INTRODUCTION

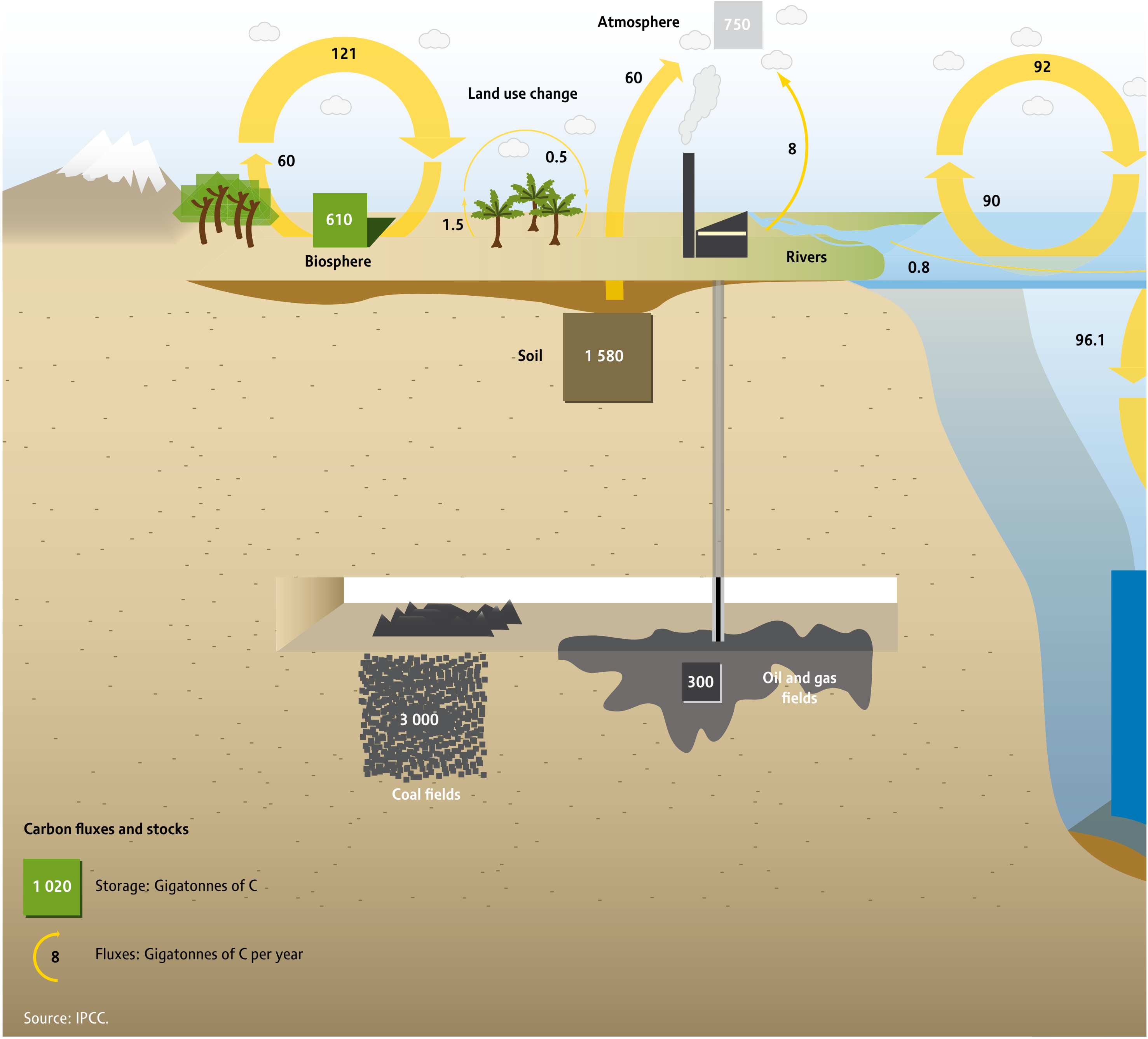
Of all the Green carbon captured annually in the world, that is the carbon captured by photosynthetic activity, over half (55%) is captured by marine living organisms (Falkowski *et al.*, 2004; Arrigo, 2005; González, *et al.*, 2008; Bowler, 2009; Simon *et al.*, 2009). This oceanic carbon cycle is dominated by micro-, nano-, and picoplankton, including bacteria and archaea (Burkill, 2002). Even though plant biomass in the oceans is only a fraction of that on land, just 0.05%, it cycles almost the same amount of carbon each year (Bouillon *et al.*, 2008; Houghton, 2007); therefore representing extremely efficient carbon sinks. However, while increasing efforts are being made to slow degradation on land, such as through protection of rainforests as a means to mitigate climate change, the role of marine ecosystems has to date been largely ignored.

Knowledge of the role of natural ecosystems in capturing CO_2 is an increasingly important component in developing strategies to mitigate climate change. Losses and degradation of natural ecosystems comprise at least 20–30% of our total emissions (UNEP, 2008a; 2009). While overall emissions from the burning of fossil fuels needs to be severely reduced, mitigating climate change can also be achieved by protecting and restoring natural ecosystems (Trumper *et al.*, 2009). Even from a narrow perspective of emission reductions alone, they can play a significant role. As steep reduction of fossil fuel emissions may compromise the development potential of some countries, it is critical that options are identified that can help mitigate climate change with neutral or even positive impacts on development. It is therefore absolutely critical to identify those natural ecosystems that contribute most to binding our increasing emissions of carbon or CO_2 and enhance this natural capacity (Trumper *et al.*, 2009). Some of these are in the oceans.

Some 93% of the earth's carbon dioxide – 40Tt CO_2 – is stored in the oceans. In addition, oceans cycle about 90 Gt of CO_2 yr^{-1} (González *et al.*, 2008), and remove over 30% of the carbon released to the atmosphere.

Resilient aquatic ecosystems not only play a crucial role in binding carbon, they are also important to economic development, food security, social wellbeing and provide important buffers against pollution, and extreme weather events. Coastal zones are of particular importance, with obvious relations and importance to fisheries, aquaculture, livelihoods and settlements (Kay and Alder, 2005) – over 60% of the world's population is settled in the coastal zone (UNEP, 2006, 2008b). For many coastal developing countries, the coastal zone is not only crucial for the wellbeing of their populations, it could also, as documented in this report, provide a highly valuable global resource for climate change mitigation if supported adequately.

This report explores the potential for mitigating the impacts of climate change by improved management and protection of marine ecosystems and especially the vegetated coastal habitat, or blue carbon sinks.


Atmosphere
750
121
60
Land use change
0.5
1.5
60
8
92
90
610
Biosphere
Rivers
0.8
96.1
Soil
1 580
3 000
Coal fields
300
Oil and gas fields
Carbon fluxes and stocks
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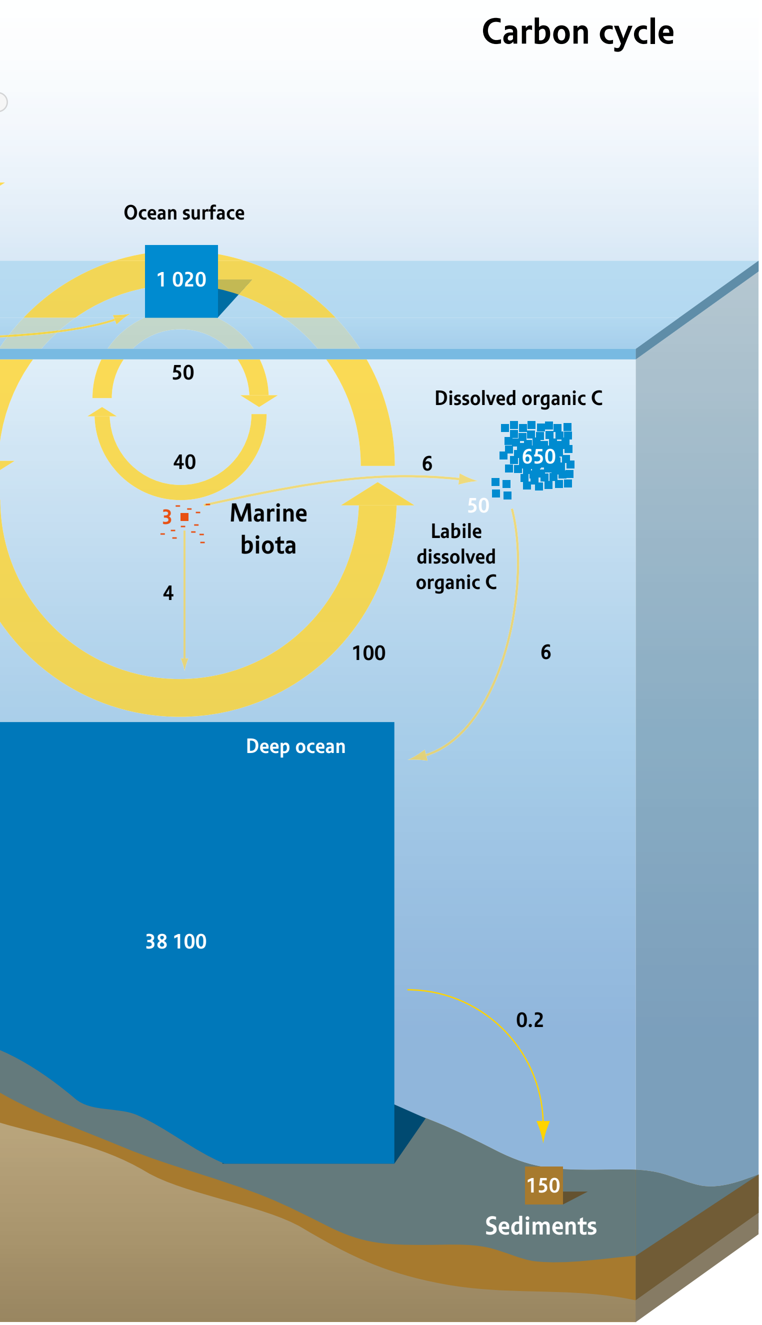
Storage: Gigatonnes of C
8
Fluxes: Gigatonnes of C per year
Source: IPCC.



Definition: Measuring Carbon

Units of Carbon used. This report will use Tg C, but readers will also see values for C and CO_2, provided in a wide range of formats. The following information may assist in wider reading.

Name	Factor	Symbol
One thousand	10^3	k (Kilo)
One million	10^6	M (Mega)
One billion	10^9	G (Giga)
One trillion	10^{12}	T (Tera)
	10^{15}	P (Peta)

$1 km^2$ = 100ha
1 ton = 2,240lbs
1 (metric) ton = 1,000kg or $1x10^6$g
Blue carbon sinks capture CO_2 through photosynthesis from the air and water and store it as carbon.

The rate of converting C to CO_2 is 44/12; i.e. 1 aton of C is equivalent to 3.67t CO_2

← **Figure 1: Carbon Cycle.** Oceans are crucial in the global carbon cycle. It was here where life first evolved; they are the source of our wealth and development. The living oceans capture over half of all the Green carbon – the carbon bound by living organisms through photosynthesis.