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Cristian Timmermann, Henk van den Belt

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Global Justice Considerations for a Proposed "Climate Impact Fund"[1]

Cristian Timmermann & Henk van den Belt
Wageningen University, Centre for Society and the Life Sciences

Abstract. One of the most attractive, but nevertheless highly controversial proposals to alleviate the negative effects of today's international patent regime is the Health Impact Fund (HIF). Although the HIF has been drafted to facilitate access to medicines and boost pharmaceutical research, we have analysed the burdens for the global poor a similar proposal designed to promote the use and development of climate-friendly technologies would have. Drawing parallels from the access to medicines debate, we suspect that an analogous "Climate Impact Fund" will increase the already very high scientific and technological supremacy of the developed world over the Global South. We advocate countering this dominance on the ground that countries with scarce research and development capacities will be in a difficult position to reject technologies and will not have a say on how such technologies should look like. Further, addressing global hazards should be an inclusive endeavour and not only a privilege reserved for the developed world. Incentivizing grassroots innovation would be a major step to promote scientific and technological inclusion.

Key words: technology transfer, distributive justice, health impact fund, development aid, climate change, priority, scientific participation.

Climate change is a major global hazard that differentially affects the regions of the world. While some areas will experience positive effects, such as increased yields in agriculture, the highly populated tropical regions will suffer negative consequences, such as a decrease in harvest yields and a wider prevalence of tropical diseases. Generally, a broad consensus holds that the current rate of greenhouse gases emissions cannot be sustained. Even if there is some scepticism whether catastrophic tipping points exist, the magnitude of potential hazards to life far outstrips the costs our and next generations would have to pay in order to mitigate greenhouse gases emissions. Therefore, we have strong moral reasons to give the benefit of doubt to the existence of such tipping points and advocate concrete proposals that could foster mitigation efforts (Singer 2004, Chap. 2). In what follows, we would like to examine in how far the concept behind the "Health Impact Fund" as formulated by Aidan Hollis and Thomas Pogge 2008 could be applied to the promotion of climate-friendly technologies. While earlier work (see Timmermann and van den Belt 2012) discussed some of the practical problems such type of fund might encounter, we wish to concentrate here on global justice considerations that have to be taken into account.

1] We would like to thank the participants of the "Global Justice: Norms and Limits" conference at the University of Bucharest (2012) for their valuable comments on our paper presentation. A special thanks goes also to Thomas Pogge for his comments and criticism on an earlier draft of this paper. This article is the result of a research project of the Centre for Society and the Life Sciences in The Netherlands, funded by the Netherlands Genomics Initiative.

After a short discussion of (1) the moral justification of the Health Impact Fund proposal, we will expose (2) that the fund might aggravate inequality in the distribution of research locations, (3) the reasons why such inequalities are condemnable, (4) that the attempt to correct this injustice is more problematic than is apparent at first sight, (5) the special role grassroots innovators could play and (6) briefly elucidate the conflict that might arise in concentrating on mitigation efforts alone while leaving adaptation needs aside.

I. INCENTIVIZING INNOVATIONS

In accordance with Rawls' theory of justice, we could argue that an intellectual property (IP) regime can be legitimately established if under that regime the least advantaged would be better off than without such an incentive mechanism. However, this type of reasoning does not resolve the question in how far the industrialized world is obliged to institute an incentive regime that not just barely matches this minimum constraint, but up to what degree it should aim at increasing the position of the worst-off to the maximum sustainable level. Addressing this one question has become a highly polarized never-ending debate with a strong clash of diverse schools of thoughts. The situation of not being able to find wide consensus for a clear answer has been aggravated by the fact that we cannot provide empirical evidence of how the well-being of the worst-off would change (or if it would change at all) if we had not the current incentive system for innovations in place.

In order to make today's intellectual property regime of patents more acceptable to the worst-off and to civil society in general, Thomas Pogge and Aidan Hollis have elaborated a detailed proposal to redress its negative consequences. The global extension of Western European, North American and Japanese standards of minimum recognition of intellectual property has increased the access and availability problems. Access to objects of innovation has become more limited, since the obligation of governments to recognize product patents (i.e. patents on the object itself, not merely the process by which it was produced) has limited the possibilities of generic manufacturers to develop cheaper alternatives to the original product for people with less financial resources. The availability problem is indirectly increased by this global extension of standards, as companies all around the world can recoup their research and development costs by selling the products resulting from their investigations on the world markets. When a particular market can pay much more for its desired objects, this creates an incentive to satisfy this particular demand, leaving other markets with less purchasing power unsatisfied.[2] On the other hand, when a market is very poor and has different needs, it will not be able to

2] Here the high income inequalities come for the poor as a double penalty, they not only suffer from their limited purchasing power, but also from the rich being so much richer and thus attracting nearly all research efforts to satisfy their wants (cf. Pogge 2008).

pay high enough mark-up prices to cover the costs incurred to develop the customized objects. When no third party jumps in, the research and development of the technological solutions needed may not occur and the products will never be available.

After the Trade-Related Aspects of Intellectual Property Rights (TRIPS) agreement started to come into effect in 1994 universalizing the mentioned standards, generic companies that tried to fill in a market gap by developing innovations specified for resource-poor markets (such as single-dosage medicines) had to change business practices as selling reverse-engineered drugs became illegal. Now more than ever, companies all over the world focus on providing products primarily designed to meet the richer markets' appetites.

As other incentives systems to promote research and development that better suit the interests of the global poor – we may think of prize-systems[3] – are conceivable but have not been implemented, we can identify the current way innovations are incentivized as an institutional injustice. Arguments stating that countries voluntarily decided to sign the TRIPS agreement lose ground when we look at historical circumstances (cf. Drahos and Braithwaite 2003, Pogge 2008, and Singer 2004, Chap. 3). The implementation of the TRIPS agreement is more a story of a reckless imposition of a treaty than a textbook example of good global democratic decision-making practice. Making available the necessary resources for establishing the Health Impact Fund can be seen as a compensation for having violated the negative duty of not imposing an oppressive regime on others. The global trade regime, with its tariffs regulation and intellectual property rights standards, acts as an oppressive regime as far as competition possibilities for newcomers in the world economy go and the real prospects of using technology to address welfare issues are taken into account.

II. DISTRIBUTION OF RESEARCH FACILITIES

The Health Impact Fund addresses the two problems of access and availability previously introduced. The cost of medicinal treatment is often dictated by the sale price of medicines, thus reducing the price tag of medicines can make treatment more widely accessible. Pharmaceutical companies, holding exclusive rights, set prices and research agendas according to market incentives that are commonly driven by consumers' ability to pay. The idea of the impact fund is to offer an extra incentive based on the impact the medicinal innovation has on alleviating the disease burden measured in its capacity to increase quality-adjusted life years (QALY). A company that has a patent on a new medicine will have the option to either exploit its exclusive rights in the traditional way, i.e. by maximizing profits through sales or could commit to the proposed impact fund, selling its drugs at production cost and receiving a reward that would be dependent on

3] Prize-systems reward innovators that first reach pre-specified targets from public funds. For a characterization in the pharmaceutical area, see Love and Hubbard 2007.

the drugs' ability to add QALY anywhere in the world. If a company has a new drug that will primarily alleviate the disease burden of those who have less purchasing power it will rationally opt for the impact fund's reward.

The main concern of the Health Impact Fund is to make medicines available to the poor. We can fear however that by focusing on this noble goal, the implementation of the HIF may actually undermine other human rights, particularly the right to share in the advancement of science, as specified in article 27.1 of the Universal Declaration of Human Rights (1948, henceforth UDHR). The HIF uses the international patent regime for its goal of meliorating global health. Hence, it does not seek to abolish the use of patents for pharmaceutical innovations, as the proponents of the fund believe that the existent regime with a substantial addition (i.e. the HIF) leaves the worst-off better off than in a world prior to the TRIPS agreement (cf. Pogge 2009).

A widely shared critique to the HIF is that the fund does not actively tackle the distribution of IP rights themselves.[4] IP rights do not only give the possibility to exclude others from copying the product, but may also hinder research *with* the product. This facilitates monopolizing follow-up research preventing particularly poorer competitors from entering the market. The HIF would therefore leave the situation where research and development is almost exclusively done in the Global North unchanged, as it does not introduce additional incentives to remedy this inequality.[5]

Our concern is how far the HIF may use the patent system for its own purpose (i.e. improving global health) before becoming complicit of supporting the other inequalities brought up by the existing intellectual property regime.

The HIF seeks to make at least $6 billion additionally available to incentivize pharmaceutical innovation a year. The companies interested in claiming those monies have to develop a new medicine. Given the way the fund is designed, there will be a stronger incentive to develop medicines for diseases that burden a high number of people. This mechanism will favour research on diseases that are now affecting a huge number of individuals but for which no cure (or insufficient remedy) is available – particularly widespread neglected diseases. Research institutes that are located in the areas where such diseases are prevalent (nowadays mostly the tropical region of the world) may have an initial advantage by having better samples of the pathogen, knowledge on how the local population has dealt with the disease, ties to the affected population and scientific expertise on the subject (cf. Timmermann 2012a). However, we should not underestimate the huge power the expensive scientific infrastructure located in the developed world has in attracting the best researchers in the field, as well as its capacity to accelerate research. Even among research institutes in the developed world there is a firm competition in

4] This criticism can be found in DeCamp 2007, as well as in Timmermann and van den Belt forthcoming, but it is also a point raised by Knowledge Ecology International (see keionline.org).

5] Further, the HIF only requires from industry to give up their price-setting privilege and not to surrender patents. This is a concession made to industry in order to reduce the amount of money needed to create the fund.

who manages to attract the best researchers with the most appealing start-up packages and cutting-edge facilities (cf. Stephan 2012). We can fear a further brain drain of the top scientists in the field of neglected diseases to the developed world.

An additional problem is that the HIF in its present form does not provide any financial assistance to help resource-poor institutes to carry out clinical trials on their newly developed substances, therefore they will have to rely on partnerships with companies that do have the financial means to further develop the drug.[6] Here the terms of scientific participation within the partnership will end up being shaped by ideals of corporate social responsibility held by the stronger partner. At the end, the subjects of the right to share in the advancement of science will have to rely on corporate social responsibility to see if they will have a chance to participate in scientific endeavours on an equal standing relative to comparable merit. Reshaping an institutional order that clearly strengthens access to medicines, but leaves the fulfilment of the human right to participate in the advancement of science to the goodwill of companies whose behaviour is primarily moulded by market incentives, unavoidably entrenches a normative standpoint that advocates prioritarianism.[7]

Another issue is the status of clinical trials as a private good. The testing for biosafety and efficacy represent the biggest expense in drug development, consisting in a huge hurdle that impedes most companies to bring new medicines on the market on their own. Treating clinical trials as a public good, would allow also small and medium-sized companies to develop new medicines (Reichman 2009). If the needed safety and efficacy testing is publicly funded, many conflicts of interest could also be avoided. When stakes are so high for demonstrating success, scientific accuracy is at risk. Outcomes are prone to be biased, standards might be weakened by a favourable selection of patients for testing the compound and publication of unfavourable results might be suppressed or delayed (Reiss 2010, 431-33 and 439).[8] Generic companies cannot rely on the data submitted by pharmaceutical companies to regulatory agencies before a specified time (that varies according to drug type and jurisdiction) for the market approval of their drugs. In practice this can act as an extension of the exclusivity time, as most generic companies do not have the means to repeat the clinical trials in order to provide a new set of data to prove the already recognized performance of the compound in question. However, in theory, regulatory data shall only be protected from "unfair commercial use" (TRIPS, art. 39) – originally this phrase was defined in terms of misrepresentation (i.e. confusing and misleading consumers), but US and EU authorities illegitimately invoke this article to

6] The need to rely on foreign partners could be aggravated if high fees to be able to register a drug with the Health Impact Fund apply.

7] Here we understand prioritarianism as the position that seeks to raise the well-being level of the worst-off, regardless if this comes at the cost of a lower aggregated welfare level for the global population as a whole.

8] It is to note that the HIF provides an additional incentive for scientific accuracy as it pays out for measured health impact (in QALY) and not for claimed health impact. However making the public aware of long-term side-effects is still not directly encouraged.

justify a new type of proprietary rights over the data on efficacy and safety that companies have to submit to regulatory agencies (see Correa 2004 and Wadlow 2008). Generic companies are therefore compelled to present a separate set of data in order to gain market approval. In order to avoid "unfair commercial use" of data, repetitions of tests involving the exposure of human and animal subjects to drugs with no therapeutic or scientific intentions are deemed acceptable. Some duplicative work could be avoided with a careful draft of the HIF proposal, as companies can be asked to give up data exclusivity rights after the ten-year reward period.

We have not been able to identify a clearer statement of what constitutes an "institutional order that is feasible" (cf. Pogge 2002) and one that is not. Drawing the line between "real-world" possibilities and theoretical feasibility, does not only satisfy philosophical cravings, but builds a solid foundation for follow-up political legitimation. As the natural rights basis of intellectual property is hardly tenable and other forms of incentivizing innovations are conceivable, a world without pharmaceutical patents is theoretically feasible. Some pessimism might be implied when stating that such a world is in principle politically *in*feasible. However one has to be quite blind to current-day political power plays to believe that a radical reform in how innovations are incentivized will occur within a relatively short time frame. Here is where the HIF gains much support, it has much higher chances to be implemented in a shorter period of time, as it constitutes only an addition to the current intellectual property regime and does not seek to build a new incentive system from scratch. The implementation of the HIF does also not hinder people to continue advocating reforms that seek a fuller realization of human rights. If the HIF gains legitimacy as a temporary solution before a more fundamental reform can be carried out, it has to show that it will have a substantial effect on human lives before becoming out-dated – something that intuitively will be self-evident, but still may need a quantifiable estimate in order to contrast a scenario of inaction. For the arguments previously spelled out, we do not believe that the HIF is the best reform that can be conceptualized, however political realities make it a very good and feasible option that can be realised within a foreseeable period of time.

Advocates of the HIF who accept compromise for the sake of political feasibility ought to admit openly that we should give priority to having a higher number of healthy people over having a lower number of healthy people with eventually more people participating in scientific endeavours. This approach aims at minimizing suffering related to disease while categorizing unhappiness due to lack of scientific engagement possibilities to a lower order of urgency. This compromise has to also acknowledge that the duplicative work necessitated by the current proprietary regime of clinical data is morally acceptable in order to reach the higher goal of improving global health. The fact that people who severely suffer from a disease cannot participate in science may help gather popular support for preferring one human right over the other, but if an institution formally acknowledges that it wishes to pursue one right at the cost of another, it will go

against the progressive realization of human rights and thus violate international law[9]. The extra research money the HIF attempts to attract will most likely not reduce the number of people who enjoy the right to share in the advancement of science in resource-poor countries, but there is no guarantee that it will not enlarge the distributional gap of research facilities between the developed and the developing world.[10] History of innovation shows us plenty of cases where prolific patenting at early stages of research has been detrimental for further product development – many such "patent thickets" have been avoided by prudent researchers, fewer are the cases where governments have succeeded in taking action (cf. Henry and Stiglitz 2010). Making research in neglected diseases profitable will first of all create a race to the patent offices, restricting freedom to operate in the few areas where poorer research institutes could work with little fear of infringing patents.

There has to be a general awareness that spending less than 0,01% of the global income (calculated from Pogge 2009, 547) for an Health Impact Fund cannot address all major inequalities raised by the implementation of the TRIPS agreement, but merely constitutes a much better situation for the global poor than not spending that money at all.

Thomas Pogge 2011 justifies his prioritarian position with an investigation on how nongovernmental aid organisations should allocate their limited resources. However this justification presumes that actors cannot change the fact that the available resources are limited and thus are obliged to make sacrifices in order to reduce the maximum amount of suffering. Governments of larger economies or supranational bodies cannot use this same argument to justify a prioritarian position that neglects significant efforts for scientific capacity-building in developing countries in favour of improving global health as they are responsible for fixing the available resources for tackling injustices. Nongovernmental organisations (NGOs) have to justify "solely" what they have accomplished with the entrusted resources. Governments have to justify not only how they have allocated the resources collected, but also the amount they have found prudent to collect and the incentive systems framed. The slightest appeal to maximize welfare improvement per euro spent globally (cf. Singer 2009) will fail to justify any accountability based on proportionality. On that account, a net official development assistance that amounts to a 0,32% share of the gross national income of the 23 Development Assistance Committee countries (OECD 2011, 139) would hardly give a solid ground to morally justify this type of prioritarianism. A country like the Netherlands could finance the HIF with the

9] A comment on the International Covenant on Economic, Social and Cultural Rights (1966, henceforth ICESCR) article 2.1 notes that "any deliberately retrogressive measures in that regard [i.e. under the obligation of progressive realization] would require the most careful consideration and would need to be fully justified by reference to the totality of the rights provided for in the Covenant and in the context of the full use of the maximum available resources" (Office of the High Commissioner for Human Rights 1990, § 9). It is to note that a right to share in scientific advancement as spelled out in the UDHR, cannot be as clearly interpreted in the corresponding article 15 of the ICESCR.

10] An outline of how research and development facilities of multinational corporations are distributed is offered in von Zedtwitz and Grassmann 2002. An insight on how this distribution affects the propagation of climate-friendly technologies is offered by Sarnoff 2011.

current official development assistance rate on its own, while Germany could pay twice the amount the HIF needs to start with its missing portion to meet the UN targeted 0,7% share for development assistance (data taken from OECD 2011, 140).

III. WHAT TECHNOLOGICAL SOLUTIONS SHOULD BE DEVELOPED?

There are a number of reasons why poorer people should not be excluded from being able to develop technological solutions.[11] Here we will discuss only one aspect: the lack of possibilities in influencing research agendas. Technologies are taking an ever more important role in our daily lives and participating in civil life without them is getting closer and closer to being impossible. On a global level there is hardly a democratic decision-making process to identify which technologies should be developed and what form they should take. Today most of the research is done in the developed world. For this part of the world we cannot say that the development of new technologies underlies strict democratic resolution, but there is nevertheless a strong civil society influence by the offering of governmental financial aid to specific business branches or the development of products by direct request. Technologies that cause public controversies can be banned altogether, but this liberty can only be made use of when a country can rely on alternative products or can expect to be able to develop such alternatives within a time frame that is compatible with the public urgency the availability of such alternatives demands. Here is where this particular liberty is especially at stake for countries in the Global South, as they almost exclusively have to make use of technologies already developed by the Global North without being able to question the local acceptability thereof.

Mitigating climate change with the aid of technology could be a much more inclusive effort than the battle against neglected diseases. When taking climate change mitigation as a global effort, researchers from poorer institutes could develop high impact solutions that do not necessarily rely on investigations made under an expensive infrastructure. The technologies developed would still count as an invention, being a public good – thus non-excludable and non-rivalrous in consumption – but will not necessarily have to continue with the trend of "complexity being better". Technologies that might be easily copied and thus nowadays do not have enough market incentives to be developed since exclusivity cannot be made full use of in practice, could be stimulated by the climate impact fund's reward system.

Here we can differentiate between a core invention, which will be applying for the fund's rewards, and subsequent local adaptation of the core invention. The company that brought up the core invention will benefit from the extra impact gained by the wide distribution of the invention and its local variation. When local variations have mutated

11] It has been argued that intellectual property affects the diversity in research practices (Timmermann 2012b) and work in progress concentrates in how far the current IP regime limits (or fails to secure) human flourishing and development (Timmermann 2012c).

to a new invention altogether, specific policies should be formulated to be able to draw the line between the new and the old product as well as to establish the fair shares each inventor should get.[12]

A second argument concerns the possibility of raising the bar independently as a group. If a society is dependent upon the technological innovations made by others, it will have to subject itself to a level of risk toleration that it cannot influence. Risk affinity varies among societies. Nowadays most countries do not have the infrastructure to develop alternatives or own solutions. In the case that predefined standards of quality, levels of toxicity or climate change mitigation targets are deemed unacceptable locally, poorer countries have no possibilities to take action and will have to content themselves with alien criterions.

Finally, climate change mitigation is a global goal in which everybody should be able to participate as it counts as a worldwide hazard. Here access to the technologies becomes important on moral grounds. For example when insufficient public transport infrastructure is available, some people will have no other option then to go to work with their energy-inefficient car. In other cases technical solutions to allow poorer people to play a role in climate change mitigation are not even available. People should have the freedom to contribute to a good cause, i.e. mitigating greenhouse gases emissions, and not to be in a situation where they can only cause further damage to the earth's atmosphere.

IV. CORRECTING THE INJUSTICE

Subsequent publications to the 2008 Health Impact Fund proposal have dropped the strict patent requirement. This was done mainly for two reasons, some high impact medicinal improvements are not patentable (cf. Syed 2009) and the potential of traditional medicine can play an enormous role for global health and therefore has also to be harnessed (Mendel and Hollis 2010). The current version of the proposal, Hollis and Pogge 2009, suggests that researchers who gain the approval of a major regulatory agency, e.g. the U.S. Food and Drug Administration (FDA), should be eligible to receive the fund's rewards. Herewith we have a slightly wider opening of the 'filter' that decides which innovations can apply for HIF rewards and which not, as more innovations will qualify. The contour of this 'filter' does not only define the hurdle that actors will have to pass in order to receive the reward, but if shaped differently will also change the spectrum of actors attracted to the fund's rewards. Making the circle of potential applicants less exclusive will stimulate a higher competition among applicants to the fund. As the reward rate is self-adjusted by competition (Hollis and Pogge 2008, 23), participating companies will have an economic interest not to have the rules of the game changed after the fund comes into existence.

12] The HIF mechanism makes the development of "me-too" drugs (i.e. drugs that have no substantial benefits over existing medicines to treat a particular disease) not lucrative. While this makes sense for diseases, the existence of me-too products to mitigate climate change has to be judged using different parameters and taking a wider scope of social implications into consideration.

When we make it possible to reach the target (maximizing QALY) by more means we will increase the number of potential competitors and thus drive down the size of the reward.[13] Making the HIF rewards accessible for new competitors will primarily hurt the established large corporations mostly headquartered in the potential donor countries, something that small and medium-sized companies around the world will welcome, but which may provoke resistance from major business lobbies.

There is also another political catch, however, in dropping the strict patent requirement for HIF eligibility and settling for approval by a major regulatory agency alone. In the latter case, a company could be asked to give up some of the exclusive rights that derive from its proprietary control of the regulatory data in exchange for becoming eligible for the HIF rewards. The catch is that this might indirectly reinforce the international legitimacy of the principle of "data exclusivity" allegedly based on article 39 of the TRIPS Agreement, a principle that is currently being promoted by the US and the EU but that is fiercely resisted by India and other developing countries. The HIF could thus be seen as implicitly taking sides (and even the 'wrong' side) on this contentious issue.

Since especially in the case of climate-friendly technologies many non-patentable but high-impact innovations may emerge, the relaxation of the patent requirement deserves further elaboration.

It is in the public interest that a medicine has been approved by a regulatory agency for efficacy and safety. We can say that loosing up this requirement for any purpose whatsoever not only contradicts public interest, but may also jeopardize the health of people who are relying on the claimed benefits of the medicine in question. A Health Impact Fund that will not demand such safety tests will not do justice to its name. However this limits "impacting" global health to medicinal innovation and the making available of new drugs, leaving other ways to improve health unrewarded by the fund. There is a very good reason to concentrate on the development of medicines: the knowledge involved in their making is a public good. As a public good it is non-rivalrous in consumption – a welfare improvement that will survive wars and civil unrest. Medicinal treatments and cures can play a key role when natural or human disasters occur, as diseases that spread out by the collapse of infrastructure, overcrowded confinement of people and rape, can be controlled. As no society can completely insulate itself from such vulnerabilities, preventive measures for disease control can never do the full job.

13] The exceptional success of one candidate drug can also affect considerably the expected pay-out for other participating companies. The HIF considers having a pay-out ceiling for a single drug (Hollis and Pogge 2008, 20). A minimum pay-out rate per QALY added could reduce uncertainties if clearly fixed. Designing the HIF with a self-adjusting pay-out rate comes with the price that every change in the scope of inventions that are allowed to apply for the fund's reward will encounter strong resistance with people having already products destined for the HIF in their research pipeline.

As far as a Climate Impact Fund is concerned, regulatory approval plays a far lesser role.[14] It is easier to estimate the difference in emission output a new technology may have over an older one, than it is to measure the efficacy a drug has on combating a disease. The distribution of the innovation landscape has the potential of being much more dispersed than in the area of medicinal innovation, as a lesser minimum infrastructure is required. However there is a fundamental difference between climate-friendly technologies and medicines: the harm caused by manufacturing the products of innovation may supersede the claimed benefits. Estimating the total emissions caused by making the product available on a massive scale is a quite challenging undertaking. The debate around biofuels has become a classic example. Therefore, some kind of hurdle to be able to apply for a Climate Impact Fund's reward seems also necessary. Some kind of certification body similar to the Technischer Überwachungs-Verein (TÜV) will be needed to set the standard of what kind of innovations could apply for the rewards. The selection of technologies will probably have to be limited to technologies whose total environmental production costs can be reasonably measured. The reward has to be fixed in relation to the total impact the technology has (reduction of emissions minus additional emissions caused by production and operation). To make the climate impact measurement cost-effective, we may not only have to restrict the types of technologies that can opt for the fund's rewards, but also demand a fairly specific standard in homogeneity of the objects of innovation.

Shifting the threshold line from having a patent with FDA approval to having FDA approval alone for eligibility for the Health Impact Fund may change fundamentally how the fund is perceived. The basic mechanism of the impact fund relies on an exchange. Innovators have to give up some type of exclusivity, mainly price-setting privileges facilitated by patents or by being the sole "owner" of clinical trials data, in order to be eligible to apply for the fund's rewards. Now, for the sake of the argument, let us imagine that a philanthropic organization systematically undertakes clinical trials to show the efficacy of traditional medicine. This organization applies for the fund's rewards for no other reason than to give the indigenous communities that brought up the traditional medicine the entire impact fund's reward monies. The decision is based solely on notions of desert – the indigenous community created a public good, a gift to society, something that has to be reciprocated.

In the case of medicines, this case might be nothing more than a thought experiment, due to the high costs of running clinical trials. While considering climate-friendly technologies, this possibility ceases to be utopian, as certification costs may only be minor. There might be some cases where the impact fund may have the possibility to

14] Regulatory approval might also be relevant for new agrochemicals and new agricultural crops which could potentially play a role in climate mitigation. Data exclusivity is not only claimed for medicines but also for agrochemicals, as the latter are also mentioned in article 39 of the TRIPS Agreement. Agri-biotech companies would also like to see regulatory data on the biosafety of GM crops being treated as proprietary.

reciprocate such kinds of gifts to society. Now having the possibility to do so and choosing not to, demands a justification. If the invention happened to enter directly into the public domain, should the impact fund reward the inventor solely on notions of desert? Does society want to use the scarce resources for addressing global hazards to reward something that is already in the public domain? A Maussean conception of gifts clearly demands some kind of reciprocity. Forgoing the possibility to reciprocating such gifts will send a very particular message on how society perceives them. Prioritizing the creation of new tools to combat current global hazards could count as a strong argument, but as we are conceptualizing a global solution we should not underestimate the social importance the reciprocation of gifts has for some societies in our world.

V. HARNESSING THE POTENTIAL OF GRASSROOTS INNOVATORS

It has been suggested that the possibility to adapt an invention to local needs and even to be able to build an equivalent using local resources is vital for distributing it to areas where the market does not have its expected effect (cf. Gupta 2010). When climate change mitigation is the central goal, there are limitations (at least economic limitations) to what we can reach with the help of standardized highly technological inventions. The huge inequalities in the world limit access to the objects of innovation and the diversity in educational backgrounds may hinder the effective use of standardized inventions in all corners of the world.

We may think of the newest generation of light bulbs showing great efficiency in energy saving. Those bulbs are expensive to acquire and require special environmentally safe disposal. In how far the next generation of light bulbs can take into account the purchasing power of the poorest half of the planet, as well as its recycling limitations, remains open, but there is some justified scepticism on how far development further down this road will be as cost-effective as a strategy that aims at a diversification of innovation projects. There are a number of inventions that can be amended according to local needs or can be locally reproduced.

By contrast, the knowledge involved in a method to convert agricultural waste into a soil enhancer, biochar, does not only add to climate change mitigation efforts but can also play an important role for food security.[15] If the method is taught to farmers in remote areas, many could develop variations thereof to adapt to the local environment and through a process of trial and error keep improving local variations. People developing particularly successful variations could be incentivized to teach other communities about their skills.

15] An extensive presentation of the popular reception of biochar is offered in www.biochar-international.org. A brief historical introduction as well as a sketch of problems that have to be overcome for a wider use in East Africa is presented by N. Hagemann 2012.

VI. CONFLICTS OF LEAVING ADAPTATION NEEDS ASIDE

In an earlier sketch of the practical problems of a Climate Impact Fund (CIF), namely Timmermann and van den Belt 2012, we came to the conclusion that such a fund would only be feasible and cost-effective if it concentrates on incentivizing technologies that can be assessed by a broad across-the-board metric (in close analogy to how the original HIF uses the QALY metric [Hollis and Pogge 2008, Chap. 3]). Therefore a CIF should concentrate, at least in its initial stage, on climate change mitigation only. At least for some technologies we can measure its relative improvement in reduction of greenhouse gases emissions to existing technologies, as mention earlier. Constructing a broad metric for climate change adaptation will be close to impossible due to the heterogeneity of the various coping strategies.

This whole path will lead inevitably to a series of disputes. Firstly, it is far from self-evident that choosing a metric for its simplicity will provide a sufficient justification for its implementation. Focusing on lowering the carbon footprint might undermine other very important goals such as maintaining biodiversity, recovering green areas, changing to more sustainable food consumption, etc. Secondly, a major initiative that concentrates solely on mitigation efforts, may lead to neglecting the importance of adaptation needs. Here we should not forget that benefits gained by climate change mitigation are a public good – nobody can be excluded from it. The urgency of climate change adaptation varies significantly, especially when assessing food security (cf. Cline 2007). Local adaptation efforts may not automatically lead to solutions that could be exported to other areas that are also struggling to adapt to the new environmental conditions.

VII. CONCLUSION

Prioritising a global relief of suffering caused by diseases or mitigating climate change are very noble goals. However the need of reshaping our incentive system for technological innovation in such a way that we can achieve those goals in a reasonable time frame should not prevent us from questioning the acceptability of the methods used in the process. We, as people participating in society, are still responsible for the institutional order that has been set up and that we maintain with our daily habits. As a collective we are deciding what is feasible and thus we cannot escape accountability.

We fear that by advocating an incentive mechanism based on the concept behind the Health Impact Fund we might implicitly confirm the moral acceptability of our global intellectual property regimes by failing to formally reject it. Even if this addition to the patent system is the best thing we could establish under given political realities and therefore solely support this type of innovation system to achieve our goals, we are still adding to the stability of a system that could be rejected on moral grounds altogether. Supporting the patent system in this way might make it harder for future policy makers

to combat it. Generally, settling for the low minimum global justice commitment the HIF suggests, might not be without negative consequences for future policymaking.

Enabling people to participate in the advancement of science cannot be addressed solely by corporate social responsibility. We therefore suggest an "innovation inclusion clause" to be set in any proposed impact fund. There are multiple ways to incentivize inclusion, some more restricting, like limiting the availability of rewards to companies that have less than a defined percentage of scientific activities in the developing world (something that might bring other problems into existence that have to be addressed accordingly). Another way is to reserve a fixed portion of the available funds to help poorer companies to overcome the clinical trials hurdle (or the required approval of comparable regulatory agencies). Such a clause can still be framed in terms of negative duties: if the HIF adds to the research gap, it has to address this negative externality.

cristian.timmermann@wur.nl
henk.vandenbelt@wur.nl

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