



## EXPERT PANEL FINDINGS

### *Copenhagen, Denmark*

The goal of Copenhagen Consensus 2012 was to set priorities among a series of proposals for confronting ten of the world's most important challenges.

These challenges were examined:

- Armed Conflict
- Biodiversity
- Chronic Disease
- Climate Change
- Education
- Hunger and Malnutrition
- Infectious Disease
- Natural Disasters
- Population Growth
- Water and Sanitation

A panel of economic experts, comprising five of the world's most distinguished economists, was invited to consider these issues. The members were:

- Finn E. Kydland, University of California, Santa Barbara (Nobel Laureate)
- Robert Mundell, Columbia University in New York (Nobel Laureate)
- Thomas Schelling, University of Maryland (Nobel Laureate)
- Vernon Smith, Chapman University (Nobel Laureate)
- Nancy Stokey, University of Chicago

The panel was asked to address the ten challenge areas and to answer the question:

*What are the **best ways of advancing global welfare, and particularly the welfare of developing countries**, illustrated by supposing that an additional \$75 billion of resources were at their disposal over a 4-year initial period?*

Ten Challenge Papers, commissioned from acknowledged authorities in each area of policy, set out 39 proposals for the panel’s consideration. The panel examined these proposals in detail. Each paper was discussed at length with its principal author. The panel was also informed by 14 Perspective Papers, providing critical appraisals of each Challenge Paper’s assumptions and methodology. Based on the costs and benefits of the solutions, the panel ranked the proposals, in descending order of desirability, as follows:

## PRIORITIZED LIST

	<i>Challenge</i>	<i>Solution</i>
1	Hunger & Education	Bundled Interventions to Reduce Undernutrition in Pre-Schoolers
2	Infectious Disease	Subsidy for Malaria Combination Treatment
3	Infectious Disease	Expanded Childhood Immunization Coverage
4	Infectious Disease	Deworming of Schoolchildren
5	Infectious Disease	Expanding Tuberculosis Treatment
6	Hunger & Biodiversity & Climate Change	R&D to Increase Yield Enhancements
7	Natural Disasters	Investing in Effective Early Warning Systems
8	Infectious Disease	Strengthening Surgical Capacity
9	Chronic Disease	Hepatitis B Immunization
10	Chronic Disease	Acute Heart Attack Low-Cost Drugs
11	Chronic Disease	Salt Reduction Campaign
12	Climate Change	Geo-Engineering R&D
13	Education	Conditional Cash Transfers for School Attendance
14	Infectious Disease	Accelerated HIV Vaccine R&D
15	Education	Information Campaign on Benefits From Schooling
16	Water and Sanitation	Borehole and Public Hand Pump Intervention
17	Climate Change	Increased Funding for Green Energy R&D
18	Population Growth	Increase Availability of Family Planning
19	Chronic Disease	Heart Attack Risk Reduction Generic Pill
20	Water and Sanitation	Community Led Total Sanitation
21	Water and Sanitation	Sanitation as a Business
22	Chronic Disease	Increasing Tobacco Taxation
23	Natural Disasters	Community Walls Against Floods
24	Water and Sanitation	The Reinvented Toilet
25	Biodiversity	Protecting All Forests
26	Natural Disasters	Retrofitting Schools to Withstand Earthquake Damage
27	Hunger	Crop Advisory Text Messages
28	Biodiversity	Extension of Protected Areas
29	Natural Disasters	Strengthening Structures Against Hurricanes and Storms
30	Natural Disasters	Elevating Residential Structures to Avoid Flooding

## BUDGET

The expert panel allocates its budget of \$75 billion over four years as follows:

<i>Solution</i>	<i>Amount Allocated Per Year, in \$US Billion Dollars</i>
Bundled Interventions to Reduce Undernutrition in Pre-Schoolers	3.0
Subsidy for Malaria Combination Treatment	0.3
Expanded Childhood Immunization Coverage	1.0
Deworming of Schoolchildren	0.3
Expanding Tuberculosis Treatment	1.5
R&D to Increase Yield Enhancements	2.0
Investing in Effective Early Warning Systems	1.0
Strengthening Surgical Capacity	3.0
Hepatitis B Immunization	0.12
Acute Heart Attack Low-Cost Drugs	0.2
Salt Reduction Campaign	1.0
Geo-Engineering R&D	1.0
Conditional Cash Transfers for School Attendance*	1.0
Accelerated HIV Vaccine R&D	0.1
Information Campaign on Benefits From Schooling*	1.34
Borehole and Public Hand Pump Intervention	1.89
<b>Total</b>	<b>\$18.75</b>

The expert panel based its budget allocations on the proposals from authors, and on their own views of appropriate expenditure.

\*Estimate included; final figure to be included later.

## METHODOLOGY

The panel considered the findings and arguments made in Challenge Paper and Perspective Papers.

In ordering the proposals, the panel was guided predominantly by consideration of economic costs and benefits. The panel acknowledged the difficulties that cost-benefit analysis must overcome, both in principle and as a practical matter, but agreed that the cost-benefit approach was an indispensable organizing method. In setting priorities, the panel took account of the strengths and weaknesses of the specific cost-benefit appraisals under review, and gave weight both to the institutional preconditions for success and to the demands of ethical or humanitarian urgency. As a general

matter, the panel noted that higher standards of governance and improvements in the institutions required to support development in the world's poor countries are of paramount importance.

For some of the proposals, the panel found that information was too sparse to allow a judgment to be made. These proposals, some of which may prove after further study to be valuable, were therefore excluded from the ranking.

Each expert assigned his or her own ranking to the proposals. The individual rankings, together with commentaries prepared by each expert, will be published in due course. (The Challenge Papers and Perspective Papers and Working Papers have already been placed in the public domain.) The panel's ranking was calculated by taking the median of individual rankings. The panel jointly endorses the median ordering shown above as representing their agreed view.

## NOTES ABOUT THE CHALLENGES

### *Hunger and Malnutrition*

The expert panel examined the following solutions to this challenge: Interventions to Reduce Chronic Undernutrition in Pre-Schoolers, R&D to Increase Yield Enhancements, Crop Advisory Text Messages, Increase Competition in the Fertilizer Market.

Based on very high benefit-cost ratios, the Expert Panel chose to give its highest ranking to Interventions to Reduce Chronic Undernutrition in Pre-Schoolers. The expert panel merged this with a similar proposed investment contained in the Education paper. For about \$100 per child, this bundle of interventions (including micronutrient provision, and also complementary foods, treatments for worms and diarrheal diseases, and behavior change programs), could reduce chronic undernutrition by 36 percent in developing countries. The expert panel noted that the educational benefits as well as the health benefits should be taken into consideration. Even in very poor countries and using very conservative assumptions, each dollar spent reducing chronic undernutrition has at least a \$30 payoff.

The Expert Panel merged the intervention of R&D to Increase Yield Enhancements with the similar investment from the Biodiversity topic. The Expert Panel noted accordingly that this investment would not lead only to a reduction in hunger, but also created benefits stemming from its effects on Biodiversity and Climate Change. The benefit-cost ratios are therefore very respectable for this intervention.

The expert panel gave a comparatively low ranking to Crop Advisory Text Messages, reflecting that this service is probably best left handled locally and by the private market.

In line with the unavailability of benefit-cost ratios for the solution of Increasing Competition in the Fertilizer Market, and the author's views that this was not as promising as it had first appeared, the expert panel chose not to rank it, while still emphasizing it as a relevant research consideration.

## *Education*

The expert panel examined the following solutions to this challenge: School-Based Health and Nutrition Programs, Conditional Cash Transfers for School Attendance, Information Campaign on Benefits From Schooling (Extended Field Trial).

The first investment considered, School-Based Health and Nutrition Programs, shared many features with the Interventions to Reduce Chronic Undernutrition in Pre-Schoolers under the heading of Hunger and Malnutrition. As a result, the expert panel combined these interventions into one investment proposal; further discussion of that investment is included above, under the heading of Hunger and Malnutrition.

The expert panel gave mid-rankings to the other two proposals considered. They found that there were considerable benefits to using conditional cash transfers to increase school attendance in some settings, and that there was a strong case to prioritize funding for an extended field trial of an information campaign on the benefits from schooling.

## *Infectious Disease*

The expert panel examined the following solutions to this challenge: Subsidy for Malaria Combination Treatment, Expanded Childhood Immunization Coverage, Deworming of Schoolchildren, Expanding Tuberculosis Treatment, Strengthening Surgical Capacity, Accelerated HIV Vaccine R&D.

The expert panel was impressed by the high benefit-cost ratios for the Infectious Disease solutions, even with conservative assumptions used.

A high priority for additional spending is to reduce the relative prices that poor countries face for new artemisinin combination therapies (through the so-called "Affordable Medicines Facility-malaria") Every \$1 million spent on this financing mechanism of the Global Fund means about 300,000 more children treated, 20,000 of whom with severe malaria. This would prevent 1,000 deaths. Thus, spending \$300 million a year on The Subsidy for Malaria Combination Treatment would prevent 300,000 child deaths, with benefits, put in economic terms, that are 35 times higher than the costs. This analysis suggests it is one of the best returns on health that could be made globally.

Another high priority is Expanded Childhood Immunization Treatment, where spending about \$1 billion annually would save 1 million child deaths and have benefits 20 times higher than the costs.

The expert panel noted that the benefits from Deworming of Schoolchildren would not just come from the health effects, but also from making education more productive.

While the benefits for Expanding Tuberculosis Treatment are lower than in the Copenhagen Consensus 2008, this remains a very worthwhile investment.

The expert panel noted a compelling need to Strengthen Surgical Capacity in the developing world, where very low-cost investments could be highly effective.

The expert panel noted while there might be a considerable delay before an HIV vaccine is ready, this was a relatively cheap investment worthy of funds.

## *Biodiversity*

The expert panel examined the following solutions to this challenge: Agricultural Productivity R&D, Extension of Protected Areas, Protecting All Dense Forests.

The expert panel chose to merge Agricultural Productivity R&D with the similar intervention proposed under the topic of Hunger and Malnutrition, noting the combined benefits of this investment; discussion of this intervention is included under that heading, above.

The expert panel questions the political viability of Protecting All Dense Forests over a 30-year period. It is not clear that many countries are able to prevent forests from being converted to agriculture today; it is unclear that the investment would achieve this.

The expert panel found that Extension of Protected Areas would have obvious benefits but also significant costs, principally the loss of output from the land that is taken out of use. The low benefit-cost ratio is reflected by its low ranking by the panel. The panel also notes that many of the benefits would be more relevant to the developed world, rather than developing nations.

## *Natural Disasters*

The expert panel examined the following solutions to this challenge: Investing in Effective Early Warning Systems, Community Walls Against Floods, Retrofitting Schools to Withstand Earthquake Damage, Strengthening Structures Against Hurricanes and Storms, Elevating Residential Structures to Avoid Flooding.

Investing in Effective Early Warning Systems was given a high ranking; it was substantially less costly, and more implementable than other interventions looked at in this topic, while it reaped significant benefits, not only from infrastructure damage reduction, but also from potentially large, reduced economic knock-on effects.

Of the two proposals to elevate structures and community walls (Community Walls Against Floods, and Elevating Residential Structures to Avoid Flooding), the expert panel noted that the Community Wall was substantially more effective. However, both were very uncertain investments and hence were ranked low. The expert panel also pointed out that a case-by-case approach was probably more useful than an overarching, global strategy. The expert panel further noted the substantial challenges inherent building sea walls, including the long timeframes required for planning, agreement, and construction.

Based on the research presented, the expert panel found that a global plan to Retrofit Schools to Withstand Earthquake Damage had a quite low cost-benefit ratio and while well-intentioned was therefore given a low ranking.

Strengthening Structures Against Hurricanes and Storms was given a low ranking by the expert panel in keeping with the relatively modest benefit-cost ratios calculated by the authors.

## *Chronic Disease*

The expert panel examined the following solutions to this challenge: Hepatitis B Immunization, Acute Heart Attack Low-Cost Drugs, Salt Reduction Campaign, Heart Attack Risk Reduction Generic Pill, Increasing Tobacco Taxation.

Hepatitis B immunization appears to be a straight-forward and solid proposal, which the panel finds worthy of investment.

Acute Heart Attack Low-Cost Drugs was a worthy investment, but seemed to be most relevant in countries in which infrastructure was already in place, suggesting there could be some challenges in low-income countries with less health care infrastructure.

Higher awareness of the risk factors of salt consumption is important, and the expert panel found that there was a need for developed world experience in Salt Reduction Campaigns to be shared with lower income nations. This is a relatively low-cost intervention. Compared to Tobacco Taxation, salt reduction campaigns should face fewer barriers.

The Heart Attack Risk Reduction Generic Pill was a rather expensive proposal at \$32 billion per year, with a respectable but not high benefit-cost ratio.

The expert panel found that Tobacco Taxation was largely a question of political will rather than funds. They noted that a gradual tax was not ideal, and that this was a highly effective response to the health problems caused by smoking. They noted that the proposed solution was more than simply taxation, but also included an information campaign which they found was important. Developed world experience with tobacco control must be shared with developing nations.

## *Climate Change*

The expert panel examined the following solutions to this challenge: Geo-engineering R&D, Increased Funding for Green Energy R&D, Low Global Carbon Tax, High Global Carbon Tax, Adaptation Planning.

The expert panel found that geo-engineering research and development, at low cost, was worthy of some funds, to explore the costs, benefits, and risks of this technology.

The panel found the Green Energy R&D should be started at a lower level than that proposed, of \$1 billion annually, which would likely imply a higher BCR. According to the Challenge Paper authors, the money should be distributed to the top green technology countries, e.g. US, Canada, UK, Germany, France, Brazil, China, India, Japan, Korea, Russia, through cross-national research consortia, focusing on financing R&D across a portfolio of technologies.

While the expert panel chose not to rank the carbon tax, it finds that a low carbon tax (around \$5/ton CO<sub>2</sub>, \$19/ton C, which is the damage estimate) increasing over time, would be a sensible policy that could help address the climate change challenge. The expert panel also recognizes that without significant technological breakthrough, significant CO<sub>2</sub> reduction remains unlikely.

The expert panel also chose not to rank the adaptation investment solution, but underscored the importance of adaptation in the future to decrease the vulnerability of the developing world to climate change.

## *Water and Sanitation*

The expert panel examined the following solutions to this challenge: Borehole and Public Hand Pump Intervention, Community Led Total Sanitation, Sanitation as a Business, The Reinvented Toilet.

The solid but relatively modest benefit-cost ratios of Borehole and Public Hand Pump Intervention led to its mid-ranking.



The expert panel noted that Community Led Total Sanitation was a ‘road-tested’ solution meaning that it carries a high degree of certainty in its ability to be expanded, as there is a good deal of previous experience and knowledge of its risks, costs, and benefits in different environments. However, like the Borehole and Public Hand Pump Intervention, it had relatively low benefit-cost ratios.

They noted that Sanitation as a Business appeared to have a relatively short timeframe to becoming available. In contrast, The Reinvented Toilet was a considerably longer time away from availability, involving research and development lasting 15-20 years followed by marketing, with an unclear pathway to success. The panel concluded that The Reinvented Toilet was a noble goal, but analysis of its costs and benefits remained highly speculative, while the necessary seed money had already been allocated by the Gates Foundation.

### *Population Growth*

The expert panel examined the following solution to this challenge: Increase Availability of Family Planning.

The expert panel recognizes the importance of meeting the unmet need for family planning. They note that some households would be easier to reach with family planning services, and recommend that attention is focused on these households first.

### *Armed Conflict*

The expert panel examined the following solutions to this challenge: Conflict Prevention, Conflict Intervention, Post-Conflict Reconstruction.

The expert panel chose not to include these interventions in its prioritized list. Conflict prevention is clearly important: peace is not an end to be achieved at the end of a conflict, but should be preserved. However, as with the solutions to Trade Barriers and Corruption, this topic is largely political, rather than an economic question of resource allocation. The expert panel notes that the research paper makes a valuable contribution to identifying the costs and benefits of responding to conflicts.

## Corruption and Trade Barriers

Two Working Papers were commissioned by Copenhagen Consensus 2012 on corruption and reducing trade barriers. The Expert panel notes the importance of responding to both of these challenges, but notes that the barriers to response are political rather than financial in nature.

Corruption can have crippling effects on development and human welfare. There is a lack of good data on the relative effectiveness of most reform programs. Yet, even without definitive studies, some options look promising because benefits seem clear and the costs are minimal. Even if the benefits cannot be precisely measured, the rates of return appear large. Collectively, improving top-down monitoring and punishment, fostering transparency and citizen involvement, adjusting bureaucratic incentives through civil service reforms, improving the competitiveness of government asset sales and large purchases, and privatizing certain government services may provide the shock needed to push a country or sector towards a self-fulfilling cycle of good governance.

Because under freer trade the world's resources would be allocated more efficiently, the expert panel finds that cuts in trade barriers and subsidies would provide a means for citizens to spend more on other pressing problems, thereby *indirectly* contributing to opportunities to alleviate other challenges facing the world. The net present value of the future benefits of a Doha agreement ranges from \$12 trillion to \$64 trillion. The costs are less than \$400 billion in present value terms, but they are mostly private rather than government costs and are dwarfed by the gross benefits.