Towards a contractually created commons in traditional knowledge and genetic resources for scientific research and innovation in India: *Scope and Challenges*[1]

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Abstract

The unlimited potential of traditional knowledge and genetic resources as a tool for generating invaluable innovations for sustainable global development is beyond doubt today. But the misuse or overuse of proprietary market based solutions in scientific research in this area have resulted in considerable distrust among nations as well as within the scientific research community. An immediate casualty of this growing distrust is hindrance of scientific research and innovations in the area. The current paradigms of intellectual property protection have also failed miserably in generating adequate incentives for research and value addition in vast majority of genetic resources and traditional knowledge with unknown/ low commercial values. The critical challenge faced today by the global scientific research community and the biodiversity/ traditional knowledge rich developing countries is in finding a new and balanced approach for information generation and information sharing that can protect the interests of all stake holders and at the same time enable scientific progress for pursuing an innovations based development paradigm in those countries.

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This paper analyses the scope and challenges of a contractually created commons in traditional knowledge and genetic resources in India, with the objective for promoting research and innovation in India. This is attempted by analysing three different case studies from India. The first case study used is the model promulgated by the Honeybee Network in India for promoting grassroots innovations and traditional knowledge. The second case study analyses the Traditional Knowledge Digital Library (TKDL) project in India. The third case study examines the Open Source Drug Discovery (OSDD) project of India. A joint perusal of these three case studies from different areas highlights not only the scope of pursuing a commons based approach, but also some of the challenges involved in the path. While the paper discusses the scope and the challenges in the context of research and innovation in India, the findings and the recommendations from this study will be of significance for most of the traditional knowledge/ biodiversity rich countries in similar stages of development.

Keywords: Traditional Knowledge, Biodiversity, Genetic Resources, Contractually Created Commons, India, Honey bee Network, TKDL, OSDD

I. Introduction

Protection of genetic resources and traditional knowledge has been one of the most contentious areas of debate in intellectual property (IP) law in the last two decades.[2] The draft negotiation text currently pending before the World Intellectual Property Organisation is one of the most illustrative examples of the extent of divergences of opinion between countries in this area.[3] As one may notice from the draft negotiation texts, there are considerable divergences even with regard to the definitions of traditional knowledge and genetic resources.[4] Two irreversible negative effects in the failure of the global community to reach a consensus on optimal mode of protection for traditional knowledge and genetic resources, are fast erosion of invaluable traditional knowledge in uncodified

[2] For a good overview of the various IP and non-IP tools currently considered in the debates over protection of traditional knowledge and biodiversity, see, generally, Overwalle, GV. 2005. Protecting and Sharing Biodiversity and Traditional Knowledge: Holder and User Tools. *Ecological Economics* 53: 585-607.

[3] World Intellectual Property Organisation. *Traditional Knowledge: Draft Articles* and *Genetic resources (Consolidated Document Relating to Intellectual Property and Genetic Resources)*, http://www.wipo.int/tk/en/consultations/draft_provisions/draft_provisions.html (accessed 2 September 2012).

[4] Ibid. See, also, World Intellectual Property Organisation. *The Protection of Traditional Knowledge: Collation of Written Comments on the List of Issues (WIPO/GRTKF/IC/11/5(A))*, http://www.wipo.int/edocs/mdocs/tk/en/wipo_grtkf_ic_11/wipo_grtkf_ic_11_5_a.pdf (accessed 2 September 2012).

form (particularly those relating to the properties of genetic resources) and hindrances to research and value addition in traditional knowledge/ genetic resources.

As many previous studies have shown, genetic resources and associated traditional knowledge can play a highly helpful role in evolving new innovations, particularly in the drug discovery process.[5] For example, in one of the studies that has analysed 122 plant derived drug compounds, it was found that 80% of them had an ethno-medical use similar/ identical to the use of the drug compound.[6] This finding is not really surprising, as many traditional knowledge holders possess immense knowledge about the medicinal and other properties of genetic resources around them. In most circumstances, they are also the most vigilant conservators of those genetic resources around them. It would be an irreversible loss for the global community, if it allows the invaluable knowledge of those conservators of biodiversity to disappear by virtue of its failure to reach a consensus on mode of protection, and this loss would be particularly heavy for the biodiversity/ traditional knowledge rich countries.

How do we protect traditional knowledge and genetic resources? It is a fact that the distrust among nations as well as within the scientific research community with regard to traditional knowledge/ genetic resources protection is primarily attributable to the misuse or overuse of proprietary market based solutions in scientific research in this area by a few researchers/ firms. Hence the critical challenge facing the global research community and the biodiversity rich developing countries is finding new and balanced approaches for information[7] generation and benefit sharing that can protect the interests of all stake holders. The present study makes an attempt in this direction by examining the scope and challenges of contractually created commons in traditional knowledge and genetic resources for promoting scientific research and innovation.

This article explores the scope and challenges of the commons based framework in the particular context of India. India was chosen for this study in view of its contribution to global biodiversity as well as its stage of economic development. India is one of the 17 mega diverse countries in the world in terms of biodiversity. It is also home to thousands of intellectually rich traditional knowledge holders who possess invaluable information about those genetic resources. But in spite of this richness in terms of traditional knowledge and genetic resources, India is also the home of millions living in poverty. Estimates suggest that nearly 30% of the 1.2 billion people in India live below the

[5] See, for example, Fabricant, DS. and NR Farnsworth. 2001. The Value of Plants Used in Traditional Medicine for Drug Discovery. *Environmental Health Perspectives* 109(1): 69-75.
[6] Ibid., 72.
[7] The term 'information' is used in this article to include both the direct information elements in traditional knowledge and also the indirect information elements in genetic resources, which are extracted through processes like scientific screening of genetic resources.

poverty line even today.[8] Hence a faster dynamic growth, based on research and innovations, is vital for India to bring the millions out of the vicious circle of poverty and this primarily led to choosing India for this study.

This study uses the case-study approach in research and attempts to answer the following three research questions – (1) Can there be a contractually created commons for protection of traditional knowledge and genetic resources?, (2) What are the scope and challenges involved in taking such an approach for protection of traditional knowledge and genetic resources?, and (3) What are the major elements to be included in such an approach, to make it optimal? The study uses three case studies from India for the present research. The first case study is the model promulgated by the Honeybee Network in India for promoting grassroots innovations and traditional knowledge. The access and use conditions incorporated in the prior informed consent forms of the Honeybee network are analysed in detail for this purpose. The second case study analyses the access and use conditions followed by the Traditional Knowledge Digital Library (TKDL) project in India. The third case study examines the Open Source Drug Discovery (OSDD) project of India. OSDD is one of the ambitious projects of the Council of Scientific and Industrial Research, India, to provide affordable healthcare to the developing world by providing a platform where global research community can collaborate and jointly find solutions to neglected diseases.

This paper is organised as follows: This brief introduction is followed by Section II which uses the classical prisoners dilemma example in game theory to illustrate the major challenge faced in the protection of traditional knowledge/ genetic resources. Such an analysis helps to better contextualize the problem we are attempting to solve. Section III discusses three case studies from India in detail. Section IV provides an overview of the joint perusal of the case studies and also their major implications. This section also highlights in detail the scope and challenges of pursuing a contractually created commons in traditional knowledge/ genetic resources for research and innovation, particularly the necessary elements for building a sustainable system. Section V concludes the paper with some remarks.

[8] http://data.worldbank.org/country/india (accessed 5 September 2012). It may be noted here that there are considerable divergences between experts with regard to poverty estimation in India and some estimates even consider that 50% of the population in India lives below poverty line. See, for example, http://www.guardian.co.uk/global-development/poverty-matters/2011/oct/04/india-measuring-poverty-line (accessed 5 September 2012)

II. Protection of traditional knowledge and genetic resources – A reflection of the classical prisoners dilemma

Game theory is a highly useful analytical tool that can help better understand the current crisis in the area of protection of traditional knowledge and genetic resources. Game theory refers to the study of the ways in which strategic interactions among different economic agents produce outcomes which might not have been preferred by any of those agents. *Prisoner's dilemma* is one of the most famous games analysed by game theorists to illustrate why two persons may not cooperate in certain situations, even if it would have been in the interests of both the parties to cooperate.[9] According to the prisoner's dilemma game, two accused persons are arrested by the Police and the Police do not have sufficient evidence for securing a conviction for them. To secure conviction, the Police separate the accused into two different cells where they cannot see each other or talk to each other. The officer then makes an identical deal with both of them independently. According to the deal offered, if that person testifies against the other accused and the other remains silent, the confessor will be released free and the silent person will receive a one year sentence. If both remain silent, both will be sentenced to only one month in jail. If both of them confess, both will receive three months sentence. The term 'dilemma' in the prisoner's dilemma game refers to the dilemma caused to both these prisoners with regard to the question as to whether to betray the other person or remain silent. In the common version of the game, game theory predicts the situation to result in confession from both prisoners (non-cooperation), though silence from both (cooperation) would have been far more beneficial for both prisoners.[10]

The current dilemmas in protection of traditional knowledge and genetic resources reflect in many aspects the prisoner's dilemma. To see why the current situation reflects the prisoner's dilemma, one may have to group the stake holders in the current scenario into two groups and consider them as two players in a game. Let Player A represent the state and knowledge holders, while Player B represent firms and researchers (both domestic and international)[11], who might be interested in

[9] For a detailed discussion on the prisoner's dilemma example, see Kuhn, S. Prisoner's Dilemma, *The Stanford Encyclopedia of Philosophy (Spring 2009 Edition)*, Edward N. Zalta (ed.), http://plato.stanford.edu/archives/spr2009/entries/prisoner-dilemma/ (accessed 5 September 2012).

[10] In the case of extended versions of this game, where the game is played repeatedly, the results can be different depending on whether the game is played finite times or infinite times. This is because repeated games provide the players opportunities to penalize the other for non-cooperation. However, if the players know the number of times the game will be repeated, the players will be opting non-cooperation, by way of backward induction.

[11] As Gupta points out, for the traditional knowledge holders and nature, the differences between foreign firms/ researchers and domestic firms/ researchers are irrelevant, as both of them are on equal footing when

doing research, value addition, and/ or commercialisation of the information. There are primarily two strategies for each of the players. For Player A (the state and knowledge holders), strategy 1 represents non-cooperation. This includes not sharing any of their genetic resources or traditional knowledge. Strategy 2 represents the alternate strategy of cooperation for Player A. This includes sharing of genetic resources and traditional knowledge with Player B. For Player B also strategy 1 represents non-cooperation. This may be in the form of activities like unsustainable extraction of genetic resources (tangible resources), non-sharing of benefits with knowledge/ resource providers, taking exclusive IP rights over information in genetic resources and traditional knowledge, etc. Strategy 2 for Player B represents the alternate strategy of cooperation. This can include the use of genetic resources (tangible resources) in a sustainable manner, engaging in benefit sharing, and avoiding the temptations to take exclusive proprietary rights over the information and tangible resources.

For illustrative purposes, the pay-offs for each players while pursuing their respective strategies, may be illustrated as shown in Table 1:

Table 1

		Player A	
		Strategy 1 **(do not cooperate)**	**Strategy 2** **(cooperate)**
Player B	**Strategy 1** **(do not cooperate)**	-5 -5	7 -7
	Strategy 2 **(cooperate)**	-7 7	5 5

To describe the payoff matrix in words, if Player A pursues strategy 1 (do not cooperate) and Player B also pursues strategy 1 (do not cooperate), the pay offs for both players will be negative. The logic

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it comes to misappropriation issues. See, for example, Gupta, AK. 2001. Intellectual Property, Traditional Knowledge and Genetic Resources; Conserving Biodiversity and Rewarding Associated Knowledge and Innovation Systems: Honey Bee Perspective (WIPO/ECTK/SOF/01/3.8), 10, http://www.wipo.int/edocs/mdocs/ip-conf-bg/en/wipo_ectk_sof_01/wipo_ectk_sof_01_3_8.pdf (accessed 5 September 2012).

behind this argument is simple. If the state and knowledge holders do not share their resources with firms or researchers, both the state and knowledge holders lose the opportunity to profit from the benefit sharing which may have occurred in a scenario where firms and researchers have access to these resources and use it for value addition/ commercialisation. Similarly, researchers and firms will also be at the losing end in this situation, as they will not get access to the invaluable resources/ information, resulting in stagnation of research/ value addition/ commercialisation. Hence both the players are having negative payoffs under scenario 1.

The second possible scenario is Player A pursuing strategy 2 (cooperate) and Player B pursuing strategy 1 (do not cooperate). Here the payoffs for Player A will be negative and the payoffs for Player B will be positive. It is not difficult to understand why this should be the case. If the state/ knowledge holders provide invaluable resources/ information to the firms/ researchers and if the firms/ researchers engage in activities like taking exclusive IP rights over the shared resources/information or abstaining from benefit sharing, the state/ knowledge holders will be at the losing end. On the other hand, the benefits under such a scenario for the firms/ researchers will be higher when compared to the situation in which they have to engage in benefit sharing and abstain from taking exclusive IP rights and this explains the high payoffs for Player B in this situation.

The third possible scenario is Player A pursuing strategy 1 (do not cooperate) and Player B pursuing strategy 2 (cooperate). Here Player B is at the losing end and Player A is at the benefiting end. The logic behind this pay-off scenario is also simple. If the state/ knowledge holders can continue to receive a share of benefits without the state/ knowledge holders actively sharing any resources/ information, the scenario provides higher payoffs for them. The scenario shows negative utility for Player B (firms/ researchers), as they do not get any additional resources/ information from Player A (state/ knowledge holders), even though they are actively engaging in benefit sharing on the already available resources and abstains from taking any IP rights over them.

The fourth scenario is the one where both the players pursue Strategy 2 (cooperate). In other words, it represents the situation where the state/ knowledge holders actively share resources/ information with firms/ researchers and the firms/ researchers actively engage in benefit sharing from the research/ value addition/ commercialisation and also abstains from misappropriating IP rights over the information/resources shared by knowledge holders/state. Obviously, both the players will have higher positive payoffs, as they both benefit from the cooperation under this scenario.

When one analyses these scenarios, it is reasonable to think that the players will pursue Scenario 4, as it is in the interest of both the players. But in real life, we could see both the players generally

ending up in scenario 1, which in effect provides negative payoffs and inefficient outcomes for both the players. But why does this happen? Game theory can provide some interesting insights as to why this happens. When Player A is engaged in the decision making process, s/he doen't know how player B will respond and s/he has to think about the possible pay-offs, taking into consideration the strategies Player B may take. When Player A looks at the possible payoffs, it could be seen that irrespective of the strategy that Player B choses, player A would always be better off by taking Strategy 1 (do not cooperate). Player A would therefore choose strategy 1 and it is commonly referred to as the 'dominant strategy'. Similarly, when Player B looks at the possible pay-offs, Player B will see that irrespective of what Player A choose, Player B would be better off by choosing strategy 1 (do not cooperate). The dominant strategies of both the players will result in scenario 1, which is considered by game theorists as a nash-equilibrium. Under the nash-equilibrium, no individual players can be better off by changing his or her behaviour, as the other players do not change their behaviours.[12] As one could notice, the nash-equilibrium scenario is not a pareto efficient outcome. The players in the game we described here will not reach the pareto-efficient outcome, as they cannot make binding commitments for cooperation.

As one might observe from many of the discussions regarding the protection of genetic resources and traditional knowledge, the illegitimate and unjust behaviour from the side of a few researchers/ firms have caused considerable distrust in the minds of the global community. The result of this mistrust is near complete stagnation of research and cooperation in the area. Many biodiversity and traditional knowledge rich states today view with high suspicion the researchers/ firms approaching them for research on genetic resources and traditional knowledge. On the other side, firms/ researchers are also in dilemma as they cannot engage in research without the support of those states/ knowledge holders. While they can always avoid taking exclusive IP rights over their research on genetic resources/ traditional knowledge, they also cannot engage in benefit sharing with the concerned knowledge holders/state or ensure fair treatment of the results of their research without a proper system in place. The resulting situation, which is reflected in the current genetic resources/ traditional knowledge protection embargo, is total lack of binding commitments for cooperation, which ultimately results in the inefficient nash equilibrium situations described above. Only measures that can help us move from the current inefficient scenario of non-cooperation between stakeholders to a pareto efficient scenario where all stakeholders cooperate for long term benefits can bring in sustainable solutions. The three case studies discussed in detail in the next section will help us better analyse whether a contractually created commons in traditional knowledge and

[12] Cooter, RD. and Thomas Ulen. 2004. *Law and Economics.* Boston: Pearson Addison Wisley, 41.

genetic resources can contribute in this direction by ensuring better cooperation from all stakeholders.

III. Three Case Studies from India

Case study 1: Honey bee Network

The Honeybee Network is an informal network of individuals, innovators, farmers, scholars, academicians, policy makers, entrepreneurs and non-governmental organizations (NGOs).[13] This informal network began activities in the area of protection of traditional knowledge, biodiversity, and grassroots innovations in the late 1980s in India, under the leadership of Professor Anil K. Gupta.[14] The three basic ideals that unites the individuals and organisations under the Honeybee network are - (1) for a knowledge system to be sustainable, it has to be both just and fair; (2) while collecting/ using knowledge from traditional knowledge holders or grassroots innovators, proper attribution must be provided, unless not desired by the knowledge providers; (3) a fair and reasonable share of benefits must go back to the knowledge holders from the value addition in traditional knowledge and innovations.[15] According to Gupta, the term 'honey bee' was used as a metaphor for this network for two factors noticeable in honeybees, but absent in the conduct of many human beings – (1) honey bee collects pollen from flowers and the flowers doesn't complain and (2) honeybee connects flower to flower through pollination.[16]

The Honeybee Network has been actively engaged in scouting, documentation and value addition of traditional knowledge, biodiversity and grassroots innovations across India. Till date, it has been able to document more than 140,000 practices from 545 districts in India.[17] Nearly 90 per cent of those innovations and traditional knowledge practices are scouted through volunteers associated with the network, while the remaining practices are received directly at the National Innovation Foundation, one of the organisations under the Honeybee umbrella.[18] Shodhyatra, a walking journey of 10 days

[13] http://www.sristi.org/hbnew/aboutus.php (accessed 14 July 2012).
[14] http://www.iimahd.ernet.in/~anilg/ (accessed 14 July 2012).
[15] Personal interactions of the first author with Prof. Gupta and other members of the Honey bee Network, during his tenure as a CSIR-NIF Fellow (2007-2008) at the National Innovation Foundation, one of the member organisations of Honeybee Network.
[16] Gupta, AK. Can Protection of Intellectual Property Rights Be of Any Consequence to the Poor People?, 6-7, http://www.iimahd.ernet.in/~anilg/selectedpub.php (accessed 26 July 2012).
[17] Gupta, AK. Innovation, Investment, Enterprise: Generating Sustainable Livelihood at Grassroots through Honey Bee Philosophy, 4, http://www.iimahd.ernet.in/assets/snippets/workingpaperpdf/13976704412012-06-04.pdf (accessed 31 July 2012). It may be noted here that not all of the 140,000 practices are unique practices.
[18] Ibid, 3.

conducted in every summer and winter, also plays a substantial role in the process of identification of practices from remote villages in India.[19] Knowledge holders in the local areas are honoured during such walks and this has provided non-material incentives not only to the knowledge holders, but also to the community as a whole to identify and bring forward more practices.[20] The honeybee network has also been organising biodiversity competitions and traditional recipe competitions.[21] Such events provide not only an opportunity for transfer of knowledge from elders to the younger generation, but also to help the younger generation to learn more about the diversity and richness of knowledge and biodiversity in rural areas.[22]

The network uses two kinds of Prior Informed Consent (PIC) forms during the scouting process – (1) PIC for scouting traditional knowledge practices and (2) PIC for scouting innovations and ideas.[23] The PIC forms specifically ask the knowledge providers whether the knowledge shared by them can be disseminated publicly. The implications of the consent are also explained by the scouting team. Depending on the type of consent provided by the knowledge provider, the Honeybee network uses two kinds of access policies for the data in its custody. For practices where consent for revealing the knowledge publicly is given by the knowledge holders, the organisation provides free and complete access to data, along with contact references (contact address of the knowledge provider and also the scout who documented the practice). Apart from the online database, many of those practices are also disseminated through the honeybee newsletter, which is published in different languages.[24] For practices relating to genetic resources, the online database can be searched using both the scientific names of plants and the local names of plants. On the other hand, in cases where the consent for publication of knowledge is not given by the knowledge holders, public access is highly restricted. In cases where the innovators do not want to share full information, synoptic information could be shared and this has enabled easier collaboration with the industry, thereby linking traditional knowledge and value addition/ commercialisation in an effective way.[25]

[19] Ibid., 5.
[20] Ibid.
[21] See, for example, http://www.sristi.org/cms/?q=en/image/tid/138 (accessed 3 September 2012).
[22] Gupta, AK. Innovation, Investment, Enterprise: Generating Sustainable Livelihood at Grassroots through Honey Bee Philosophy, 6.
[23] http://www.sristi.org/cms/pic (accessed 23 July 2012).
[24] http://www.sristi.org/wsa/ (accessed 23 July 2012).
[25] Honeybee network is reported to have received queries from more than 55 countries for the products. Gupta, AK. Values in Vogue: Institutional Pathways for Sustaining Grassroots Innovations for Creating Public Goods, 13, http://www.iimahd.ernet.in/assets/snippets/workingpaperpdf/15082386562012-06-06.pdf (accessed 1 August 2012).

Vast majority of the practices shared by the Honeybee Network are in public domain and only a tiny miniscule are subject to patent protection.[26] As Gupta suggests, this shows an interesting paradox of enriching public knowledge without depriving the rights of the knowledge providers.[27] The honeybee network has also been able to build a Micro Venture Innovation Fund, with the help of Small Industries Development Bank of India.[28] This fund is intended to provide funding for knowledge holders to engage in value addition, without worrying about collateral or guarantors. Interestingly, reports suggest that more than 60 per cent of the knowledge holders who made use of this funding mechanism have already been able to pay back their amounts.[29] More than 60 technologies have also been licensed by the network so far and in some cases the entrepreneurs were entering into licensing agreements even in the absence of any patent protection on the subject matter of licensing.[30] According to Gupta, though those entrepreneurs could have used those technologies legally without any licensing, they did not do so only because of the ethical values.[31]

Interestingly, the first licensing contract that SRISTI (one of the NGOs under the network) entered with a company involved pooling of public domain traditional knowledge.[32] The pooled technology was licensed to three small entrepreneurs for different districts in India, for small fees ranging from USD 500 to USD 1000, depending on the number of districts.[33] This indeed was a novel model of pooling of traditional knowledge practices, licensing of such pooled practices and sharing of benefits with all concerned. In a more recent licensing deal, wherein SRISTI licensed 12 technologies to a pharmaceutical company named Matrix BioSciences, the company also provided the name and photographs of innovators in the product packages, thereby showing a path breaking model of non-monetary benefit sharing.[34] This was in addition to the sharing of monetary benefits from the product.[35] The same packaging label also invited the public to contribute similar knowledge to the Honeybee network by contacting in the address provided in the label. In a nutshell, the Honeybee network is remarkable for showing the world a new model of contractually created knowledge pool, which can increase the welfare of all stake holders.

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[26] Gupta, AK. Can Protection of Intellectual Property Rights Be of Any Consequence to the Poor People?, 1, http://www.iimahd.ernet.in/~anilg/selectedpub.php (accessed 26 July 2012).
[27] Ibid.
[28] http://www.nif.org.in/mvif_bd (accessed 1 August 2012)
[29] Gupta, AK. Innovation, Investment, Enterprise: Generating Sustainable Livelihood at Grassroots through Honey Bee Philosophy, 5.
[30] Ibid.
[31] Ibid.
[32] Gupta, AK. Values in Vogue: Institutional Pathways for Sustaining Grassroots Innovations for Creating Public Goods, 14.
[33] Ibid., 15.
[34] Gupta, AK. G2g – Grassroots to Global: The Knowledge Rights of Creative Communities, 3, http://www.iimahd.ernet.in/~anilg/selectedpub.php (accessed 1 August 2012).
[35] Ibid.

Case study 2

The Traditional Knowledge Digital Library (TKDL) is a project initiated by the Government of India in the year 2001, as a defensive mechanism against misappropriation of traditional knowledge.[36] The period preceding the establishment of this project had witnessed some of the most controversial traditional knowledge related patent disputes in different parts of the world. This includes grant of patents relating to turmeric and basmati by the United States Patent and Trademark Office (USPTO) and the grant of patents relating to neem by the European Patent Office (EPO).[37] According to some estimates, nearly 2000 patents were erroneously granted annually by patent offices across the world on applications primarily containing subject matter already described under traditional medicinal systems and this was primarily attributable to the lack of access for patent examiners to much of India's traditional medicinal knowledge existing only in regional languages.[38] The TKDL project was aimed to address this problem and it sought to overcome this challenge by evolving a multi-lingual traditional knowledge database and a novel traditional knowledge resource classification system.[39] The TKDL now contains transcriptions from 150 books relating to traditional Indian medicine.[40] It is reported to have around 34 million pages of formatted information on 2,260,000 medicinal formulations.[41] The classification system adopted by the TKDL was modelled on the International Patent Classification (IPC) used by the WIPO and it consists of nearly 27,000 subgroups for Ayurveda, Unani, Siddha and Yoga.[42]

Interestingly, access to the TKDL is highly restricted. As is evident from the comments made by some of the chief proponents of the project, the very basic view that seems to have guided the evolution and access structure of this database is that *"[a]ttempts to exploit TK for industrial or commercial benefit can lead to its misappropriation and can prejudice the interests of its rightful custodians."*[43] For fear of such misappropriation of the information contained in the database, the TKDL does not provide open access to the public and the access to the database is limited to select patent offices

[36] The main collaborators in the project are the Council of Scientific and Industrial Research (CSIR), Ministry of Science and Technology and Department of AYUSH, Ministry of Health and Family Welfare. http://www.tkdl.res.in/tkdl/langdefault/common/Abouttkdl.asp?GL=Eng (accessed 2 August 2012).
[37] For detailed discussion on these patents, including the disputed claims in those patent applications, Ghosh, S. 2003-2004. Globalization, Patents, and Traditional Knowledge. *Columbia Journal of Asian Law* 17: 73, 93-107.
[38] Gupta, VK. 2011. Protecting India's Traditional Knowledge. WIPO Magazine 5: 5.
[39] Ibid., 6.
[40] Data as on July 2012. http://www.tkdl.res.in/tkdl/langdefault/common/AboutTKDL.asp?GL=#Present (accessed 29 August 2012)
[41] Gupta, VK. Protecting India's Traditional Knowledge, 5.
[42] Ibid. 6.
[43] Ibid., 5.

that have signed an access agreement containing strong non-disclosure provisions.[44] Only around 7 patent offices have signed the agreement so far and this includes EPO and patent offices of Australia, Canada, Germany, UK, US and Japan.[45]

But how far is the project successful? While no one can deny that the TKDL would be highly helpful in challenging frivolous patent applications based on traditional knowledge, there appears to be scarcity of concrete data on the actual number of patent applications opposed/ revoked so far using the TKDL references. While this could partly be attributed to the fact that patent examiners generally use multiple references while declining a patent application or directing the modification of a claim (and hence success cannot be attributed to the TKDL alone!), it is also partly attributable to the lack of updated statistics on the actual number of prior art submissions based on the TKDL made at different patent offices and the average rate of acceptance of the prior art submissions from the TKDL.[46] However, one of the recent articles from the director of the TKDL project has made references to a study conducted by a TKDL expert team at the EPO and claims that there has been nearly 44% decline in patent applications relating to traditional Indian medicines.[47]

An empirical analysis of the incidents reported under the heading 'TKDL Outcomes against bio-piracy' in the TKDL project website shows that TKDL had been successful in preventing the grant of erroneous patent applications or modification of patent claims or forcing the applicants to withdraw erroneous patent applications in around 105 instances, till July 2012.[48] Cross-sectional analysis of the same data show that the TKDL team focus mostly on the EPO as 55 of the 105 reported instances are relating to withdrawal of patent applications before the EPO and another 17 instances relate to amendment/ modification of claims or description by applicants at the EPO.[49] However, we could not find any data as to whether the same applicants had patent applications with same or similar claims in other jurisdictions and whether any actions were taken on them. It is also interesting to

[44] The non-disclosure agreements are not available in the TKDL website. However, a young researcher had recently filed an application under the Right to Information Act for getting the copies of the access agreements signed with USPTO, EPO and JPO and the copies he received are now available online. See Reddy, P. The TKDL 'Free Access' Agreements with the EPO, JPO & USPTO: Subsidizing Foreign Patent Offices? (*SPICYIP*, 22 February 2012) http://spicyipindia.blogspot.be/2012/02/tkdl-free-access-agreements-with-epo.html (accessed 28 August 2012).

[45] Data as on July 2012. http://www.tkdl.res.in/tkdl/langdefault/common/AboutTKDL.asp?GL=#Present (accessed 29 August 2012).

[46] Some scholars have also pointed out instances wherein the TKDL team has wrongly claimed the success in revocation of patents to their prior art submission. See, for example, 'Guest Post: The Traditional Knowledge Digital Library and the EPO' (*SPICYIP*, 19 March 2012), http://spicyipindia.blogspot.be/2012/03/guest-post-traditional-knowledge.html (accessed 28 August 2012).

[47] Gupta, VK. Protecting India's Traditional Knowledge, 7-8. However, as the data relied to reach those figures and the assumptions used in this regard are not available in the public, it is hard to verify the claim.

[48] http://www.tkdl.res.in/tkdl/langdefault/common/outcome.asp?GL=Eng (accessed 29 August 2012).

[49] Ibid.

observe from the data that the TKDL references are hardly ever used in the patent examination process before the Indian patent office. The report in the TKDL website do not mention even a single instance before the Indian patent office, though one would reasonably expect a fairly large number of Indian traditional knowledge related applications before the Indian patent office also.[50]

But the most relevant TKDL related data for the present discussion is the one relating to the usage of the TKDL database by patent examiners across the world. As mentioned earlier, access to the TKDL database was given only to select patent offices and TKDL team had imparted training for those patent offices to use the TKDL database. However, the data available in the TKDL website shows that only in one instance, an examiner had referred to the TKDL *suo moto*.[51] In other words, in all other instances, the TKDL project team must have been conducting searches on their own and opposing the applications as third party references. It is hard to claim that this is an efficient approach to deal with frivolous patent applications based on traditional knowledge, as the number of such applications happening across the world would be far exceeding the number of persons who could be employed by the TKDL project to track such applications. This inefficient outcome is primarily attributable to the secrecy wall built around the TKDL database. An alternate approach, wherein this database is opened to the general public, would have enabled far easier and efficient reviewing of patent applications from across the world using the references in the TKDL and it would have also made the project far more significant.

The secrecy brought around the TKDL database also appears to be without any legal or moral justification.[52] It is without legal justification as the TKDL project was merely transcripting information available in existing books in regional languages to a searchable multi-lingual database. Those books were already available to the public and there is no reason why the transcripted information should be held in secrecy. The secrecy is without moral justification as the TKDL is a public funded project and the public have every right to ensure maximum benefits from a highly resource consuming project like the TKDL. By wrapping under a veil of secrecy and limiting the access to just around 7 patent offices that have signed confidentiality agreements, the TKDL project is resulting in sub-optimal use of public resources. An open access approach would not only have

[50] Ibid. See, also, Rathi, M. Unveiling the Link: CSIR and Indian Intellectual Property Office (*SPICYIP*, 16 April 2012), http://spicyipindia.blogspot.be/2012/04/guest-post-unveiling-link-csir-and.html (accessed 28 August 2012) and Reddy, P. Trying to make sense of TKDL's access policy – Why is the Indian Patent Office being ignored? (*SPICYIP*, 10 April 2012), http://spicyipindia.blogspot.in/2012/04/trying-to-make-sense-of-tkdls-access.html (accessed 28 August 2012).

[51] http://www.tkdl.res.in/tkdl/langdefault/common/outcome.asp?GL=Eng (accessed 29 August 2012).

[52] For a critical analysis of the legal justifications for making TKDL a confidential website, see Reddy, P. Is the TKDL a 'Confidential Database' and is it Compliant with Indian Copyright Law? (*SPICYIP*, 29 March 2012), http://spicyipindia.blogspot.be/2012/03/is-tkdl-confidential-database-and-is-it.html (accessed 28 August 2012).

prevented many more frivolous patent applications across the world, but may also have enabled value addition on the knowledge, which were already in public domain. One should also note that all these additional benefits would have been achieved without any dilution of the basic objective of the TKDL project, which was to defend traditional knowledge from being subjected to patent protection, as more researchers could have engaged in independent and voluntary peer reviewing of patent applications and many more patent examiners (including those in the patent offices that have not signed the agreement with the TKDL project) would have been able to treat such knowledge references as prior art while examining a patent application.

Case study 3: Open Source Drug Discovery Project

Open Source Drug Discovery (OSDD) is an innovative drug discovery project initiated under the leadership of the Council of Scientific and Industrial Research (CSIR) in India.[53] Beginning in the year 2008, the project uses the power of openness and collaboration in research for developing effective drugs against neglected, yet catastrophic, diseases like tuberculosis and malaria. One of the basic characteristics of the market for neglected diseases like tuberculosis is that most of the patients are in economically poor countries and hence most of the big pharma companies do not have sufficient incentives to undertake research and development in those areas. But the neglected diseases are posing a huge health challenge for many economically poor countries. For example, recent WHO statistics show that 8.8 million people were affected with Tuberculosis in the year 2010 alone and 1.4 million people died, indicating the gravity of the issue.[54] More than 95% of those Tuberculosis related deaths are happening in middle or low income countries.[55] Market based solutions have clearly failed to address this growing global health challenge and OSDD was initiated by the CSIR to address this health challenge.[56]

Drawing inspiration from the success of the open source software projects and the power of crowd sourcing, the founders of OSDD has aimed to address the challenge of developing drugs against neglected diseases by providing an open platform where professionals from across the world can collaborate and work together for identifying and developing new drugs on neglected diseases. The work methodology adopted in this regard is novel, yet simple. Any student, researcher or organisation can become a member of the OSDD community through a simple registration process in the OSDD website. The larger complex problem of drug development is divided into different smaller

[53] http://www.osdd.net/about-us (accessed 30 August 2012).
[54] http://www.who.int/mediacentre/factsheets/fs104/en/index.html (accessed 30 August 2012).
[55] http://www.who.int/mediacentre/factsheets/fs104/en/index.html (accessed 30 August 2012).
[56] See, generally, Bhardwaj, A., and others. 2011. Open Source Drug Discovery: A New Paradigm of Collaborative Research in Tuberculosis Drug Development. *Tuberculosis* 91: 479.

work packages that move from basic coordination to clinical development of new molecular entities and they are posted in the open platform. The solutions for the entire process of drug discovery, which are divided into different problems, can be brought forward by any member of the OSDD community and the contributions are clearly attributed to the contributors. To ensure consistency in this process all contributions are both date stamped and time stamped. All the contributions are subject to open peer review in the platform and this also ensures quality, as no researcher would like to risk her or his reputation.[57] Community members who need funding for their research (relating to the OSDD objective) can post their request in the platform and such project related requests are also subject to open peer review. The core funding of the OSDD project is from the Government of India and it has already allocated $12 million for the OSDD, with more in the pipeline.

According to the OSDD license terms, which is provided in the OSDD website, all the information, contents and results available in the OSDD portal, including those relating to the identification of drugable non-toxic targets, in vitro and in vivo validation, in silico screening of molecules, lead optimization and clinical trials, are considered as protected collective information under the ownership of OSDD and it will be held in trust by the CSIR on behalf of the OSDD.[58] According to the license terms, anyone accessing the protected collective information has the obligation to contribute any additions or improvements made to or using such information back to the OSDD through the same portal.[59] The license also stipulates that in the event of a member acquiring any intellectual property rights by making improvements or modifications on any part of the collective information, s/he shall grant an unencumbered worldwide non-exclusive right on it to the OSDD for further research.[60] The license also mandates members to submit back to the collective information the output or result of any use, whenever they are based on the collective information.[61] The license also seeks permission from the members to enable licensing of the research results generated out of the OSDD, for the purpose of furthering the OSDD mission.[62]

While making it mandatory for the users of the portal to make appropriate attribution to the original contributors, the license also makes it explicit that all contributions made by them will also be

[57] Masum, H. 2012. Insider Views of Collaborative R&D for Health: Q&A with Zakir Thomas (2 August 2012) http://healthresearchpolicy.org/blog/2012/aug/2/insider-views-collaborative-rd-health-qa-zakir-thomas (accessed 31 August 2012).
[58] See Sec.3 of the Terms and Conditions http://sysborg2.osdd.net/html/portlet/login/terms.jsp (accessed 30 August 2012).
[59] Ibid.
[60] Ibid.
[61] Ibid.
[62] Ibid.

attributed properly.[63] The license also allows the members to make improvements, additions or modifications on the collective information and use it commercially or non-commercially.[64] The only condition stipulated in this regard is that they must also share all such improvements, additions and modifications in the forum.[65] For those members wishing to bring to the OSDD forum any of their inventions which are patented or which are kept as trade secrets, only for the purpose of generating Information for OSDD, they are allowed to do so without licensing or disclosing or parting with such invention or technology.[66] The only requirement stipulated in this regard is to submit the Information so generated to the OSDD to become a part of collective information.[67] Interestingly, the OSDD has also explicitly warned the members not to infringe the intellectual property rights of the third parties during their collaborative works at the OSDD.[68]

In just four years, OSDD has been able to make remarkable progress in the drug discovery process. The first target disease for the OSDD is tuberculosis and more recently the OSDD has also started collaboration for developing drugs against malaria. One of the most remarkable achievements so far made by the OSDD community in the tuberculosis project is the re-annotation all genes in Mycobacterium tuberculosis genome, as researchers were previously having information about only a quarter of the approximately 4000 genes.[69] With the help of around 500 volunteers under the sub-project codenamed as *connect2decode*, this task was completed in a remarkably small time period of 4 months.[70] More importantly, *Connect to Decode's* Interactome Pathway Annotation (IPW) is considered to have generated the largest ever data set of manually curated interactions in Mtb and the IPW data has been made available in the web platform of OSDD for enabling further research.[71] As the OSDD portfolio page reveals, experiments are continuing at different stages and the OSDD already has two candidates in the hit to lead phase.[72] OSDD has also recently announced its intention to begin Phase II-b clinical trials for a new tuberculosis drug along with the Global Alliance on tuberculosis.[73] The fact that OSDD now has more than 6000 registered participants from 130

[63] See Sec. 4 of the Terms and Conditions.
[64] See Sec. 4.2 of the Terms and Conditions.
[65] See Sec. 4.2 of the Terms and Conditions.
[66] See Sec. 4.4 of the Terms and Conditions.
[67] See Sec. 4.4 of the Terms and Conditions.
[68] See Sec. 5.1 of the Terms and Conditions.
[69] See, generally, Vashisht, R., and others. 2012. Crowd Sourcing a New Paradigm for Interactome Driven Drug Target Identification in Mycobacterium tuberculosis. PLoS ONE 7: e39808.
[70] Bagla, P. 2012. Crowd-Sourcing Drug Discovery. *Science* 335: 909.
[71] Vashisht, R., and others, Crowd Sourcing a New Paradigm for Interactome Driven Drug Target Identification in Mycobacterium tuberculosis, 2.
[72] Status as on January 2012. http://www.osdd.net/osdd-portfolio (accessed 30 August 2012).
[73] Overdorf, J. TB or not TB: India Crowdsources Research (*Global Post*, 11 July 2012) http://www.globalpost.com/dispatch/news/regions/asia-pacific/india/120703/india-drug-discovery (accessed 30 August 2012).

countries is also equally remarkable here.[74] This high intensity participation is undoubtedly an illustration of the interest of the research community in collaborative open research for common causes.

IV. Major implications from the case studies

A joint perusal of these three case studies from three different areas reveals many important insights. This section highlights seven important implications for further discussion.

1. Contractually created commons, as seen in the case of honeybee network databases, can not only help in defensive protection of traditional knowledge, but also provide affirmative protection for the real conservators of biodiversity and traditional knowledge.
2. Contractually created commons can enable benefit sharing in the form of not only material goods, but also non-material incentives like recognition within the community.
3. As the Honeybee case study shows, affirmative protection action can ensure better livelihood for the conservators of knowledge/ biodiversity and thereby better opportunities to prevent the erosion of traditional knowledge / biodiversity. Comparatively high positive response to Honeybee scouting efforts also testifies this element.
4. As the Honeybee case study shows, contractually created commons can enable easier pooling of knowledge and value addition, thereby helping the research and innovation process of a country.
5. While efforts like that of the TKDL are laudable for defensive protection, it is limited by the fact that it fails to provide incentives for the real conservators of biodiversity and traditional knowledge to disclose more knowledge or engage in sustainable use of resources. The same objectives of defensive protection could be achieved by a contractually created commons, with the additional benefit of providing incentives to the conservators of biodiversity/ traditional knowledge.
6. The developments in digital technologies have enabled not only easier communication, but also easier collaboration across the world. This is very much evident from the online research platform created by the OSDD for new drug discoveries and the high response from researchers across the world for engaging in collaborative research in that platform.
7. New online platforms could be created where scientists from across the world could collaborate and add value to traditional knowledge/ genetic resources related information. Such

[74] http://www.osdd.net/news-updates/osddcommunitycrosses6000mark (accessed 30 August 2012)

collaborative efforts can substantially help to bridge the gap between formal and informal science and such efforts are particularly relevant in the context of research and innovation in an economically poor country like India.

India is fortunate to have extremely rich biodiversity and traditional knowledge. The best approach to develop and maximise this information wealth is networking people and those information for creating more information.[75] Such an approach of networking would also bridge the gap between formal and informal sciences and India would be able to bring forward far more innovations to the world, particularly in the area of medicines and public health. However, this would be possible only if India is able to preserve and add value to its invaluable genetic resources and traditional knowledge. A contractually created commons that can combine the best elements of the case studies discussed here can substantially help India in this regard.

One of the pragmatic approaches to achieve this objective is to replicate the Honeybee model more widely and complement it with an open research platform similar to that of the OSDD. This could be achieved either by supporting the Honeybee network or similar organisations in every state and district in India. An alternate approach would be to persuade the Biodiversity Management Committees constituted under the National Biodiversity Act to use more volunteers (particularly students and researchers) and adopt this approach.[76] Volunteers have a prominent role in the success of a mission like this, particularly in proper scouting and documentation of knowledge/ information. As the Honeybee experience shows, knowledge holders are generally more inclined to reveal information to volunteers whom they can trust, than officials coming for any scouting purposes.

Four necessary elements to be ensured in the process of creating a contractually crated commons research platform in India are - (1) mandatory Prior Informed Consent from the knowledge holders, (2) proper and mandatory attribution of the information to the knowledge holders, (3) explicit assurance for benefit sharing (monetary and non-monetary) in the event of value addition or commercialisation in the information shared by knowledge holders, and (4) explicit assurance for sharing of information back to the knowledge holders, about all the value addition and commercialisation on

[75] Citing the example of Wikipedia, Benkler has argued that the best way for maximising information and knowledge resources is through networking of millions of people who can pool together their knowledge and efforts to create new products, ideas and solutions. Benkler, Y. 2011. *The Penguin and the Leviathan: How Cooperation Triumphs over Self-Interest*. New York: Crown Publishers, 153.

[76] There are 31,542 Biodiversity Management Committees in India, as on 2010. National Biodiversity Authority, *Annual Report 2009-10*, 27, http://nbaindia.org/content/103/37//reports.html (accessed 1 September 2012). The Biodiversity Management Committees are also presently engaged in preparing a People's biodiversity register. But to make the scouting efforts more successful, it may have to recruit more volunteers skilled and interested in scouting traditional knowledge/ genetic resources.

the knowledge shared by them. All the information should be properly catalogued and preserved in networked databases. In cases where volunteers identify novel formulations (which will not be considered as traditional knowledge under the Indian Patents Act) from knowledge holders, appropriate IP protection measures has to be taken before sharing it in the database, and the IP protection details has to be specifically mentioned while sharing the information in the database. As the experience from the Honeybee network shows, such IP protection measures can enable easier sharing of benefits and also the legal possibilities to prevent free riding on the information shared, though the instances where they have to be enforced will be very few.[77] Once appropriate protection IP protection measures are taken, even those IP protected information should be shared openly in the database. Access to these networked databases should be given not only to all patent offices (to prevent frivolous patents based on traditional knowledge), but also to all researchers who are willing to sign an agreement that includes both benefit sharing and information sharing discussed above. A click-wrap agreement (like the one used in the OSDD website) could be used for the researchers, as it would bind them to the terms of benefit sharing and information sharing with knowledge holders, without causing much procedural hurdles. Similar to the open position taken in the OSDD, all modifications and improvements should also be mandatorily shared through the same platform.

Efforts in this direction will not only assure far more research and development in India, but also far more sharing of benefits with the real conservators of knowledge, particularly for two reasons. First, it solves the 'trust deficit' crisis, discussed in section 2, to a greater extent, as all stake-holders will have a more transparent view of both the use of information and the sharing of information. The long term benefits would be more visible to all stakeholders and this would ensure binding commitments for long term cooperation from all stakeholders. Secondly, an open database as suggested here will reduce the transaction costs for innovation. The digital access character of the proposed database reduces not only search related costs for information, but also the costs for identifying the beneficiaries for sharing benefits. This is particularly important as reduction of transaction costs of the institutions and players are also considered highly necessary for any mediating platform to achieve legitimacy.[78] The proposed model will also be able to give higher political and economic clout for the conservators of knowledge. Some scholars like Ghosh, who have analysed the limited

[77] The general position taken by the Honey bee network with regard to IP protection is that people to people sharing (horizontal learning) should be encouraged and free of cost, while the commercial use of any information should be a subject of licensing. Gupta refers to this as an emerging 'Technology Commons'. Gupta, AK. How to protect the inventions of the poor (*SciDev Net*, 2 May 2012) http://www.scidev.net/en/science-and-innovation-policy/supporting-grassroots-innovation/opinions/how-to-protect-the-inventions-of-the-poor.html (accessed 6 August 2012).

[78] Gupta, AK. Innovation, Investment, Enterprise: Generating Sustainable Livelihood at Grassroots through Honey Bee Philosophy, 9.

commons approach for protection of traditional knowledge had suggested that it may not protect the interests of indigenous people and does not necessarily give them the political and economic clout generally taken as the central normative guideline.[79] But the commons model proposed in this paper will overcome this challenge, as the mandatory prior informed consent requirement will give the knowledge holders the ultimate right to determine whether to share their information or not. Only such empowerment can bridge the trust deficit that has caused over the years and such an empowerment is highly necessary to prevent the knowledge erosion that occurs through non-sharing of information.

But is the concept of contractually created commons for traditional knowledge and genetic resources free from challenges? The biggest challenge one may face in evolving the proposed contractually crated commons is enforcement of contracts. In other words, there is always the possibility of a section of researchers/ firms trying to free ride on the knowledge shared in the proposed databases. However, the success of digital commons shows that when people are made aware of the virtues of benefit sharing and also when the benefit sharing is easier and transparent, the chances of free riding will be lesser. As Benkler points out in one of his recent works, most experiments conducted by different disciplines in different societies show that fully half of all people behave cooperatively in a systematic, significant, and predictable manner, while only around 30% are found to engage in selfish behaviour.[80] The success of business models based on open source software is a testimony to the tendency of the majority of population to behave cooperatively when sharing is easier. However, as any legal and policy change should also take into consideration the minority who might engage in selfish behaviour, this study would also like to highlight some of the important steps that could address the issue in the context of our proposed contractually crated commons in Traditional Knowledge and Genetic Resources.

One of the most important measures in this regard is regular screening of the user details for accessing the databases (this can enable the tracking of usage) and ensuring the genuineness of the registration related data of the user. This could be easily implemented with the help of software that can track the location and IP address details of website/ database users. An equally important measure against free riding is making explicit ex ante that the violation of the terms of contract will be shared publicly. This is a particularly important step in the context of our proposed commons, as the threat of shaming might have higher effect against possible violations when compared to many other sanctions, as no researcher/ firm would generally be willing to risk reputation for violation of

[79] Ghosh, S. Globalization, Patents, and Traditional Knowledge, 142-143.

[80] Benkler, Y. *The Penguin and the Leviathan: How Cooperation Triumphs over Self-Interest*, 12-15. Benkler also cites examples from different areas like Wikipedia, Linux, and Community policing in Chicago to illustrate the success of collaborative relationships.

benefit sharing/ information sharing. In a similar way, all the details of benefit sharing and information sharing from researchers using the database should also be made openly and continuously available in the same platform so as to motivate more researchers/ firms to engage in sharing. To deal with disputes which may arise in spite of the above mentioned precautionary measures, it is also important to constitute a mediation mechanism within the legal framework of the proposed commons, so as to enable the settlement of disputes in a cost-effective and speedy manner. Finally, there should also be provisions for initiating dispute settlement through courts in cases where mediation fails and this would be easier in cases of information where IP protection existed.

Apart from the above mentioned measures, there should also be active encouragement for researchers and students to voluntarily monitor patent applications, using the resources available in the proposed databases, and such peer reviewing can be the most effective tool against misappropriation of information. If relevant prior arts are identified against pending patent applications/ wrongly granted patents, they should be shared in the proposed platform with the name of the volunteer who helped to identify them (unless s/he wished to remain anonymous) and this may motivate more volunteers to contribute to the peer reviewing process. Unlike the case of TKDL, wherein the TKDL project team had to pursue patent searches almost singlehanded (due to the confidential nature of the TKDL database), the databases proposed in this paper will help volunteers across the world to identify prior art far more easily and bring them to the attention of patent offices to prevent misappropriation of information. Finally, as a long term measure, efforts must also be made at an international level to make the disclosure of the source of genetic resources and traditional knowledge a mandatory aspect in all patent applications. This may also necessitate an amendment in the TRIPS Agreement.

V. Conclusion

This paper was an attempt to identify the scope and challenges of a contractually created commons in traditional knowledge and genetic resources, for promoting research and innovation in India. As discussed in the background of three interesting case studies from India, a contractually created commons model in the lines discussed in this paper can be highly helpful for fostering research and innovation in a country like India. The proposed model would also provide far better protection against erosion of traditional knowledge and genetic resources, as benefit sharing and information sharing will provide better incentives to document and preserve genetic resources and traditional

knowledge. At a time when the international community is struggling to reach consensus on the mode and breadth of protection for traditional knowledge and genetic resources, India can show the world a new model of protection that combines the goals of protection of traditional knowledge and genetic resources with research and innovation in those invaluable resources. This might indeed persuade many more nations to proactively engage in similar measures. As discussed in the previous section, we do not expect the suggested model to be completely free from challenges, as in any system there may be a minority trying for free-riding. But it is a fact that free riders are a minority in any system/society and the precautionary steps highlighted in the previous section will substantially reduce such risks and enable an inclusive research and innovation led growth paradigm.