

# Briefing

## Climate change, poverty and environmental justice

### What the IPCC scientists say about climate change impacts

This briefing summaries many of the findings of the Intergovernmental Panel on Climate Change (IPCC) Working Group 2<sup>1</sup> report on climate impacts, published on 31<sup>st</sup> March 2014. It refers to impacts at different possible future temperature rises, and highlights some of the significant co-benefits resulting from action to reduce carbon pollution.

It is still possible to keep global temperature rises below 2°C (compared to pre-industrial times) although it will take significant effort to do so, particularly in achieving rapid, deep and sustained cuts in dirty energy (the fossil fuels coal, gas and oil) .

Developed countries are not only failing to significantly reduce their use of fossil fuels but they are also failing to fulfil their legal, moral and political obligations to provide the substantial, new and additional public finance for developing countries to grow cleanly. Where finance transfers do occur they are often existing aid commitments repackaged as climate finance or debt creating loans or used to facilitate their corporations to dominate - making the likelihood of substantial investments in infrastructure and technology for adaptation and mitigation that will benefit the poor unlikely.

It is therefore not surprising that the current pathway is for 4°C warming or more.

As this briefing makes clear, warming of even 2°C degrees will have significant negative consequences, particularly for the poorest in the world. 4°C degrees warming would be utterly devastating.

The briefing first summarises how climate change disproportionately impacts the poorest (those who have done least to cause climate change). It then identifies impacts on food, health and ecosystems. And it finishes by briefly summarising the IPCC findings on limits to adaptation and their warnings on pursuing excessive bioenergy. Friends of the Earth's conclusions are at the end.

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For more than 40 years we've seen that the wellbeing of people and planet go hand in hand – and it's been the inspiration for our campaigns. Together with thousands of people like you we've secured safer food and water, defended wildlife and natural habitats, championed the move to clean energy and acted to keep our climate stable. Be a Friend of the Earth – see things differently.

## The poorest will suffer from climate change and poverty will increase

Estimates suggest over one billion people currently live under \$1.25/day and a second billion between \$1.25 and \$2.<sup>2</sup> The top twenty per cent of the world's population receive four-fifths of the world's income whereas the bottom twenty per cent have 1%. The IPCC report states that *"within-country inequality is rising in Asia, especially China...and income inequality is rising in many fast growing LICs [low income countries] and MICs [middle income countries] and HICs [high income countries]."*<sup>3</sup> This is the context within which climate change is playing out.

The report is clear that the poorest in society will be hurt most by climate change.

It says that *"People who are socially, economically, culturally, politically, institutionally, or otherwise marginalized in society are often highly vulnerable to climate change and climate change responses"*<sup>4</sup>. In contrast *"privileged members of society can benefit from climate change impacts and response strategies, due to their flexibility in mobilizing and accessing resources and positions of power, often to the detriment of others."*<sup>5</sup>

Women, children and the elderly are particularly at risk, for example: *"women often experience additional duties as labourers and caregivers as a result of extreme weather events and climate change...while facing more psychological and emotional distress, reduced food intake, adverse mental health outcomes due to displacement, and in some cases increasing incidences of domestic violence."*<sup>6</sup>

Rapid urbanisation and associated poverty is also creating additional vulnerable communities leading to the *"expansion of highly vulnerable urban communities living in informal settlements, many of which are on land exposed to extreme weather"*<sup>7</sup>.

The report makes clear that poor people don't have the resources to rebound from extreme weather events (which will increase as a result of climate change). It states that *"urban and rural transient poor who face multiple deprivations can slide into chronic poverty as a result of extreme events, or a series of events, when unable to rebuild their eroded assets"*<sup>8</sup>

Climate change, particularly the extreme levels that will result from business as usual fossil fuelled economies, will lead to greater poverty. *"Climate change will create new poor between now and 2100, in low, medium, and high-income countries... [it will] slow down economic growth and poverty reduction, further erode food security, and trigger new poverty traps, the latter particularly in urban areas and emerging hotspots of hunger."*<sup>9</sup>

Some of the poorest countries of the world will not be able to adapt to anything but the lowest levels of global warming – which requires rapid, deep and sustained cuts in carbon pollution. For example: *"a study of response options in Sub-Saharan Africa identified some scope for adapting to climate change associated with a global warming of 2°C above pre-industrial levels, given substantial investment in institutions, infrastructure, and technology, but was pessimistic about the prospects of adapting to a world with 4°C of warming."*<sup>10</sup>

## Food

The effects of climate change on crop and food production are already evident in several regions of the world, even with relatively low levels of warming compared to the 'business as

usual' trajectory (0.8 degrees warming to date, over 4 degrees possible by 2100). The report states *"negative impacts of climate trends have been more common than positive ones"*<sup>11</sup>.

Climate change is expected to further damage crop productivity as warming increases. The report states that *"with or without adaptation, negative impacts on average yields become likely from the 2030s with median yield impacts of 0 to -2% per decade projected for the rest of the century and after 2050 the risk of more severe impacts increases"*<sup>12</sup>. This decline is within the context of a growing global population.

The risks to food production are not spread evenly, *"Risks are greatest for tropical countries, given projected impacts that exceed adaptive capacity and higher poverty rates compared with temperate regions"*<sup>13</sup>.

The report is also clear that not all the impacts from future extremes are easy to predict, particularly the combination of impacts. For example, *"crop yields have a large negative sensitivity to extreme daytime temperatures around 30°C [and] interactions among CO<sub>2</sub> and ozone, mean temperature, extremes, water, and nitrogen are non-linear and difficult to predict"*<sup>14</sup>. In other words, the impact on crop productivity could be much worse than currently stated.

Not surprisingly allowing global temperatures to increase to 4 degrees centigrade or above pre-industrial times brings extreme risks. The report states *"Under scenarios of high levels of warming, leading to local mean temperature increases of 3-4°C or higher, models based on current agricultural systems suggest large negative impacts on agricultural productivity and substantial risks to global food production and security."*<sup>15</sup> The proportion of land exposed to drought disaster is expected to increase from 15% currently *"to 44+/-6% by 2100, based on a range of projections including some that reach or exceed 4°C global warming"*<sup>16</sup>.

Fisheries will also be damaged and changed due to climate change and ocean acidification. The report states that *"The progressive redistribution of species and the reduction in marine biodiversity in sensitive regions and habitats puts the sustained provision of fisheries productivity and other ecosystem services at risk"* and *"Socioeconomic vulnerability is highest in developing tropical countries, leading to risks from reduced supplies, income, and employment from marine fisheries."*<sup>17</sup>

But it isn't only higher temperatures that threatens food production. For example:

- Winter chill is important to some perennial crops and could lead to a decline in productivity of 17.7% to 22.6 % in Egypt by 2050<sup>18</sup>.
- Pest, weed, and disease impacts are omitted from most yield projections but are expected to increase for some pests although decline for others, but with *"a tendency for risk of insect damage to plants to increase."*<sup>19</sup>

## Health

Climate change is already contributing to human ill-health – heat, changes in water-borne diseases, food stress. The report makes clear *"the present world-wide burden of ill-health from climate change is relatively small compared with effects of other stressors"*<sup>20</sup> and that

until mid-century the impact of climate change will primarily be “*exacerbating health problems that already exist*”. But across the 21<sup>st</sup> century as a whole climate change “*will lead to increases in ill-health in many regions, as compared to a baseline without climate change*”. In other words, in the second-half of the century climate change will not only exacerbate illnesses but will lead to many more illnesses. Globally any positive impacts from climate change will be outweighed by the magnitude and severity of negative impacts it says.<sup>21</sup>

Again the impacts are not expected to be evenly spread: “*Risks are unevenly distributed and are generally greater for disadvantaged people and communities in countries at all levels of development.*”<sup>22</sup>

In a business as usual scenario some of the world’s land area will be experiencing 4-7 degree higher temperatures by 2100 over land which will “*compromise normal human activities, including growing food or working outdoors, raising doubt about the habitability of some areas, for parts of the year.*”<sup>23</sup>

The report quoted one study that suggested “*global labour productivity will be reduced during the hottest months to 60% in 2100 and less than 40% in 2200...[with] tropical and mid-latitude regions including India, Northern Australia, South-eastern USA...particularly badly affected.*”<sup>24</sup>

Extreme weather is predicted to increase with climate change. The report stated that “*it has been estimated conservatively that around 2.8 billion people were affected by floods between 1980-2009, with over 500,000 deaths*” going on to say “*it is very likely that health losses caused by storms and floods will increase this century if no adaptation measures are taken*” and quoted a modelling study that suggested “*in the 84 developing countries [modelled], an additional 52 million people and 30,000 km<sup>2</sup> of land were projected to be affected by 2100.*”<sup>25</sup>

Water shortages will also increase:

- The report states “*approximately 80% of the world’s population already suffers serious threats to its water security*”<sup>26</sup> and “*each degree of warming is projected to decrease renewable water resources by at least 20% for an additional 7% of the global population*”.
- The percentage of global population living in river basins with new or aggravated water scarcity is projected to increase with global warming, from 8% at 2°C to 13% at 5°C<sup>27</sup>.
- The number of people with significantly decreased access to renewable groundwater resources is projected to be roughly 50% higher under a high emissions business as usual scenario compared to a low emissions scenario.
- “*About 150 million people currently live in cities affected by chronic water shortages and by 2050, unless there are rapid improvements in urban environments, the number will rise to almost a billion.*”<sup>28</sup>
- Further climate change also brings “*risk of loss of rural livelihoods and income due to insufficient access to drinking and irrigation water and reduced agricultural productivity, particularly for farmers and pastoralists with minimal capital in semi-arid regions.*”<sup>29</sup>

The report also suggests *“high ambient CO<sub>2</sub> concentrations in the atmosphere will affect human health by increasing the production and allergenicity of pollen and allergenic compounds and by decreasing nutritional quality of important food crops”*.<sup>30</sup>

## Ecosystems

Humans depend on healthy ecosystems for the services they provide, such as food provision, water purification by wetlands, removal and sequestration of carbon dioxide by forests, crop pollination by insects, coastal protection by mangroves and coral reefs, regulation of pests and diseases, and recycling of waste nutrients.<sup>31</sup>

The report notes that *“the planet’s biota and ecosystem processes were strongly affected by past climate changes at rates of climate change lower than those projected during the 21st century under high warming scenarios”*<sup>32</sup> and *“the paleoecological record and models provide high confidence that it will be difficult or impossible to maintain many ecological systems in their current states if global warming exceeds 2 to 3°C”*<sup>33</sup>

In other words we are going to damage the ecosystems we rely on, the question is how much damage we will inflict, which is tied to how much warming we allow.

Unless carbon pollution is reduced rapidly and deeply to follow a low emissions scenario *“Many species will be unable to move fast enough during the 21st century to track suitable climates”*<sup>34</sup> and *“a large proportion of species are projected to be at increased risk of extinction”*<sup>35</sup>, with only mitigation scenarios in the most stringent category able to *“maintain moderately healthy coral reefs.”*<sup>36</sup>

Increased tree mortality and associated forest dieback is projected to occur in many regions over the 21st century, says the report, due to increased temperatures and drought, *“forest dieback poses risks for carbon storage, biodiversity, wood production, water quality, amenity, and economic activity”*<sup>37</sup>.

The different responses to species to climate change also matter due to relationships and dependencies between them, for example between pollinators (including honeybees) and flowering plants. This is illustrated by a study in Illinois, USA, which found the pattern of which plants were pollinated by which bees were altered by differing rates of phenological shifts and landscape changes over 120 years, with 50% of bee species becoming locally extinct<sup>38</sup> Pollination is critical for the food supply as well as for overall environmental health (its value has been estimated globally at \$350 billion for the year 2010).<sup>39</sup>

Importantly the report also confirmed the finding in the previous IPCC report in 2007 that approximately 20-30% of the plant and animal species assessed are at increasing risk of extinction as global mean temperatures exceed a warming of 2-3°C above pre-industrial levels. The new report stated that all model-based analyses since this date *“broadly confirm this concern, leading to high confidence that climate change will contribute to increased extinction risk for terrestrial and freshwater species over the coming century”*.<sup>40</sup>

The lowest rates of projected climate change, which can only be achieved through a rapid reduction in fossil fuel use, would *“allow most species to track climate towards the end of the century.”*<sup>41</sup>

But at higher warming scenarios there is high risk of *“abrupt and irreversible regional-scale change in the composition, structure and function of terrestrial and freshwater ecosystems, especially in the Amazon and Arctic, leading to substantial additional climate change.”*<sup>42</sup>

Adaptation can have some limited impact, for example *“large reductions in deforestation, as well as wider application of effective wildfire management, lower the risk of abrupt change in the Amazon, as well as the impacts of that change”,* but *“adaptation measures will be unable to prevent substantial change in the boreal-arctic system”*<sup>43</sup>.

## Adaptation

For the first time the WG2 report put a lot of emphasis on the need to adapt to a changing climate. But the critical question of how much climate change humans can adapt to was not answered. This was partly because of a lack of literature but also because how much is willing to be lost – in terms of human lives, wellbeing or species and ecosystems - is an ethical decision not a scientific one. The report says *“adaptation is fundamentally an ethical issue because the aim of adaptation is to protect that which we value.”*<sup>44</sup>

The report stated that *“there is little evidence to either substantiate or refute the idea that global mean warming beyond 2°C represents a global adaptation limit”*<sup>45</sup> because *“there is a lack of empirical evidence to quantify magnitudes of climate change that would constitute a future adaptation limit”*.

It also stated that *“recent literature suggests that incremental adaptation may not be sufficient to avoid intolerable risks, and therefore transformational adaptation may be required to sustain some human and natural systems”*.<sup>46</sup>

However, whilst the scientists felt unable to identify a hard limit to adaptation they did make it clear that risks, even high risks, cannot be removed through adaptation. For example they state that *“in Africa, there are much greater impacts upon crop productivity, freshwater resources, and ecosystems at [a global average warming of] 4°C than 2°C with adaptation failing to reduce risk below a ‘high’ level at 4°C (‘very high’ for crop productivity)”*<sup>47</sup>.

They state that even with 2°C warming adaptation cannot eliminate risks in Africa *“Of nine climate-related key regional risks identified for Africa, eight pose medium or higher risk even with highly adapted systems, while only one key risk assessed can be potentially reduced with high adaptation to below a medium risk level, for the end of the 21st century under 2°C global mean temperature increase above pre-industrial levels. Key regional risks relating to shifts in biome distribution, loss of coral reefs, reduced crop productivity, adverse effects on livestock, vector- and water-borne diseases, under-nutrition, and migration are assessed as either medium or high for the present under current adaptation, reflecting Africa’s existing adaptation deficit. The assessment of significant residual impacts in a 2°C world at the end of the 21st century suggests that even under high levels of adaptation, there could be very high levels of risk for Africa”*.<sup>48</sup>

In other words, if the lives and livelihoods of Africans (and others around the world) are valued it will be necessary to keep global temperatures to below 2°C warming.

*“The theory and the evidence indicate that adaptation cannot generally overcome all climate change effects”*<sup>49</sup> the report states.

To further indicate the threats from a 4°C world the report identified some of the potential impacts from this 'business as usual' temperature:

- Large increases in water stress, groundwater supplies, and drought in a number of regions with >4°C warming, and decreases in others, generally placing already arid regions at greater water stress.
- Risks of large-scale singular events such as ice sheet disintegration, methane release from clathrates, and onset of long-term droughts in areas such as southwest North America
- the near-complete loss of the Greenland ice sheet over a millennium or more, causing a global mean sea-level rise of up to 7 m (current estimates indicate a threshold is greater than about 1°C but less than about 4°C)
- The Atlantic Meridional Overturning Circulation (Gulf Stream) is considered *very likely* to weaken over the 21st century, with a best estimate of 34% loss under a high emissions 4°C scenario.
- The release of CO<sub>2</sub> or CH<sub>4</sub> to the atmosphere from thawing permafrost carbon stocks over the 21st century is in the range of 180 to 910 GtCO<sub>2</sub> for a high emissions 4°C scenario. The latter of which is broadly equivalent to the likely total global emissions between 2000 and 2020.
- A combination of high temperatures and high humidity in some areas for parts of the year will compromise normal human activities, including growing food or working outdoors
- Above 4°C local warming, risks for food security become very significant
- Some models project large increases in fire risk in parts of the world.
- widespread coral reef mortality is expected with significant impacts on coral reef ecosystems
- a high risk of extensive loss of biodiversity with concomitant loss of ecosystem services

Given this evidence it is not surprising that many governments, commentators, researchers and civil society argue that adaptation to 2 °C rise is hard enough because much of value will be lost, but adaptation to 4 °C simply is not possible. Indeed 100 developing countries - including those from Africa, the most vulnerable small islands and the world's poorest countries - together with much of global civil society argue that the focus must be on avoiding 1.5°C warming and that carbon pollution limits must be set to give a very high likelihood of not breaching 2°C.

### **Adaption tools and costs**

The report states that *“Global adaptation cost estimates are substantially greater than current adaptation funding and investment, particularly in developing countries, suggesting a funding gap and a growing adaptation deficit. The most recent global adaptation cost estimates suggest a range from \$70 billion to \$100 billion per year globally by 2050, but there is little confidence in these numbers. The evidence base is limited and there is strong evidence of important omissions”*<sup>50</sup>. *“Extreme events, a potential source of large adaptation costs, are not properly covered”* nor are *“costs in ecosystem services, energy, manufacturing, retailing and tourism.”*<sup>51</sup> Estimates of expenditure on adaptation was order of magnitudes lower than necessary at *“\$244 million [2011]), and in 2012 estimated at \$395 million.”*<sup>52</sup>

Much of the funding requirement is in developing countries, with the report citing figures for water, “globally, to maintain water services at non-climate change levels to the year 2030 in more than 200 countries, total adaptation costs for additional infrastructure were estimated as US\$531 billion, with US\$451 billion (85%) required in developing countries, mainly in Asia and Africa”<sup>53</sup>

Technology transfer to developing countries is also seen as essential. The report cites report on a Technology Needs Assessments carried out in developing countries which lists about 165 technological needs related to mitigation and adaptation. The report found that “in many of these cases patents and other intellectual property protection constrain technology transfer.” It recommended the use of patent buy-outs, patent pools, compulsory licenses and other open source approaches<sup>54</sup>.

The report also identified formal insurance schemes as important – such as micro-insurance and weather index insurance - in addition to informal strategies such as “risk spreading, social networks, local credit, asset markets, and dividing herds between kin act as informal risk management mechanisms”. Without insurance poorer people are forced to “invest in low-risk, low-return livelihood activities, which makes asset accumulation to escape chronic poverty very difficult”.<sup>55</sup>

## Mitigation

The IPCC Working Group 3 will report on mitigation options, however the WG2 report issues some warnings about some mitigation options that done badly can exacerbate poverty and other problems, notably bioenergy and biofuels. For example:

- Biofuel production is projected to increase water consumption significantly in some countries (e.g. Germany, Italy and South Africa), and to exacerbate the already serious water scarcity in others (e.g. Spain and China)<sup>56</sup>
- Biofuel production, often linked to transnational large-scale land acquisitions, raises two major livelihood and poverty concerns: food price increases and dispossession of land. The report states that “there is growing apprehension that increased competition for scarce land undermines women’s access to land and their ability to benefit economically from biofuel investment...[the] greatest risk for negative outcomes [is] for smallholders in Africa.”<sup>57</sup>
- Widespread transformation of terrestrial ecosystems in order to mitigate climate change, such as carbon sequestration through planting fast-growing tree species into ecosystems where they did not previously occur, or the conversion of previously uncultivated or non-degraded land to bioenergy plantations, will lead to negative impacts on ecosystems and biodiversity.<sup>58</sup>

It is also likely that the Working Group 3 report will also identify that many bioenergy and biofuel options do not reduce carbon pollution and may even exacerbate it.

But mitigation can bring co-benefits, and action to address other issues can benefit mitigation, for example:<sup>59</sup>



- Improving energy efficiency and shifting to cleaner energy systems can reduce local emissions of health-damaging and climate-altering air pollutants from energy systems, as well as cutting greenhouse gas emissions.
- Shifting consumption away from animal products, especially from ruminant sources, in high-meat consumption societies toward less-intensive healthy diets, also cutting greenhouse gas emissions
- Designing transport systems that promote active transport and reduce use of motorized vehicles, leading to lower emissions and better health through improved air quality and greater physical activity.
- Meeting unmet demands for access to reproductive health services (including modern family planning) improves child and maternal health but also reduces future emissions of greenhouse gases. The report cited one study showed that emissions could be lower by 30% by 2100 if access to contraception was provided to those women expressing a need for it. Providing the unmet need for these services in areas such as the Sahel region of Africa that has both high fertility and high vulnerability to climate change can also potentially significantly reduce human suffering as climate change proceeds.<sup>60</sup>

## Conclusions

Climate change is already having a negative impact on humans and ecosystems. Some further warming cannot be avoided. The choice we have in front of us is to work towards preventing climate change increasing to 2 degrees or more or to accept higher levels of warming. At its heart this is an ethical choice. If we value the lives and livelihoods of the poorest in the world (in developed and developing countries), and if we value ecosystems and other species, we must rapidly and deeply cut the use of dirty energy such as coal, gas and coal in order to avoid 2 degrees warming.

Even if we prevent 2 degrees warming much more effort is needed on adaptation. The funds spent today are orders of magnitude less than required. Wealthy countries must fund adaptation in poorer countries.

But it is clear from the IPCC WG2 report that we are kidding ourselves if we think we can adapt to 4 degrees warming. We can't.

A rapid transition to a low carbon economy is possible. Doing so will bring many co-benefits. It's time to embrace this change, it is positive change.

**References** - All references are to the IPCC WG2 report as published 31<sup>st</sup> March 2014 unless otherwise stated. SPM refers to the Summary for Policy Makers.

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<sup>1</sup> A summary of the earlier Working Group 1 report by the IPCC on the physical basis of climate change is available at: Friends of the Earth (2013), Climate change: what the scientists say, [www.foe.co.uk/sites/default/files/downloads/ipcc\\_report\\_2013.pdf](http://www.foe.co.uk/sites/default/files/downloads/ipcc_report_2013.pdf)

<sup>2</sup> Chapter 13, P6

<sup>3</sup> Chapter 13, P8

<sup>4</sup> TS, P7

<sup>5</sup> TS, P7

<sup>6</sup> TS, P8

<sup>7</sup> TS, P10

<sup>8</sup> TS, P11

<sup>9</sup> Chapter 13, P3

<sup>10</sup> Chapter 19, P37

<sup>11</sup> Chapter 7, P2

<sup>12</sup> Chapter 7, P3

<sup>13</sup> TS, P22

<sup>14</sup> TS, P10

<sup>15</sup> Chapter 7, P3

<sup>16</sup> Chapter 19, P25

<sup>17</sup> TS, P22

<sup>18</sup> Chapter 7, P23

<sup>19</sup> Chapter 7, P23

<sup>20</sup> TS, P11

<sup>21</sup> TS, P24

<sup>22</sup> SPM, P13

<sup>23</sup> Chapter 11, P4

<sup>24</sup> Chapter 11, P30

<sup>25</sup> Chapter 11, P13

<sup>26</sup> Chapter 3, P19

<sup>27</sup> Chapter 3, P18

<sup>28</sup> Chapter 11, P10

<sup>29</sup> SPM, P12

<sup>30</sup> Chapter 19, P4

<sup>31</sup> Chapter 19, P16

<sup>32</sup> Chapter 4, P2

<sup>33</sup> Chapter 4, P10

<sup>34</sup> Chapter 4, P3

<sup>35</sup> Chapter 4, P4

<sup>36</sup> Chapter 19, P6

<sup>37</sup> SPM, P16

<sup>38</sup> Chapter 4, P55

<sup>39</sup> Chapter 4, P65

<sup>40</sup> Chapter 4, P31

<sup>41</sup> Chapter 4, P28

<sup>42</sup> Chapter 4, P5

<sup>43</sup> Chapter 4, P5

<sup>44</sup> Chapter 16, P29

<sup>45</sup> Chapter 13, P28

<sup>46</sup> Chapter 16, P3

<sup>47</sup> Chapter 19, P46

<sup>48</sup> Chapter 22, P3

<sup>49</sup> Chapter 17, P3

<sup>50</sup> Chapter 17, P3

<sup>51</sup> Chapter 17, P15

<sup>52</sup> Chapter 17, P16

<sup>53</sup> Chapter 3, P25

<sup>54</sup> Chapter 17, P20

<sup>55</sup> Chapter 13, P21

<sup>56</sup> Chapter 3, p26

<sup>57</sup> Chapter 13, P19-20

<sup>58</sup> Chapter 4, P6

<sup>59</sup> Chapter 11, P4

<sup>60</sup> Chapter 11, P35