A global or a partial climate agreement – what difference does it make?

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Introduction

The work of the EMF22 demonstrated the consequences for the world's climate and for the energy system costs of having certain regions of the world entering the mitigation efforts at a late stage (e.g. Clarke et al. 2009, Loulou et al. 2009, and Russ and van Ierland 2009).

This paper explores different scenarios concerning future climate agreements to better understand the climatic and economic effects of different types of climate agreements. This analysis will shed light on the following questions:

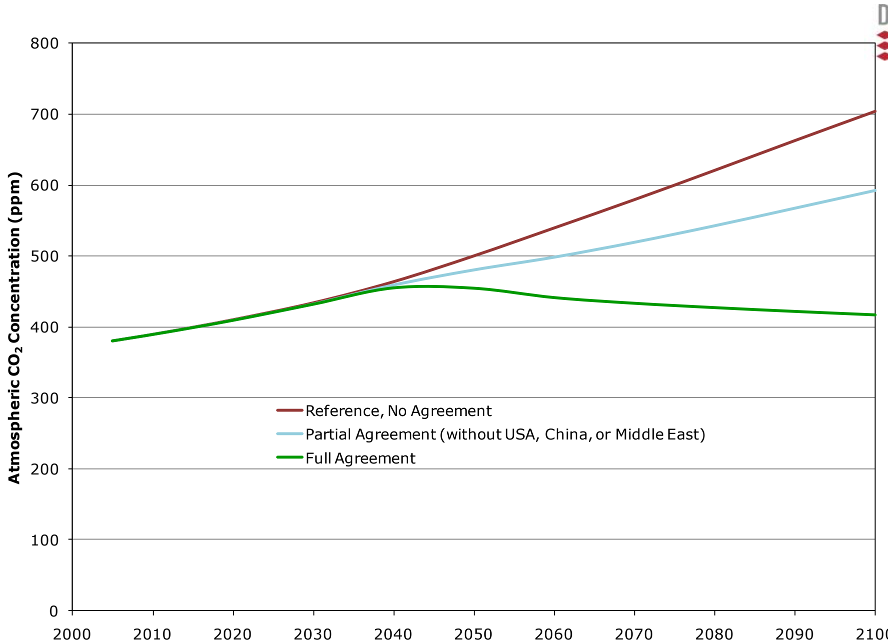
Is it possible to achieve atmospheric stabilisation of greenhouse gases such that the global mean temperature increase does not exceed 2° C if the USA, China, and the Middle East do not participate in a global policy?

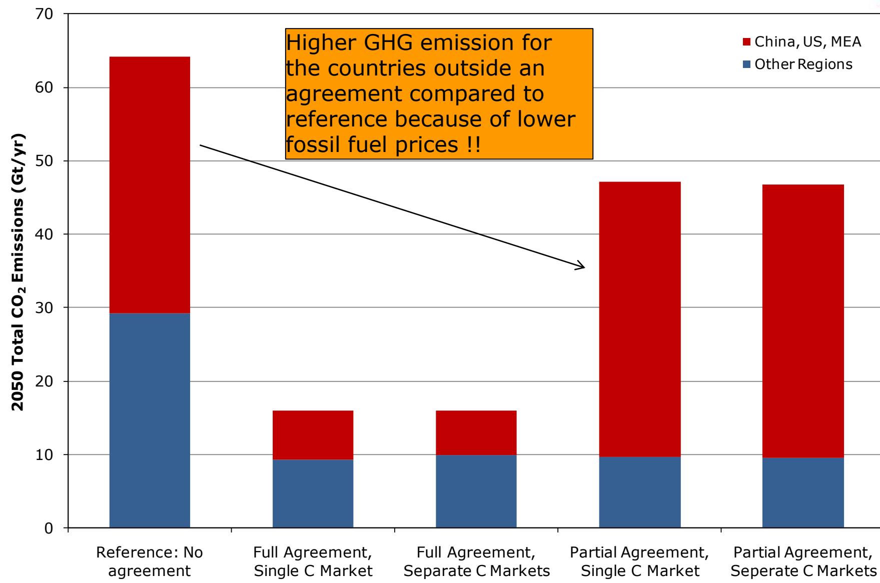
Would a separate carbon market for developed and developing countries (versus a single common market) be as effective at meeting the climate stabilisation targets?

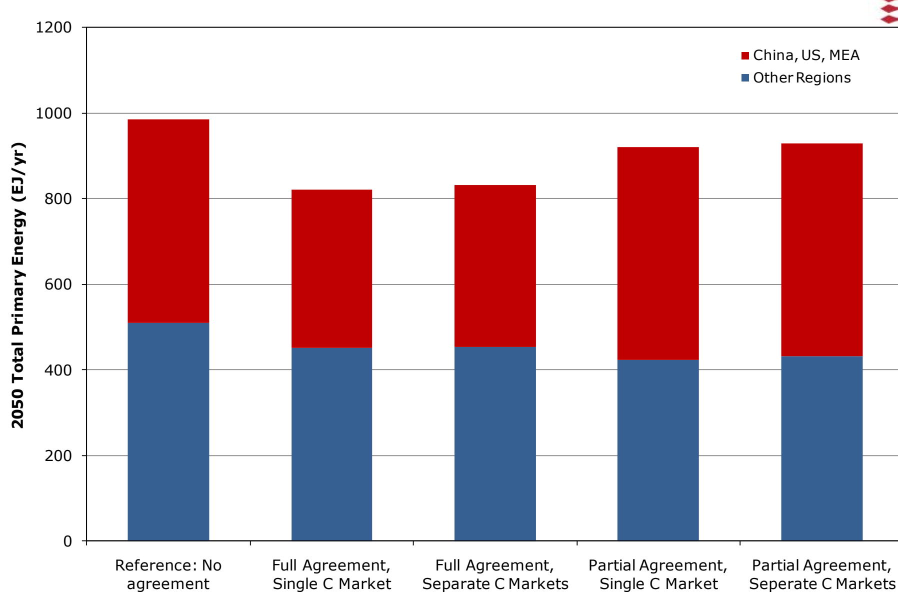
Scenarios

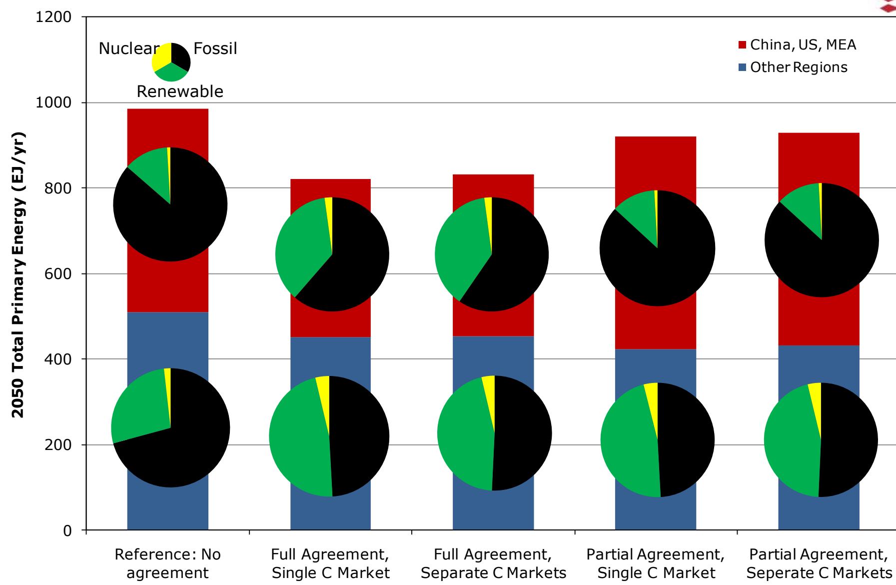
Reduction in 2050

	Industrialised countries		Developing countries	
	USA	**Other**	**Other**	**MEA, China**
Reference scenario	No climate agreement			
Global agreement	-80%		-50%	
Global cost optimal	-80%(IND) -50%(DEV)			
Partial agreement	No reduction targets	-80%	-50%	No reduction targets
Partial cost optimal		-80%(IND_{other}) -50%(DEV_{other})		

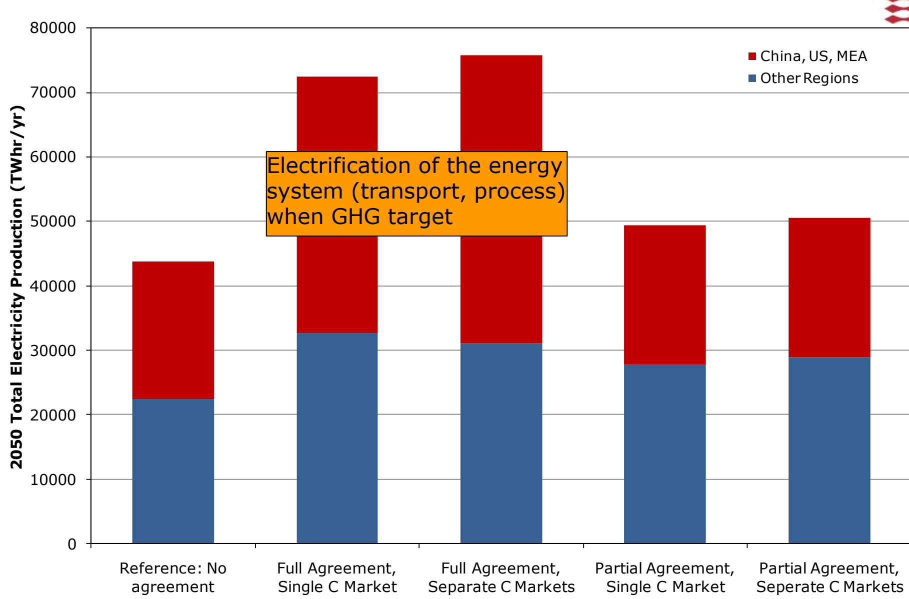



Higher GHG emission for the countries outside an agreement compared to reference because of lower fossil fuel prices !!
China, US, MEA
Other Regions
2050 Total CO_2 Emissions (Gt/yr)
70
60
50
40
30
20
10
0
Reference: No agreement
Full Agreement, Single C Market
Full Agreement, Separate C Markets
Partial Agreement, Single C Market
Partial Agreement, Seperate C Markets

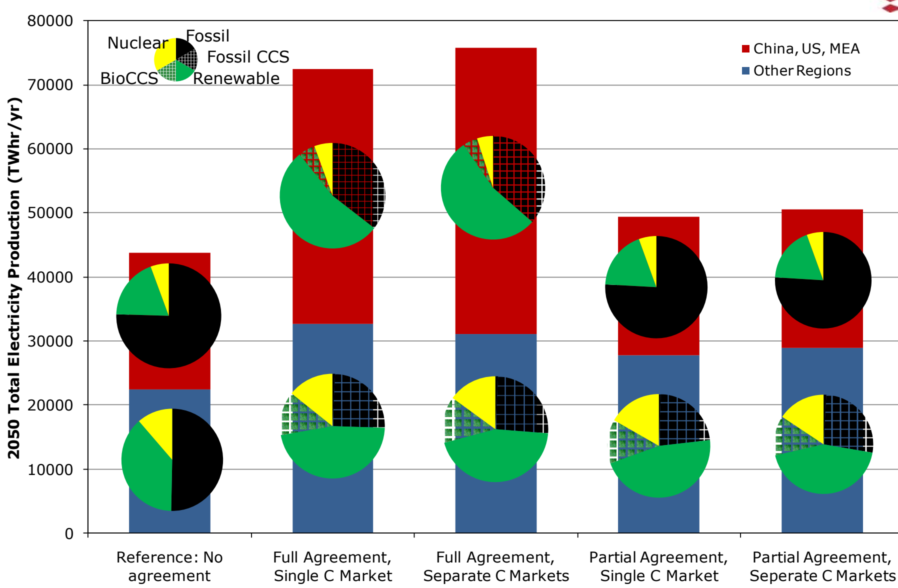

China, US, MEA
Other Regions
2050 Total Primary Energy (EJ/yr)
1200
1000
800
600
400
200
0
Reference: No agreement
Full Agreement, Single C Market
Full Agreement, Separate C Markets
Partial Agreement, Single C Market
Partial Agreement, Seperate C Markets



2050 Total Primary Energy (EJ/yr)
1200
1000
800
600
400
200
0
Nuclear
Fossil
Renewable
China, US, MEA
Other Regions
Reference: No agreement
Full Agreement, Single C Market
Full Agreement, Separate C Markets
Partial Agreement, Single C Market
Partial Agreement, Seperate C Markets



2050 Total Electricity Production (TWhr/yr)
80000
70000
60000
50000
40000
30000
20000
10000
0
China, US, MEA
Other Regions
Electrification of the energy system (transport, process) when GHG target
Reference: No agreement
Full Agreement, Single C Market
Full Agreement, Separate C Markets
Partial Agreement, Single C Market
Partial Agreement, Seperate C Markets



Increase in Total Discounted System Costs compared to the Reference Scenario

	Global Agreement	Partial Agreement
Single Market	9.7%	2.6%
Separate Markets	10.0%	2.6%

Discussion

The failure to include USA, China, and the Middle East in an international climate agreement has serious implications for the global climate. The Chinese economy is growing fast, and China is becoming an increasingly important player in the global economy, world politics, and in the competition for energy and resources. USA, as the richest country in the world, is a large consumer of goods and energy. Oil production in USA has peaked, and the country is heavily dependent on import of fossil fuels. The Middle East has the largest reserves of oil and gas in the world and therefore has little incentive to reduce consumption or support a global climate agreement.

Looking at results for the partial agreement case, it is clear that a lower demand for fossil fuels from countries within an agreement will reduce the price on fossil fuels for the countries outside the agreement. This leads to a higher consumption of fossil fuels in these countries than in the scenario with no climate policy at all.

A possible solution to avoid the increased use of fossil fuels in the non-participating countries could be an embargo, or high export taxes, on fossil fuel trade with the non-participating countries. However, as the Middle East has the largest estimated oil resources in the world, a trade embargo would mainly have an effect on the coal market. Furthermore, the political feasibility of such a solution must be considered low, even though a so-called border adjustment tax has already been discussed in the EU.