccines Eradication/Control	Threshold Summation/Network	IPR/Distribution Health System
Climate Mitigation Climate Innovation	Summation Threshold/Summation	IPR
Financial Stability Prevention Financial Stability response	Network Threshold	
Trade Liberalisation Trade Facilitation	Summation Summation	Supply Capacity
Conflict Prevention Crisis Response	Network/Summation Threshold	
Org Crime Corruption	Network Network	
Energy Security –Supply Energy Security - Demand	Network Summation	
Global Innovation System	Summation	IPR/Innovation System
Ecosystem services	Summation	

Profitability depends on distribution of costs and benefits and can require financial transfers between countries



- **Costs and Benefits:** Many GPGs require countries to act at levels where national costs outweigh national benefits. For example, high GHG emitting countries; mega-biodiverse countries; countries acting as transit routes for drug trafficking.

Countries can be assured of positive net benefits from cooperation through:

- **Direct funding/transfers:** biodiversity protection; organised crime
- **Differentiation of targets/obligations:** climate change; trade;
- **Bundles with other issues:** financial stability with IFI lending; IPR protection with trade liberalisation
- **Lowering ambition of GPG agreement** or delivery of benefits to non-paying parties

Stability often requires monitoring and credible sanctions

- Stability is harder to achieve than profitability as most countries can gain by free-riding on others' actions
- Best option is to have credible sanctions against non-participation or withdrawal/non-compliance, but these have to be agreed and implemented inside the scope of each agreement:
 - Trade sanctions e.g. WTO; Montreal Protocol
 - Legal sanction e.g. ICC; investment arbitration
 - Agreement collapses on withdrawal (quid-pro-quo game)
 - Links to broader issues e.g. reputational risk; political costs
- Stability easier to ensure with a small number of large stable power blocks in an agreement as consequences of withdrawal clearer.
- Withdrawal happens less often than theory predicts, but common for small/medium size countries: Australia – climate; N Korea – proliferation; SIDS – money laundering.

Key myths around GPG Production

- **Myth 1 - GPGs always need cooperation to be provided:** not threshold or summation goods if national benefits high enough e.g. CFC phase out and development of CFC substitutes
- **Myth 2 - GPGs need most countries involved to be provided:** core can be small even for summation (climate = 20) and network goods (trade). Co-operation by major players can produce GPGs for all.
- **Myth 3 - GPGs require large international funds:** most GPGs are just coordinated at international level. Profitability is usually assured through differentiated targets or obligations, only in some cases are international side payments used to ensure profitability and cooperation.

Conditions for effective implementation

Even when producing a GPG is notionally profitable for a stable core of countries, cooperation can fail due to poor implementation in three areas:

- **Institutional effectiveness:** institutional structures give efficient implementation of cooperative agreement
- **International Investment:** adequate additional investment is generated and efficiently transferred to ensure profitability and counter-act consumption failures
- **Co-production:** incentives are designed to ensure GPG production supports, and is supported by, co-production of linked national public goods (NPGs)

Institutional failures can undermine potentially viable agreements



- **Effectiveness:** institutions to ensure effective delivery of agreement aims, especially in complex, multidisciplinary and innovative areas, for example: public-private partnerships on innovation; peacebuilding; technical capacity building.
- **Efficiency:** institutions to ensure lowest cost provision of GPGs e.g. tradable permit systems; variable targets; outcome based regulation.
- **Stability:** effective monitoring and sanctions – including the ability to ensure compliance through national level capacity building

International Investment



- **Production:** adequate investment to produce any internationally supplied GPGs e.g. innovation; peacekeeping capacity; global monitoring and science.
- **Profitability:** adequate investment to allow compensation payments between winners and losers to an agreement e.g. Global Environment Facility; tradable permit distribution.
- **Consumption:** adequate investment to allow developing countries to consume available GPGs at an optimal level e.g. innovation; co-operation on corruption; legal capacity to use WTO dispute system.

Incentives for co-production with National Public Goods (NPGs)



- GPGs are often co-produced with NPGs, for example: carbon sequestration, biodiversity conservation and watershed protection; health systems
- If national provision is optimal for producing GPG then there is no need for cooperation. If national provision is sub-optimal then issue of how to express value of GPG component when a global price (e.g. on carbon) doesn't exist.
- Strategic incentives exist for national authorities to under-invest in co-produced goods hoping for international subsidies (e.g. GEF and incremental cost). But GPGs can also be a source of new funding for NPG production for poverty reduction.
- Need to ensure incentives maximise co-production of linked GPGs and NPGs. This balance of funding for global and national components usually decided by negotiated agreement.

Pure global public goods are mostly sub-sets of each GPG area; high levels of co-production with NPGs



	Global Public Good?	Some co-production?
Infectious Disease	Vaccine development Global disease eradication/control	Yes – if national benefits high Yes – health system
Climate	Climate mitigation Climate technology	Yes – energy security Yes – IPR
Financial Stability	Contagion control International Stability Funds	Yes – natl. stability No
Trade	MFN/Lock-in/Disputes Facilitation/standardisation	No Yes – economic efficiency
Security	Prevent Spillover Impacts International security architecture	No Yes – natl. security capability
Org Crime	Intl. Criminal Network Prosecution	Yes
Energy Security	Price stability Lower competition	No Yes – efficiency/diversity
Innovation	Knowledge Spillovers	No
Ecosystem services	International Eco services Biodiversity	Yes – with national services Yes – natl. conservation

Summary: Undersupply of GPGs

- **Undersupply** is not just a technical issue – it depends on the distribution of costs and benefits and how equity issues are handled. Taking account of developing country welfare (“pro-poor GPGs”) will usually change the level and type of optimal GPG provision.
- The size of **core agreement** needed to deliver optimal GPG provision can vary very widely and not all countries have to be involved.
- **Effective Co-operation** may require side payments or equity agreements to ensure profitability for all critical countries. Monitoring, credible sanctions and/or strategic cooperation between power blocks are needed to provide stability.
- **Effective Implementation** requires efficient institutions, adequate investment in production and consumption and incentives to maximise **co-production** of GPGs with National Public Goods.



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There are often strong incentives to pursue unilateral alternatives to cooperative GPGs



- Co-operation is complex and difficult to deliver
- International institutions have a mixed record of delivery and performance
- Countries have different attitudes to the desirability and legitimacy of international cooperation (e.g. EU vs. US)
- Even at the national level there are continuing arguments over where public goods should be financed and production controlled (federalism/subsidiarity)
- Additional benefits of cooperative solution must significantly outweigh unilateralist or club options to be attractive

There are many National Responses to GPG Undersupply – “Defensive Expenditures”



- **Isolation** - e.g. closing/restricting borders, self-sufficiency in energy.
- **Buffering/resilience** - reducing exposure to global shocks e.g. national oil reserves, vaccine stocks, diversifying export markets; financial options/instruments; climate adaptation investment.
- **Reaction** - rapid response to emergent threats e.g. military intervention, police activity on drugs and international crime.
- **Network/System Capture** - place key parts of international governance networks under national control e.g. installing compliant governments in key states, bypassing democratic processes in international institutions, strategic use of bilateral aid.
- **Partial Coalitions** - invest in regional/global governance networks e.g. clubs, forming coalitions of the willing etc.

Unilateralist alternatives often exclude LDC interests, and can damage poverty reduction; though in some cases unilateral action by LDCs may be beneficial



A defensive approach can be a legitimate and optimal response to GPG under-provision – but favours richer and larger countries which have the resources to cooperate.

- **Anti-poverty alternatives:** LDC interests are underrepresented in unilateral or club alternatives e.g. bilateral/regional trade and investment deals
- LDCs can be harmed by unilateral actions e.g. border restrictions and product standards to prevent disease spread; strategic capture of energy resources driving prices higher; short term anti-crime and terrorism operations.
- Widespread investment in defensive expenditure reduces incentives for future co-operative production of GPGs
- **Pro-poor alternatives:** Some areas where international agreement is unlikely or DC voice weak (e.g. energy security; financial stability) major investment in LDC defensive expenditures could be best development agency policy



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Why should development agencies invest capacity and financial resources in GPG production?



- GPGs are becoming increasingly important to sustained poverty reduction as globalisation intensifies; some are critical to achieving the MDGs in the short term.
- Without an explicit focus on equity and benefits to poverty reduction, poorer countries interests will be under-reflected in negotiations over GPG production; especially with the rise of MICs.
- Ineffective co-operative production of GPGs will stimulate unilateral alternatives/defensive expenditures from powerful countries, often to the detriment of the poor.
- Many poorer countries cannot consume existing GPGs due to a lack of national capacity e.g. scientific information.

GPG Cooperation – Diagnostic Questions



- **Benefits:** does the agreement generate large direct financial benefits (shareable through side payments) or welfare benefits?
- **Conflict/trade-offs:** are there clear winner and losers from co-operation - or do all benefit? What is the distribution of benefits between IC/MICs and LDCs?
- **Alternatives:** are there unilateral alternatives to cooperation?
- **Enforceability:** can the agreement be monitored? Does a “natural” sanction exist inside the agreement to encourage compliance (e.g. trade in WTO) or are there no clear levers (e.g. fisheries)
- **Depth of governance** - can countries easily implement commitments (e.g. dropping tariff barriers) or will it require greater national governance (e.g. climate; drugs, terrorism)

Enforceable, win-wins based delivering financial benefits and requiring only “shallow” governance are most likely to be delivered but are uncommon (e.g. trade)

Annotated Analytical Framework for Developing development agency strategies on GPGs

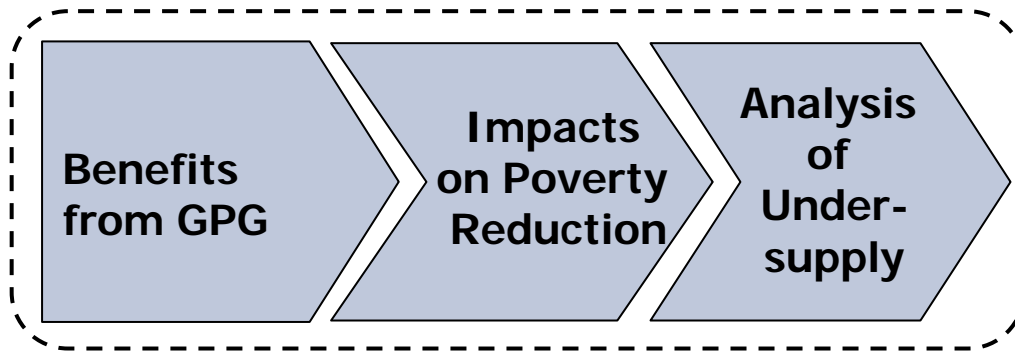


Alternatives

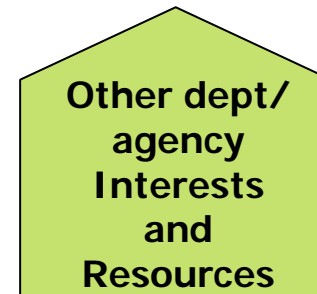


- Unilateral options
- Negative impacts on poverty?
- Poor-poor unilateral LDC action?

Benefits, Barriers and Opportunities



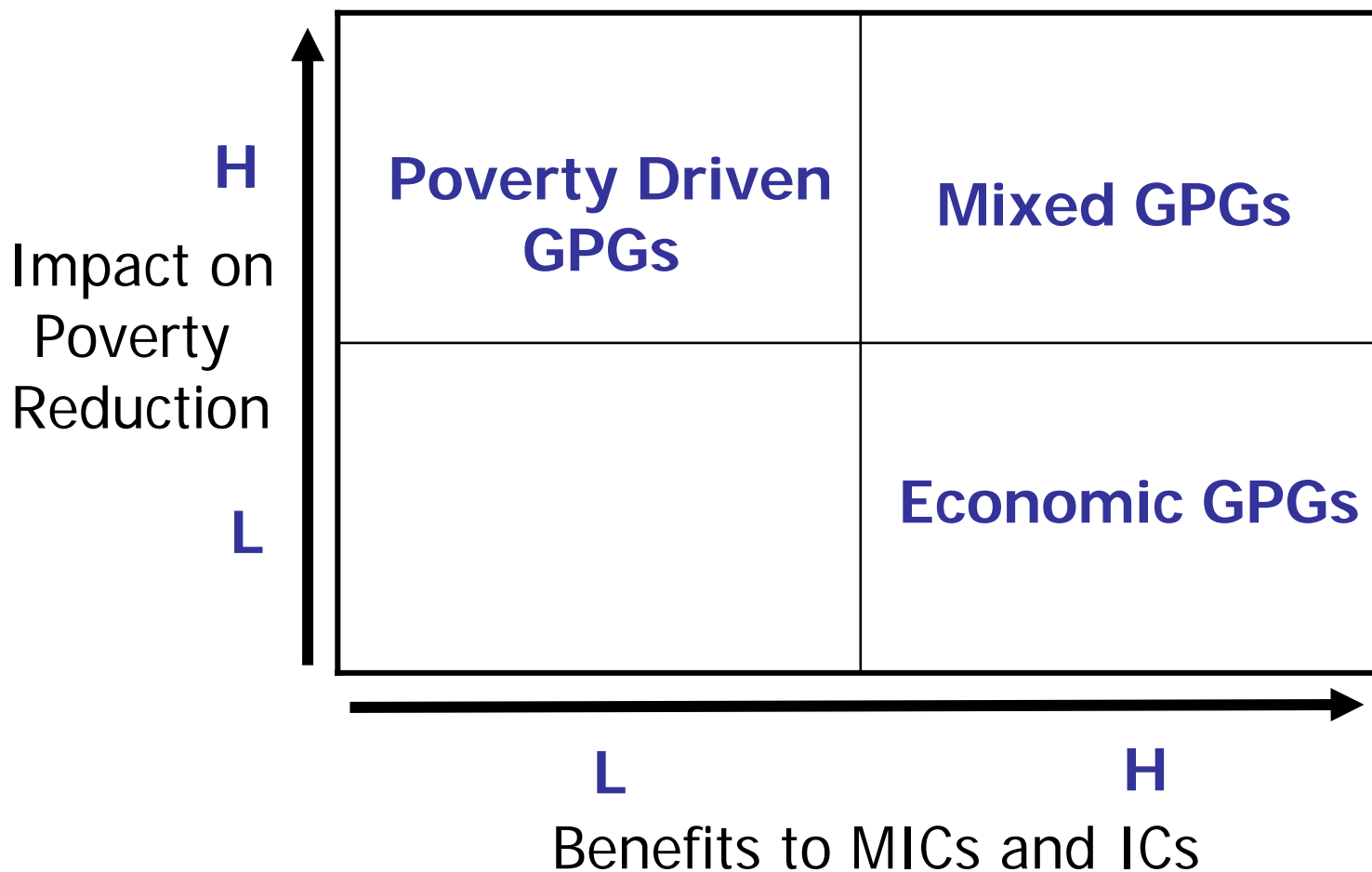
- Govt. Objectives
- Political focus
- Development agency/ Other dept action
- Development agency action



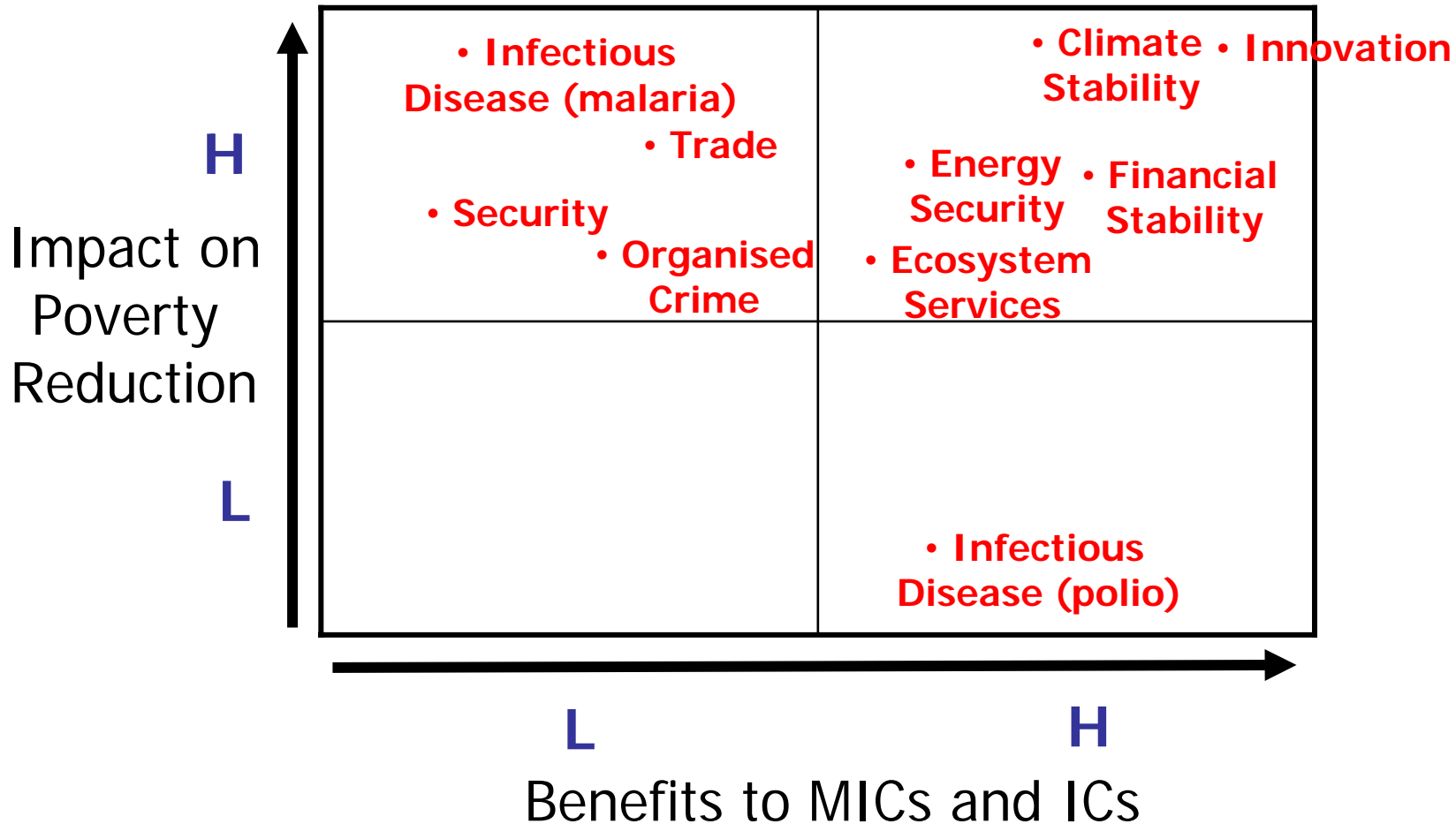
Partners

<ul style="list-style-type: none"> • Total benefits • Undersupply? • Interdependence with other GPGs 	<p>Poverty Impacts</p> <ul style="list-style-type: none"> • Impact on MDGs • Long term Impact on poverty <p>Balance of Interests</p> <ul style="list-style-type: none"> • Poverty GPG? • Mixed GPG? • Economic GPG? 	<p>Cooperation</p> <ul style="list-style-type: none"> • Core Agreement • Profitability • Stability <p>Implementation</p> <ul style="list-style-type: none"> • Institutions • Investment • NPG Co-production
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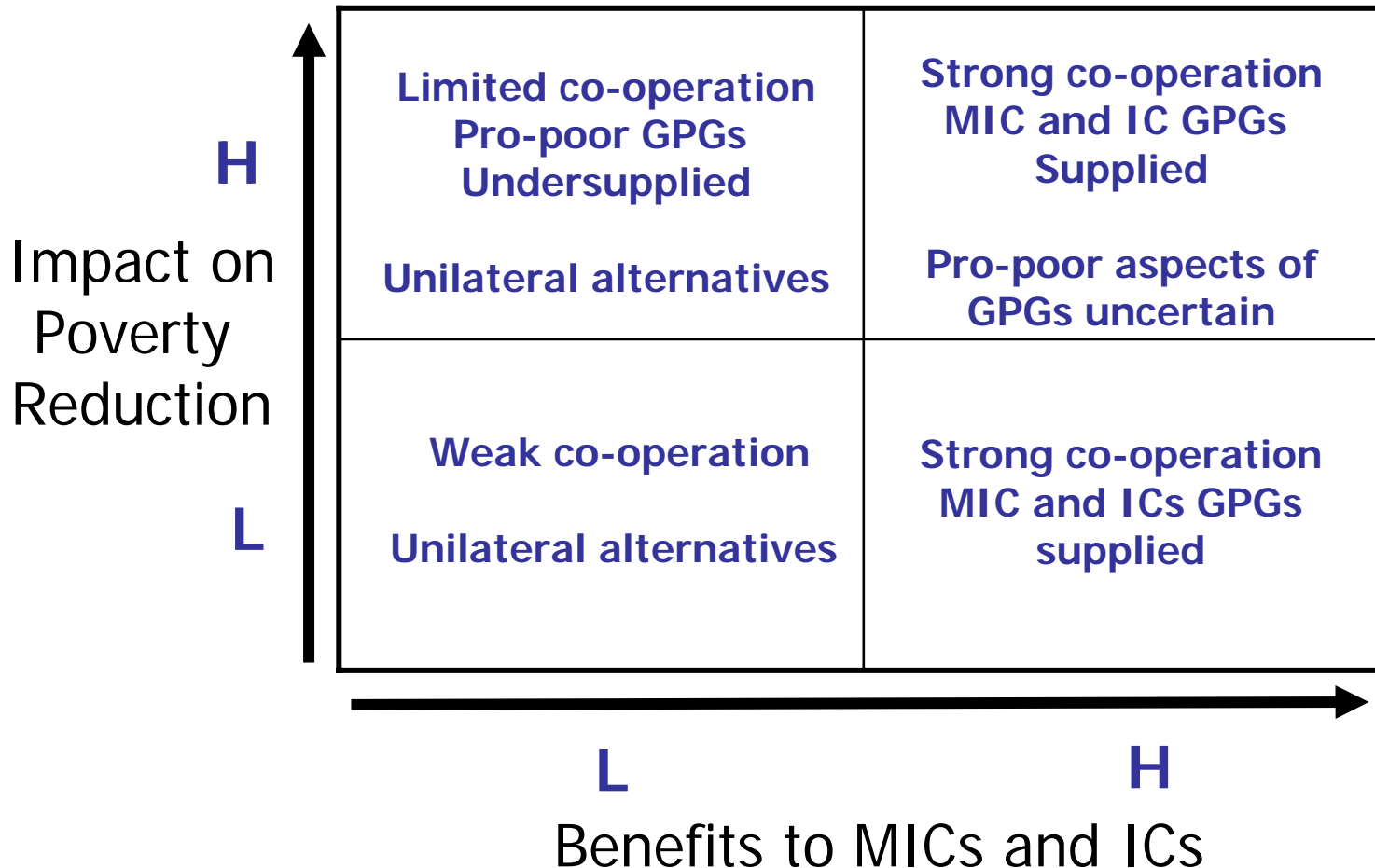
Taxonomy of GPGs can be defined by balance of benefits for MICs/ICs and Poverty Reduction



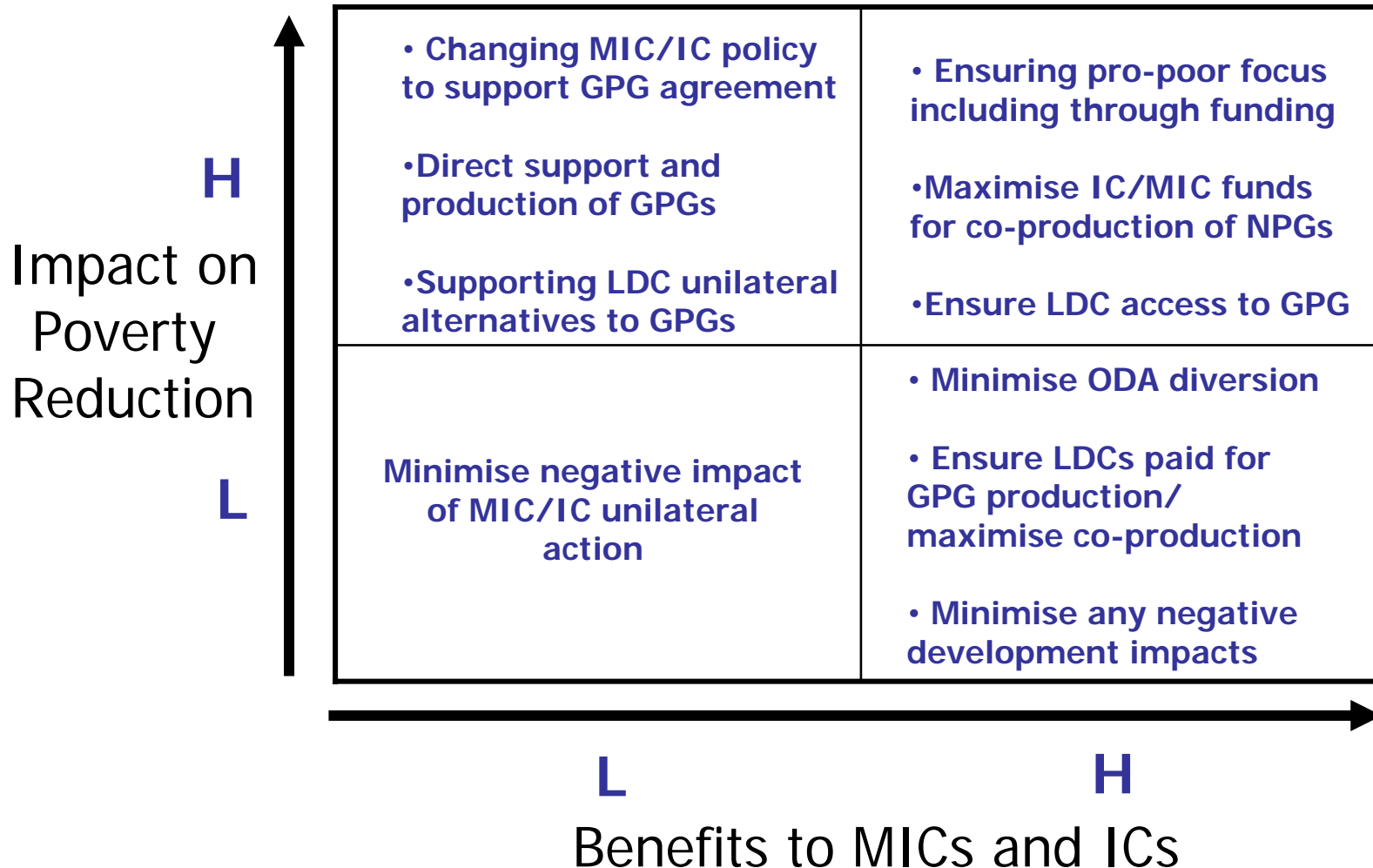
Initial estimate of key GPG benefit distribution



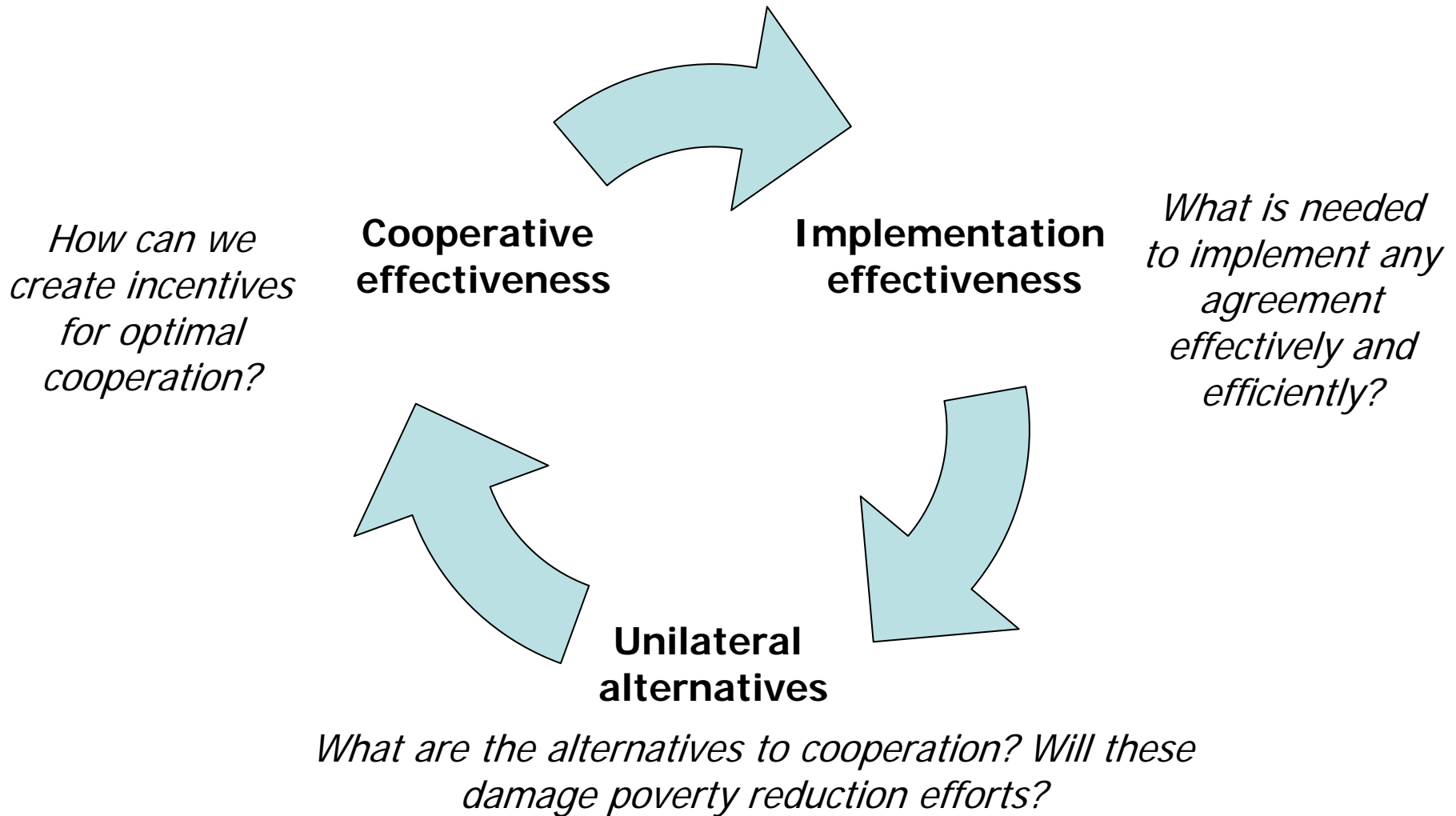
Distribution of benefits largely determines potential cooperative outcome



Development agencies will prioritise different objectives depending on the distribution of GPG benefits



Strategies to create co-operation on GPGs will be based on how factors interact in negotiations



How should Development agencies prioritise action on GPGs?



- Quantitative impact on MDGs and sustained poverty reduction, including longer term risk management benefits
- Areas where developing country interests are under-represented in existing agreements
- Areas where developing countries lack capacity to consume GPGs or can leverage finance for co-production

Need to understand GPGs as a system not just silos

Example: Climate Change

- Climate Stability brings benefits to all countries, but costs of mitigation are borne by MICs/ICs (20 countries = 80% of global emissions)
- LDCs and poor populations in MICs are most vulnerable to climate change, and have least resources to adapt.
- MIC/IC agreement on optimum level of climate stabilisation would be far higher (600ppm?) than one reflecting interests of LDCs and poor populations in MICs (400-450ppm?)
- Primary development agency focus should be to push for tighter stabilisation targets. Also need defensive expenditures on adaptation in LDCs, which should be paid for via non-ODA funds from ICs. Lowest priority is gaining additional funding for mitigation in LDCs, though this has strong co-production benefits with NPGs (e.g. energy security) and delivering MDGs.

How much should the International Community fund GPG production?



- Minimum level is the additional cost above providing optimal levels of national public goods.
- When national capacity is constrained (e.g. in LDCs) may require higher “incentive” payments for production or side payments to obtain agreement.
- Major component of “costs” may arise from including developing country interests in objectives of agreement e.g. stabilisation level for GHG concentrations.

Should invest in areas of high value creation, not focus on cost minimisation (as in GEF)

Past relationship between GPG provision/financing and ODA funding



- Past analysis of increases in GPG funding (e.g. Velde et al 2001) suggested that it was being diverted from ODA spending. However, this analysis conflated GPG spending on biodiversity with spending on national watershed management, and the remaining rises in GPG spending were accounted for by additional pro-poor investment in HIV/AIDs and peacekeeping.
- The subsequent focus on additionality of funding for GPGs led to perverse incentives undermining the production of pro-poor GPGs;
 - A desire for clear GPG funding additionality to ODA resulted in proposals for new vertical funds which cut across the emerging country-based funding approach
 - Failure to identify poverty reduction benefits and co-production opportunities meant that GPG issues were not integrated into national programmes and additional funding was not leveraged for poverty reduction
 - Focus on transfers for GPG production led to strategic gaming by LDCs who systematically undervalued co-production benefits to maximise concessional flows e.g. GEF. This resulted in ineffective implementation and donor withdrawal into unilateral/tied alternatives.

Development agencies should aim to maximise synergies between GPG provision/financing and poverty reduction investment



- Many GPGs do not require significant funding, but cooperative mechanisms, leveraged loan finance (e.g. IF) and public/private mechanisms to stimulate markets.
- Sustained poverty reduction will require both ODA and GPG funding. Development agencies need to understand level of GPG provision required and be prepared to act where critical undersupply exists.
- Development agencies should aim to maximise co-production of GPGs and NPGs by ensuring other departments bid for adequate funding of their GPG objectives e.g. ecosystem services; security
- The synergies and links between GPG production and national development require GPGs to be embedded in sound development approaches. Development agencies should dedicate capacity to working with other departments on the development aspects of all GPGs (including “Economic GPGs”) to prevent negative impacts and ensure effective implementation.

Core messages

- Investment in GPGs is critical for managing growing risks to sustained poverty reduction. More work is needed to define benefits and embed these in resource allocation modelling.
- Effective prioritisation and action requires a focus on the value created by GPGs not cost-minimisation of risks to ODA
- There is a need to engage other departments in all areas to ensure “pro-poor” systems of GPG production as this will not happen automatically
- Large poverty reduction benefits can be gained from enabling LDCs to benefit from additional funds for co-production of GPGs and NPGs and increase their consumption of existing GPGs.

Technical Annex



E3G

Basic Public Good Theory



- Public goods are underprovided because individuals lack the correct incentives to produce them at an optimal level. For “pure” public goods the incentive problems stem from the non-rival and non-excludable characteristics and the assumption of homogeneous nature of actors.
- However, most goods are mixed:
 - Impure Public Goods: partially rival and/or partially excludable
 - Club goods: excludable at cost
 - Co-produced goods: mix of public and private goods
- Standard economic public good theory (Samuelson et al) assumes feasible preference aggregation and equity to simplify the analytical problem.
- Political economy analysis of public goods has always highlighted equity, distributional issues and “indeterminacy” of public good definitions

Defining GPGs and International Public Goods



- *"Global Public Goods are commodities, resources, services and systems of rules or policy regimes which provide substantial cross-border public benefits"*: GPGs/IPGs must provide benefits that flow across international borders (or in the international commons) which are public in having aspects of a non-rival and/or non-excludable nature. This includes pure public goods; impure public goods; club goods; partially excludable goods; and joint products (Binger 2003).
- Public goods is used to describe a range of benefits including:
 - *"provision of direct utility;*
 - *risk reduction (or disutility),*
 - *capacity enhancement."*
- *"Global public goods can generally only be produced in sufficient supply through cooperation and collective action between countries."* GPGs/IPGs are generally undersupplied because no one country has either the incentives or capability to produce them. However, in a world where countries vary greatly in size this is not always the case: for some innovation goods (e.g. HIV vaccine) where national benefits do give adequate incentives; for goods such as global security the US has adequate national benefits to provide a large proportion of this GPG unilaterally.

Distribution of Benefits from GPG Provision



- **National economic benefits:** financial benefits from trade opportunities; lower energy price volatility; climate change damage; innovation protection
- **National welfare benefits:** other non-financial benefits from increased health; reduced duration of conflict; lower crime levels;
- **Global economic benefits:** financial benefits from lower financial risks; lower trade transaction costs/standardisation; reduced incentives for corruption; access to innovation; dynamic innovation improvement.
- **Global welfare benefits:** other non-financial benefits from biodiversity conservation; humanitarian relief; political stability; global disease control.

Unlike the assumptions underlying much National Public Good theory the costs and benefits of consuming and producing GPGs tend to be distributed unevenly, which is key to understanding undersupply

2 ways of looking at GPGs/MDG link

- More efficient substitute for national action on MDGs. Maximise impact of marginal \$ invested over 3 years?
- Creating the long term system conditions for sustainable poverty elimination. Maximise number of “expected poverty-days” reduced over 30 years?

Definition of GPG undersupply can be based on welfare or financial optimisation.



Production - GPG under-provision is falling short of either:

- **Optimal global welfare:** GPG provided so as to maximise global welfare based on Willingness-to-Accept (WTA) and taking into account costs of provision (national public good analogue). For this each country has to optimise its GPG production based on global welfare. No guarantee exists that each country gains from agreement as this depends on distribution of costs and benefits.
- **Pareto optimal outcome:** GPG is provided based on national optimal provision at global Willingness-to-Pay (WTP) for the GPG. In this case the “winners” can potentially provide financial compensation to “losers” to ensure Pareto improvement holds.

GPG Production Taxonomy

- **Threshold Goods:** Total production of GPG is equal to the largest amount of resources devoted to provision e.g. vaccine development; fusion R&D. $GPG = \text{Max}(N_i; N_j; N_k)$ where N is number of countries C in each sub-coalition.
- **Summation Goods:** Total production of GPG is equal to the sum of global resources devoted to provision e.g. climate change; biodiversity protection; trade liberalisation. $GPG = \text{sum}(C \dots C_i)$ where C_i is the resources devoted by each country in coalition.
- **Network Goods:** Total production of GPG is a non-linear combination of national resources, often defined by strength of “weakest link” e.g. financial stability; infectious disease control; organised crime. $GPG = F(C \dots C_i)$ where F is a non-linear function of the impact of particular countries in the coalition C_n .

Economics of Additionality



- Additional value of producing a GPG can be defined as the additional benefits available from international cooperation compared to optimal provision of national public goods in all countries.
- For summation and network goods the global optimum may require higher provision in some countries than the national optimum (Global marginal benefits > National marginal benefits)
- For threshold goods sufficient levels of cooperation will always make national contributions optimal as it increases national marginal benefits.

Conditions for effective cooperation



- **Core agreement:** the size of agreement between sufficient critical cooperating countries needed for optimal supply of the GPG given the specific production technology.
- **Profitability:** that all countries gain from agreeing to provide a GPG (Additional Benefits > Additional Costs)
- **Stability:** no country can gain by leaving an agreement to provide a GPG given the reaction of remaining countries to this defection

Profitability

Countries will only cooperate when they of positive net benefits from the agreement to produce a GPG by:

- **Direct funding/transfers:** biodiversity protection; organised crime
- **Differentiation of targets/obligations:** climate change; trade;
- **Bundles with other issues:** financial stability with IFI lending; IPR protection with trade liberalisation
- **Lowering ambition of GPG agreement** or delivery of benefits to non-paying parties

Without equity principles GPG agreements at best are Pareto Optimal with side payments



- Best outcome of international agreement on GPG production is Pareto Optimal with side payments, where winners compensate losers
- If benefits are mainly welfare gains in DCs this will be sub-optimal compared to global welfare optimal solution as Ability-to-Pay differs
- Need to supplement agreement with equity provisions to achieve optimality (“common and differentiated responsibility “etc)
- LDCs can leverage fairer outcome by blocking agreement if critical to GPG production, but risk costs of no agreement or other countries agreeing a partial or unilateral solution.

Stability

- Much harder to achieve theoretically than profitability – “exit” includes non-compliance with obligations (Barrett, Carrero)
- Self-enforcing stability unlikely for large numbers of countries (above 10) if no institutional mechanisms to assess performance. Stability is higher with small number of large power blocks who can develop a strategic understanding of each other’s reaction functions.
- Monitoring and credible sanctions can reduce strategic gaming:
 - Trade sanctions
 - Agreement collapses on withdrawal (quid-pro-quo game)
 - Linked or repeated games increase stability
- Withdrawal happens less often than game theory predicts, due to reputational effects