

# The Myth of ‘Tragedy of the Commons’ in Sustaining Water Resources

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## Abstract

With growing concerns regarding natural resources security over the last fifty years, a range of movements, including the notion of *the tragedy of the commons* suggest how to enhance sustainability of natural resources. A case in point is the discourse on the necessity of introducing regulatory and market schemes for the challenges to the sustainability of the commons. This article, *inter alia*, highlights the literature on the *tragedy of the commons*, in order to understand its theoretical and practical strengths, and examine the applicability of its core ideas to current issues of water security. As contemporary water security problems are interconnected and complex, the article challenges the adequacy and effectiveness of coercive regulatory arrangements to individual water users’ behavior in sustaining water security. It also examines the variation of new initiatives (in natural resources management) from the traditional perspectives of the *tragedy of the commons*. It is argued that introducing coercive regulatory institutional arrangements is not by itself sufficient because water security may require comprehensive regulatory and non-regulatory institutional arrangements at national and transnational levels (supplemented by comprehensive implementation strategies) to address a range of water pressures.

## Key words

Tragedy of the Commons, the Commons, open- access, institutional arrangements, water security, water pressures

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## Introduction

Where natural resources experience little pressure and in the absence of scarcity problems, regulatory intervention may not be so important.<sup>1</sup> The theory of the *tragedy of the commons* calls for the commons to be appropriated. When such

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<sup>1</sup> James Salzman and Barton H. Thompson (2010). *Environmental Law and Policy*, 3<sup>rd</sup> Edition, Thomson Reuters, p.47.

appropriation is not possible, the theory suggests the introduction of regulatory intervention, which limits the access to and use of the commons. Hardin's coercive regulatory remedy focuses on the behaviour and control of individual users in limiting access to and use of scarce natural resources. From a water security point of view, the focus of this theory is to introduce coercive regulatory schemes for the demand of water users. The implication of this remedy is that a lack of coercive regulatory instruments for water demand management is a root problem for the water resources tragedy.

This study argues that approaching water resources problems in terms of the regulation of individual water users' demand management may have its own positive contribution to enhancing water sustainability, if the institutional arrangements for demand management are comprehensive enough to address a range of water over-exploitation problems. However, contemporary water security challenges are diverse by their nature, and these problems do not always stem from lack of coercive regulatory institutions for water demand management.

Enhancing water security needs to be approached through multifaceted regulatory and other institutional arrangements, which are beyond the regulation of individual water users' behaviour. Such institutional arrangements should be introduced more inclusively and comprehensively to address the range of water security pressures, including controlling the behaviour of riparian states, which the tragedy of the commons has barely addressed. More importantly, regulatory rules by themselves may not bring about change without introducing effective implementation strategies. Considering all these challenges, the central argument of this study is that lack of proper institutional arrangements for water demand management may be part of the problem for contemporary water security challenges.

The academic inquiry in this article re-frames the tragedy of the commons debate in relation to water security, in the orientation that the regulatory arrangements themselves for the demand of individual water users should be comprehensive enough to address a range of water pressures. However, present day water security challenge may need non-coercive regulatory institutions. It is argued that the tragedy of the commons theory should be re-framed to an orientation that understands water security challenges from the perspectives of the interconnected and complex problems that need integrated water resources management with a view to addressing a range of water security threats.

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# 1. Basic Assumptions of the Tragedy of the Commons Theory

## 1.1 The concepts of the tragedy of the commons

The fear of the ruin of scarce natural resources by human action is not a new idea. Hardin published an article in *Science Journal* in December 1968, entitled 'The Tragedy of the Commons'.<sup>2</sup> Subsequently, this notion has been widely discussed and has dominated scholarship in different disciplines. Since its publication, the article has been widely reprinted in scientific journals and quoted across disciplines.<sup>3</sup>

The tragedy of the commons theory embodies two key words: 'tragedy' and 'commons'. The word '*tragedy*' is not seen in the usual theatrical sense. Hardin stated that '[t]he essence of dramatic tragedy is not unhappiness. It resides in the solemnity of the remorseless working of things.'<sup>4</sup> Until the commons are ruined, rational individual users generate the maximum possible benefits, whilst leaving the cost of over-exploitation of the commons. Hardin further underlined the idea that '[t]his inevitableness of destiny can only be illustrated in terms of human life by incidents which in fact involve unhappiness. For it is only by them that the futility of escape can be made evident in the drama.'<sup>5</sup>

Similarly, the tragedy of the commons uses the word '*commons*' frequently. Hardin described 'commons' as a common pool of resources where access to natural resources is open to all persons.<sup>6</sup> These resources are freely available to anyone in the system and are unregulated. Similarly, Crowe defined the concept 'commons' as 'a social institution...some environmental objects, which have never been, and should never be, exclusively appropriated to any individual or group of individuals'.<sup>7</sup> In his description, Crowe includes such things as water, the atmosphere and living space as 'commons'.<sup>8</sup> An example that Hardin used is that of open-access pastureland, in which no user has the prerogative to exclude others from use, and all users are equally entitled to use it without any

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<sup>2</sup> Garrett Hardin (1968). *The Tragedy of the Commons*, 162 SCI. 1243, 1244.

<sup>3</sup> Ian Angus, *Socialist Voice: Marxists Perspectives for the 21'st Century*, August 24, 2008.

<sup>4</sup> Hardin, *supra* note 2, pp. 1243-1248.

<sup>5</sup> Ibid.

<sup>6</sup> Ibid.

<sup>7</sup> Berly Crowe (1969). 'The Tragedy of the Commons Revisited', *Science, News Series* 166(399) 1103-1107.

<sup>8</sup> Ibid.

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restriction. There have been criticisms against Hardin's usage of the term 'commons' to describe open-access resources.<sup>9</sup>

## 1.2 A large number of people as owners

Hardin's notion of the tragedy of the commons was not a new finding. Its roots and assumptions are partly related with Aristotle's perspectives. Aristotle had stated that anything that 'is common to the greatest number has the least care bestowed on it'.<sup>10</sup> Noticeably, Aristotle observed that the nature of rights over a thing affects its prospects of care; it can either enhance the sustainability of resources, or may expose them to depletion and degradation. In those circumstances when the level of care a given thing receives is the least possible, the prospect for those resources may be depletion.

The underlying idea is that when something is under the control of the largest number of people, it becomes difficult to provide the maximum possible care that thing deserves. This idea implies that holding a thing in common is not by itself problematic; the crisis is most likely experienced when a large number of people enjoy a common right over a thing. The contrary reading of Aristotle's premise implies that the care level of something is the maximum possible when the number of persons with property rights over the thing is small.

In terms of environmental resources, '...the creation or recognition of property rights' is considered as the scheme that remedies the problems of the commons.<sup>11</sup> Vesting property rights prerogatives on individuals or communities has been assumed to halt the short-term economic gain that can devastate the long-term benefits of resources.<sup>12</sup> Once the government creates or recognizes property rights over something then it leaves it for the market, with the assumption that no one would act against his or her own self-interest.<sup>13</sup> In contrast to something held in common by a large number, private property rights provide an incentive that encourages an owner to value and manage the resources for his long-term benefits. For instance, Carol contends that 'exclusive private property is thought to foster the well-being of the community, giving its

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<sup>9</sup> Michael Taylor (1992). 'The Economics and Politics of Property Rights and Common Pool Resources', *Natural Resources Journal* 32; p 3 see also Dasgupta, Partha (1982). *The Control of Resources*, Cambridge, Mass.: Harvard Press, p.13.

<sup>10</sup> 'Politica', trans. B. Jowett, in Richard Mckenon (ed.) *The Basic Works of Aristotle* (New York: Random House, 1941), pp.1113-1316.

<sup>11</sup> Salzman and Thompson, *supra* note 1, p.47-48.

<sup>12</sup> *Id.*, p.48.

<sup>13</sup> *Ibid.*

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members a medium in which resources are used, conserved and exchanged to their greatest advantage'.<sup>14</sup>

One of the important differences between ordinary common rights and public property is the amount of people who enjoy the thing in question. In many cases, in ordinary commons, the number of persons with common rights may be too small, whereas, in public, it is too large.<sup>15</sup> Since a large number of users are involved, the care bestowed to the resources is the least possible, unless there are schemes to regulate users' behaviour. However, in those contexts where something is owned by a small or large group as co-owners, there has been care for the resources, since a group of people introducing self-regulation or a level of resources use is determined by a government's rules to ensure the sustainability of the resources.<sup>16</sup> The co-owning group excludes others from intervention, which adversely affects their interest.<sup>17</sup> In the case of public property rights, most of the time, a given thing is held in common by the largest number of people, and the government has the authority to control access and the extent of use in order to protect the common interest.<sup>18</sup> Noticeably, users of the commons are expected to abide by the rules that impose duty.<sup>19</sup>

### 1.3 Unregulated commons

Hardin noted that if the commons are left unregulated, the extent of exploitation relies on the judgment of the users themselves, and he doubts that individual rational users would work to sustain the long-term interests of the common users. Apparently, those individuals who exploit the commons excessively would leave fewer resources for those users who commit themselves. In the absence of any rules restricting the access and extent of use, such resources become open-access resources.

Ultimately, such exploitation of resources would lead the commons to a tragedy that might even lead the resources to the extent of extinction. For such adverse consequences, Hardin's theory criticizes the political-economic model

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<sup>14</sup> Carol M. Rose (1986). 'The Comedy of the Commons: Commerce, Custom, and Inherently Public Property', *Faculty Scholarship Series*. Paper 1828. Available [http://digitalcommons.law.yale.edu/fss\\_papers/1828](http://digitalcommons.law.yale.edu/fss_papers/1828), last accessed 05 august 2013

<sup>15</sup> Daniel H. Cole (2002). *Pollution & Property: Comparing Ownership Institutions for Environmental Protection*, Cambridge University press, p. 11.

<sup>16</sup> Carl Dahlman (1980). *The Open Field System and Beyond: Property Rights Analysis of an Economic Institution*, Cambridge: Cambridge University Press, pp. 26, 132

<sup>17</sup> Daniel Bromley W. (1991). *Environment and Economy: Property Rights and Public Policy*, Oxford,: Basil Blackwell, pp. 25-6.

<sup>18</sup> Daniel H. Cole (2002). *Pollution & Property: Comparing Ownership Institutions for Environmental Protection*, Cambridge University press, pp 7-8.

<sup>19</sup> Ibid.

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of leaving the resources as open-access. As a root cause of environmental challenges, the tragedy of the commons considers the absence of regulatory rules of the commons users' behaviour.<sup>20</sup> It assumes not only that the commons is a natural resource held in common by many individuals, but also that the access and extent of the exploitation of resources is unregulated.<sup>21</sup> The incentive is created since the cost of the exploitation of resources is externalized and is borne by the public at large, whilst rational individual users are maximizing short-term economic gain with no cost to pay.<sup>22</sup>

Hardin illustrated this problem by using open-access pastureland. With open-access pastureland, each rational herdsman makes an effort to maximize the gains from his or her herding in a plot of land.<sup>23</sup> In such situations, Hardin believed that a rational herdsman would receive most pasturelands benefits by adding more and more herds, whilst at the same time; these practices would lead the natural resources to ruin.

The tragedy of the commons develops in this way. Picture a pasture open to all. It is to be expected that each herdsman will try to keep as many cattle as possible on the commons. Such an arrangement may work reasonably satisfactorily for centuries because tribal wars, poaching, and disease keep the numbers of both man and beast well below the carrying capacity of the land. Finally, however, comes the day of reckoning, that is, the day when the long-desired goal of social stability becomes a reality. At this point, the inherent logic of the commons remorselessly generates tragedy.<sup>24</sup>

The tragedy of the commons theory stresses that natural resources experience possible threats to their sustainability if they are left unregulated.<sup>25</sup> It is believed that, in 'open access', any user or group of users is unable to limit access and unwise use the commons.<sup>26</sup> The users' behaviour is uncontrolled, in terms of protecting common interests and environmental sustainability;<sup>27</sup> they are free to use the resources to the extent of their need. The fear for such resources is, without rules or limitations, people act less responsibly.<sup>28</sup> The openness (non-

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<sup>20</sup> Eban Goodstein (1995). 'The Economic Roots of Environmental Decline: Property Rights or Path Dependence?', *Journal of Economic Issues* 62, p. 1029.

<sup>21</sup> Salzman and Thompson, *Supra* note 1, pp. 19, 47.

<sup>22</sup> *Ibid*, pp.20-21.

<sup>23</sup> Hardin, *supra* note 2, pp. 1243-1248.

<sup>24</sup> *Ibid*.

<sup>25</sup> Hardin, *supra* note 2, p. 1243.

<sup>26</sup> Cole, *supra* note 18, p. 6.

<sup>27</sup> Bonnie J. McCay (2009). *Right to Nature: Ecological, Economic, Cultural, and Political Principles of Institutions for the Environment* (Editors: Hanna, S., Carl Follke, F. and Makler, K. Island Press, Washington), p. 115.

<sup>28</sup> *Ibid*.

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restriction) of the access and use of the resources facilitates those resources' ruin. As the incentives to exploit the use of resources increase, the users are encouraged to exploit the unregulated resources more and more.<sup>29</sup> Eventually, all users may resort to exploiting as their capacities allow, rather than reasonable use from what is available and from what the carrying capacity of the resources permits. 'Freedom in a common brings ruin to all.'<sup>30</sup>

The milestone underlining the tragedy of the commons is that if a resource is held in common by a large number of people, for use by all without limitation of access and use, and owned by no person or group, no one may wish to behave and use the resources in a manner that sustains the resources for long-term common use. The users exploit resources in a way that promotes short-term self-benefits while ignoring or undermining the long-term benefits. In such a situation, '[t]he result is individually rational in the short term – if the resource will be depleted, you might as well ensure you get your share –but collectively disastrous in the long term.'<sup>31</sup> The openness of the commons develops a dilemma for the commons use. This dilemma is described as '...individually rational behaviour is collectively deficient. Individuals' personal incentives work *against* the best long-term solution.'<sup>32</sup> Due to this, the commons held through public property may require more regulatory and non-regulatory schemes to enhance the sustainability of resources.

## 2. Averting the Tragedy

Identifying the conditions that lead to a ruin does not assure sustainability of the commons. It needs to find out mechanisms that can facilitate sustainable resources usage. The tragedy of the commons gives insight as to how to prevent the open access scarce resources from generating ruin for all.<sup>33</sup> The theory has identified two alternative solutions: the commons to be appropriated when such measure is possible, or be regulated by coercive rules if appropriation is impossible. Both remedies suggest defining institutional arrangements limiting access and use of the commons towards controlling the overuse of natural resources.

### 2.1 Appropriation of the open-access resource

The market-oriented remedy for the tragedy of the commons theory suggests that, if appropriation is possible, a government can establish rules assigning

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<sup>29</sup> Ibid, pp. 19, 47.

<sup>30</sup> Hardin, *supra* note 2.

<sup>31</sup> Salzman and Thompson, *supra* note 1, p.20.

<sup>32</sup> Ibid.

<sup>33</sup> Hardin , *supra* note 2, pp. 1243-1248.

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private property rights over scarce open-access resources; then, each resources owner uses natural resources in a way that is sustainable. The implication is that a 'rational individual' does not cause his or her own resources to be ruined by his or her own actions. Hardin's argument, suggesting appropriation of natural resources, supports privatization to regulate users' behaviour. Privatization of the commons assumes the owners defend abuse of the natural resources through property law. The assumptions are that publicly owned sectors are exposed to inefficient performance, are subject to 'state failure', and portray market forces as better devices to enhance economic efficiency.<sup>34</sup>

However, the market itself is naturally exposed to failure.<sup>35</sup> This demonstrates that free market is not a panacea for social, environmental and economic problems.<sup>36</sup> For instance, *Peritz* defined the term 'competition' as 'a process whereby firms fight against each other in order to secure customers for their products by adopting any means'.<sup>37</sup> *He further* described free competition as 'the most certain way of fixing the true worth of merchandise between buyers and sellers'.<sup>38</sup> The restraint or absence of a choice in any market affects competition.<sup>39</sup> Accordingly, the notion of competition itself is a mediating force that balances interests. Here, for competition to happen there must be competitors who compete in the same market to obtain maximum profits, and consumers who have choices of a specific service or product.<sup>40</sup>

Simply put, if efficient regulatory schemes are not in place, 'state failure' in the case of public control is replaced by 'market failure' in the case of private control. The essence of this idea is that privatization itself does not bring about competition if there are no possible competitors. Even in markets with many choices, leaving the market alone to its own devices (demand and supply) may give rise to unwanted outcomes.<sup>41</sup> Potentially, in an unregulated market, firms

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<sup>34</sup> UNCTAD Model Law, (2001b). The relationship between competition authorities and regulatory bodies, pp.12-18.

<sup>35</sup> Michal S. Gal (2004). *The Ecology of Antitrust Preconditions for Competition Law Enforcement in Developing Countries*, New York University School of law, pp. 22-38

<sup>36</sup> Erik Swyngedouw, (2005). 'Dispossession H2O : the contested terrain of water privatisation', *Capitalism Nature Socialism*, 16(1), p. 82.

<sup>37</sup> CUTS (2001). *Competition Policy and Law Made Easy*' Monographs on Investment and Competition Policy, pp. 6-8.

<sup>38</sup> Rudolph Peritz (1996). *Competition Policy in America*, (Oxford University press), p.1.

<sup>38</sup> *Ibid.* pp. 2-3.

<sup>39</sup> OECD (2000). *Hard Core Cartels*, Meeting of the OECD Council at Ministerial Level, pp. 12-13

<sup>40</sup> *Ibid.*

<sup>41</sup> Gal, *supra* note 35, pp.22-38.

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may tend to impose restrictions that are anti-competitive practices by their nature. In such situations, it is often said that the government monopoly may have been replaced by a private monopoly, leading to 'market failure'.<sup>42</sup>

## 2.2 Restraint by coercive rules developed through outside agents

In cases where appropriation is impossible, the tragedy of the commons suggests the regulated access and use of commons. These rules involve 'Mutual Coercion Mutually Agreed Upon'.<sup>43</sup> Hardin believed that it might not be possible to limit the tragedy of commons through a mere 'verbal appeal'. The theory recommends the introduction of coercive rules that limit selfish individuals or groups. As a society, the users need to change their behavior towards the over-exploitation of the commons. To avert the tragedy of the commons, in addition to the creation or recognition of property rights, a range of regulatory and non-regulatory schemes have been developed.<sup>44</sup> One of these regulatory arrangements is prescriptive (coercive) regulation. In prescriptive regulation, the government may limit access or the extent of the exploitation of resources.<sup>45</sup> The rules limit the particular types of natural resources usage that a government considers unsustainable, and declares some resources uses are permitted. Through this, access to and exploitation of some natural resources are limited or stopped.

The Coercive rules are generally developed and administered by outside agents. It favors direct top-down natural resources management. This type of regulatory instrument is often considered as command-and-control regulation by a government agency, and it is doubtful that it brings about an effective change in the level of resources exploitation.<sup>46</sup> Once the users have attained the relevant level of limitation to access or use of the commons, the rule does not offer incentives to encourage further innovation that enhances sustainable resources use.<sup>47</sup> Due to this, the users may continue to rely on traditional and non-innovative regulatory mechanisms. However, some scholars argue that strict prescriptive regulation increases sustainable use through encouraging the production process and innovation designs.<sup>48</sup>

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<sup>42</sup> Ibid.

<sup>43</sup> Hardin, *supra* note 2, p.124.

<sup>44</sup> Salzman and Thompson, *supra* note 1, p.47.

<sup>45</sup> Ibid.

<sup>46</sup> Ibid.

<sup>47</sup> Ibid.

<sup>48</sup> Porter & Van der Linde (1997). 'Towards a New Conception of the Environment-Competitiveness Relationship', 9 *Journal of Economic Perspectives* 97, Issue 4, pp. 47-52.

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Another regulatory means is financial penalties or charges that internalize the cost. This regulatory approach discourages unsustainable resource use through imposing fees.<sup>49</sup> It aims to provide incentives for each user to shape his or her behavior. A practical problem for introducing this scheme is identifying the appropriate fee, which accommodates the full social and environmental cost, since the valuation of the right fee is difficult.<sup>50</sup> Naturally, introducing and implementing the correct internalization of the social and environmental cost is increasingly dependent on the political willingness of a given country. For such a scheme to be effective, the fees should be high enough to send price signals toward sustainable resources use; however, environmental goods charges often tend more towards revenue-raising.<sup>51</sup> In contrast to financial penalties, financial payments could subsidize those people who use the resources in a beneficial way, in order to encourage sustainable resources use.<sup>52</sup> Both regulation and market instruments are designed to discourage harmful social behavior and encourage beneficial behavior. In this case, the government does not impose penalties or charges; instead, it subsidizes them.

### 3. Drawbacks of the Tragedy of the Commons

When Hardin demonstrated what he called the tragedy of the commons on pastureland, it was not about a 'common', which is owned by a group of users who own a thing collectively and restrict other users coming from outside a group, but it was about open-access resources. Hardin using the term 'commons' whilst describing 'open-access' or 'unregulated' resources has been seen as a misconception.<sup>53</sup> Stevenson noted that common property is not open access; the group has rights and duties to limit access and the extent of exploitation of resources.<sup>54</sup> Since such property has defined rights and duties upon group users and outsiders, the commons closely resembles private property, which gives the owner the right to exclude others' exploitation without his/her consent.<sup>55</sup>

Similarly, Dahlman contends that the commons has been regulated by quasi-governmental or governmental rules.<sup>56</sup> The access and use of the resources

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<sup>49</sup> Ibid, p.50.

<sup>50</sup> Ibid.

<sup>51</sup> Ibid.

<sup>52</sup> Ibid.

<sup>53</sup> Taylor, *supra* note 9.

<sup>54</sup> Glenn Stevenson (1991). *Common Property Economics: A General Theory and Land Use Applications*, Cambridge, Cambridge University Press, pp. 58-9.

<sup>55</sup> Ibid.

<sup>56</sup> Salzman and Thompson, *supra* note 1, p. 21.

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within a group are limited.<sup>57</sup> For instance, in England, common pastureland has persisted for centuries.<sup>58</sup> Such pasturelands were not open-access in their nature; instead, they were owned by a defined group that excluded any other group from intervention in the property rights they had. Often, the village court, the government or a quasi-government regulated their exploitation.<sup>59</sup> Similarly, Turkish fisheries have been governed through common property rights, and this system has persisted for a long period of time.<sup>60</sup> The fishers themselves have developed rules governing the extent of exploitation, to avert possible depletion.<sup>61</sup> The government has also developed regulatory rules limiting fishers.<sup>62</sup>

On the other hand, Bromley contends that 'a common property regime for the group becomes an open access regime for the individuals within the group.'<sup>63</sup> There are no rules limiting individual group members from access and use of the resources. However, practice indicates that the traditional common does not entitle the group to exploit the resources without restriction.<sup>64</sup> Their exploitation levels are limited by rules developed by themselves or the government.<sup>65</sup> The members in common pool resource cannot exclude its group's members; they exclude non-group members from access and use.<sup>66</sup> The main confusion regarding the tragedy of the commons may stem from confusing ordinary commons or common pool resources with open-access resources. With the ordinary commons, individual owners can have a range of prerogatives to control access and the extent of exploitation to make the resources sustainable. There are schemes that exclude users outside the group and regulate resources use within the group.<sup>67</sup>

Elinor Ostrom observed the commons from the perspective of real-world contexts, by carrying out empirical research on communal resources, such as fisheries, land irrigation systems and farmland. She considered open-access

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<sup>57</sup> Ibid.

<sup>58</sup> Id., pp. 33-36.

<sup>59</sup> Id., p. 126.

<sup>60</sup> Fikret Berkes (1992). 'Success and Failure in Marine Coastal Fisheries of Turkey', in Daniel W. Bromley (ed.), *Making the Commons Work*, San Francisco: Institute for Contemporary Studies, p. 167.

<sup>61</sup> Ibid.

<sup>62</sup> Id, p. 168

<sup>63</sup> Daniel W. Bromley (1991). *Environment and Economy: Property Rights and Public Policy*, Oxford,: Basil Blackwell, p. 149.

<sup>64</sup> Ibid.

<sup>65</sup> Ibid.

<sup>66</sup> Id, pp. 25-6.

<sup>67</sup> Taylor, *supra* note 9, pp. 6- 8.

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resources and common pool resources as two different concepts. With open-access resources, she believed that there is no limit to the access of resources, and it is impossible to identify who the users are.<sup>68</sup> Open-access resources are characterized as those resources that are free to all users. She described common pool resources as large enough, and difficult to define who the users are, but it is not impossible to identify them.<sup>69</sup> Hardin's explanation of pastureland usage suggests that the word 'commons' refers to 'open-access' resources, in which no individual has a claim to any part of the resources used by another user; the commons nature of resources allows the use of a portion of it for his/her own benefit, without any limitation from other users. For example, resources like the open sea and the atmosphere are classified as open-access resources, whereas rivers and lakes are categorized as common pool resources.<sup>70</sup>

The second criticism against Hardin's theory was related to the decision-making institutional arrangements and organizational structures that he proposed to avert the tragedy of the commons. Ostrom argued that, with common pool resources, users have their own rules, developed to utilize the resources and limit outsiders. The tragedy of the commons also does not suggest a management role for the users of scarce common resources. It is very vague as to what organizational remit is appropriate for enhancing the security of water and it is unclear which level of government that would be mandated to provide regulatory rules. Moreover, it seems to fail to recommend options for coercive rules.

Hardin's assumptions and the solutions he suggested fail to consider the community as part of the management to supplement the coercive regulatory arrangements, but the theory finally fails to demonstrate the practical and theoretical relevance of community management. Ostrom suggested an idea that recognizes, under certain circumstances, the possibility of managing natural resources by the community itself. She underlines the fact that, in some circumstances, community users formulate the rules that regulate common pool resources and enforce them without any government intervention.<sup>71</sup> Her work brings a self-governance system at the centre of sustaining scarce natural resources in defined circumstances.

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<sup>68</sup> Elinor Ostrom (2008). 'The Challenges of Common-pool Resources', *Environment: Science and Policy for Sustainable Development*, 50:4, p. 11.

<sup>69</sup> Elinor Ostrom (1990). *Governing the Commons: the Evolution of Institutions for Collective Action* (New York, Cambridge University Press), pp. 90-105.

<sup>70</sup> Ostrom and Hess (2001). *Artifacts, Facilities and Content: Information as a Common Pool Resource*, Conference on Public Domain, Duke Law School, November, pp. 9-11.

<sup>71</sup> Ostrom, *supra* note 69, pp. 90-105.

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However, Ostrom described the following circumstances that should shape common pool resources management.<sup>72</sup> Primarily, the resources' boundaries should be defined, and the users' rights be clearly identified. Moreover, there must be established rules specifying the amount of resources that each user is entitled to exploit from the common pool of resources. The third aspect concerns collective choice arrangements. Many of the individuals who are affected by the utilization and protection of the resources should become involved in the group that makes or modifies the rules that govern collective action. The fourth aspect suggests that there must be close monitoring of the behaviour of users. This can be done by a body that is at least partially accountable to the users, or can involve the users themselves. The fifth idea involves imposing a graduated sanction on the wrongdoer, based on the context and nature of seriousness. The users or officials accountable to them, or both, can impose this sanction.

Another aspect is that there should be a low-cost conflict resolution system that resolves conflict between users, or between users and the officials managing the resources. Furthermore, there is the idea that users are not restricted to having their own institutions to manage resources by the government authorities. There must be a minimum standard that entitles the users to organize how they manage their resources. At the same time, they must be given long-term access to the resources. The final aspect is the introduction of multilayer governance for the appropriation, provision, monitoring, enforcement, and conflict resolution and governance activities.

Hardin's theory called for the intervention of increased government agencies rather than participatory management through developing self-rules. However, the local users are not the only cause of the tragedy of the commons; rather they come up with solutions that are supportive in sustaining the commons. With regard to this, Ostrom demonstrated the possibility of the introduction of cooperative arrangements for the commons through collective agreement on how to exploit the resources sustainably.<sup>73</sup>

The commons in the tragedy of the commons demonstrate that resources are kept open-access for a larger number of individuals. As the numbers of the commons users are too many, it becomes increasingly difficult to adopt such a cooperative system and limit free riders. Often, the transaction costs are too high both to reach an agreement and to implement it.<sup>74</sup> This collective action problem may limit introducing a self-governance system in water resources management.

Ostrom's practical evidence has shown the existence of long-lived irrigation communities that have been stable due to the decision-making of the users'

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<sup>72</sup> Ibid.

<sup>73</sup> Salzman and Thompson, *supra* note 1, p.19.

<sup>74</sup> Ibid.

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community.<sup>75</sup> However, Ostrom did not entirely rule out or disagree with Hardin's theory, nor did she disagree in principle with the inevitability of the tragedy of commons in the absence of an institutional arrangement regulating the behaviour of users, or in situations where common pool resources management systems are weak or impractical.<sup>76</sup> She maintains the optimality of the use of privatization and coercive rules as devices in different circumstances. The common pool resources theory only works in exceptional circumstances, depending on the context of resources and the behaviour of the users.

What Ostrom totally rejected was the limited choices of decision-making within the institutional arrangements that the tragedy of commons theory proposes, and the way that 'commons' was conceptualized. She underlined that the government and market alone are not solutions to the threats of natural resources pressures. Her ideas were subsequently reinforced by Bosselman, who noted that a common pool resource is not a resource that is available to anyone to exploit. Rather, it is regulated by community norms as to how it is used and who participates in the utilization and protection of the resource.<sup>77</sup>

Another study conducted by Ostrom, in collaboration with other scholars, suggests that there is no single institutional arrangement that averts the challenges of water resources security. Rather, 'the best system of control is one, which meets the most critical challenges of the situation at hand'.<sup>78</sup> They suggested that the reason why a 'control system sometimes succeeds and sometimes fails is that the challenges of resources management vary with resource; characteristics of the resource users; and the environmental, social, economic, and political context of resource use – most of which change over time'.<sup>79</sup> This study further suggests that water resources management should be context-specific, changing with the factors that shape the contexts, and flexible enough to accommodate those changes.

More empirical research conducted by Ostrom concerning common-pool resources shows that the status of some common pool resources are, at present, better in some areas while the scenario is different in other parts of the world.<sup>80</sup>

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<sup>75</sup> Elinor Ostrom (2000), 'Collective Action and the Evolution of Social Norms', *The Journal of Economic Perspectives*, 14(3) American Economic Association, pp.150-153.

<sup>76</sup> *Ibid.*

<sup>77</sup> Fred P. Bosselman (1996). 'Limitation Inherent in the Title to Wetlands at Common Law', 247(15) *Stan. Envtl. J.L.*, pp.283-284.

<sup>78</sup> Ostrom, Stern and Dietz (2003). 'Water Rights in the Commons', *Water Resources Impact* 5(2), pp. 9–12.

<sup>79</sup> *Ibid.*

<sup>80</sup> Elinor Ostrom (2008). 'The Challenges of Common- pool Resources', *Environment: Science and Policy for Sustainable Development*, 50(4), p. 10.

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The cause for mixed outcomes in common pool resources management is the existence of variation in the contexts.<sup>81</sup> She suggested that the institutional arrangements regarding natural resources require updating regularly in the light of information and experience gained.<sup>82</sup> They should be framed as change-responsive.<sup>83</sup> This new orientation in common pool resources discloses the necessity of modifying institutional arrangements in relation to the dynamics of the context. She also noted the fact that common pool resources management should take into account the interests of users and provide a conflict resolution mechanism.<sup>84</sup>

In this study, she reinforced the idea that common pool resource management varies according to the scope of the area it covers, the number of users, and the nature of exploitation. She concluded that there is no particular ideal common pool resource management scheme; rather, it varies with the context.<sup>85</sup> She went on to argue that common pool resources may be governed through various institutional arrangements, but she grouped these institutional arrangements roughly into three: governmental, private and communal institutional arrangements.<sup>86</sup> These ranges of management institutions are not alternatives; they may only be effective if used with sufficient information regarding the context of the common pool resources problems. None of these policy options are free of the disadvantages incurred upon their use; it is wise to choose based on the circumstances in question. These institutional arrangements are not the best schemes in all contexts and at all times.

Whilst Ostrom places direct resource users at the centre of decision-making, the initial study of the common pool resource did not provide for the involvement of persons that have a stake in the specific natural resources other than direct users when the circumstances contended by Ostrom are met.<sup>87</sup> Accommodating the stakes of non-direct natural resources users is equally important in natural resources management, and this was undermined. In particular, in Ostrom's early study of the common pool resource, the inclusion of the 'outsiders' community's' interests was unclear. The impression is that the

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<sup>81</sup> Ibid.

<sup>82</sup> Id, p. 17.

<sup>83</sup> Ibid.

<sup>84</sup> Ibid.

<sup>85</sup> Id., p. 11.

<sup>86</sup> Ibid.

<sup>87</sup> Elinor Ostrom (1990), *Governing the Commons: the Evolution of Institutions for Collective Action*, (New York, Cambridge University Press, pp. 90-105.

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decision-making in common pool resource was dominated by the users' self-governance system.<sup>88</sup>

In such situations, it is said that the selfish users may not see far beyond their self-interest.<sup>89</sup> It is often said that such natural resources management is a constraint for economic development,<sup>90</sup> and may undermine the equitable use of natural resources for present and future generations.<sup>91</sup> The danger may be critical to 'voiceless' stakeholders that cannot protect their interests, such as the water environment.<sup>92</sup>

Whilst Hardin is correct in observing that the destiny of unregulated scarce resources is ruin and threats to the security of humans and the economy, the remedies he suggested fail to recognize the creditability of participatory natural resources management. The theory seems reluctant to consider local level empowerment in the management of scarce natural resources. Moreover, the theory relied purely on coercive rules, and neglected the benefits of non-coercive models of natural resources management. For Hardin, the users of commons are the threat to resources conservation. Natural resources, including water resources, need social learning, which involves the stakeholder in natural resources management.<sup>93</sup> Hardin's suggestion tends to favour a more centralized than polycentric decision-making process in water resources management.<sup>94</sup>

In the tragedy of the commons theory, issues such as distributional equity, community welfare and other social and cultural benefits are undermined.<sup>95</sup> Naturally, environmental concerns are too important to be left solely to the regulators. The involvement of the local citizens is crucial to protect the environment. The common users may change their behavior towards sustainable resources use or combat against unsustainable resource exploitation by others when they realize that unsustainable resource exploitation is already happening – or is about to start happening. In addition to such hard rules and market instruments, persuasion is a soft approach to force users to change their

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<sup>88</sup> Bonnie J. McCay (2009). *Right to Nature: Ecological, Economic, Cultural, and Political Principles of Institutions for the Environment* (Editors: Hanna, S., Carl Follke, F. and Makler, K. Island Press, Washington), pp.119-121.

<sup>89</sup> *Ibid.*

<sup>90</sup> Savenije and Zaag (2000). 'Conceptual Framework for the Management of Shared River Basins; with Special Reference to the SADC and EU', 2 *Water Policy*, p. 25.

<sup>91</sup> Christopher D. Stone (2010). *Should Trees Have standing?: Law, Morality, and Environment* (3rd Oxford press, Inc. New York), p. 172.

<sup>92</sup> *Ibid.*

<sup>93</sup> Pahl-Wostl and Hare (2004). 'Process of Social learning in Integrated Resources Management', 14 *Journal of Community & Applied Social Psychology*, pp.193-194

<sup>94</sup> Garrett Hardin, *supra* note 24, pp. 1243-48.

<sup>95</sup> McCay, *supra* note 88, p. 111.

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behaviour.<sup>96</sup> To this end, governments engage in a range of activities that inform the danger and create awareness of unsuitable resources exploitation, and educate the users by showing the causes and possible dangers of the over-use of resources.<sup>97</sup>

The tragedy of the commons may be addressed more effectively through an adaptive governance system that takes into account specific contexts, rather than privatization or government regulation.<sup>98</sup> In addition, natural resources have been best governed and sustained for centuries through informal institutions, rather than the formal institutions that Hardin prescribed.<sup>99</sup> However, this is not to generalize that traditional institutions are the best fit in all places and contexts; depending on the nature of the problems, the contexts of the natural resources and the behaviour of the users, their level of effectiveness varies.

For instance, transcending water pollution problems, climate change and related challenges that are exacerbating the scarcity of natural resources may not be effectively managed through traditional institutional arrangements alone, although they have yet to supplement formal institutional arrangements.<sup>100</sup> Many challenges to the availability of water resources are local by their natures, but their impacts are transcending. Naturally, such challenges may require complex, polycentric and more comprehensive institutional arrangements than localized, fragmented or centralized arrangements.

The tragedy of the commons did not envisage the contribution of weak and ineffective institutional arrangements in the increasing insecurity of the sustainability of natural resources. Rather, Hardin focused on the absence of institutional arrangements. He noted that unregulated scarce natural resources are vulnerable to ruin, but over-simplified the possible solutions, suggesting privatization or government regulation.<sup>101</sup>

Moreover, in its initial stage, the common pool resource theory did not place due focus on how to manage the impact of one natural resource utilization on the adjacent water body. In real world, common pool resources do not exist in isolation; ecosystems are interconnected with their adjacent ecosystems. Pressures on the given land resources affect the uses and protection of adjacent water resources. The problems of unwise exploitation of land resources may not be limited to those resources or users. However, the early orientation of the theory indicates that the theory did not give adequate place for regulating a

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<sup>96</sup> Salzman and Thompson, *supra* note 1, p.50.

<sup>97</sup> *Ibid.*

<sup>98</sup> Thomas Dietz, Elinor Ostrom, Paulc Stern(2003), 'The Struggle to Commons', 302 *Science*, p. 1910.

<sup>99</sup> *Id.*, p. 1907.

<sup>100</sup> *Ibid.*

<sup>101</sup> Dietz, Ostrom and Stern, *supra* note 98, p. 1910.

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range of factors, which may contribute for the threat of natural resources scarcity except demand management.

## 4. Some Issues in the Applicability of the Tragedy of the Commons for Water Security Management

### 4.1 Water security conceptualization

Water security may be seen as a catch-box, which brings a range of threats under scrutiny. For instance, the UN Human Development Report 2006 describes water security as ‘...ensuring that every person has reliable access to enough safe water at affordable prices to lead a healthy, dignified and productive life, while maintaining the ecological systems that provide water and also depend on it’.<sup>102</sup> Similarly, Garay and Sadoff defined water security as an ‘...acceptable quantity and quality of water for health, livelihoods, ecosystems and production coupled with an acceptable level of water-related risk to people, environment and economics’.<sup>103</sup>

The notion of ‘*water security*’ encompasses sustainable availability of adequate quality water.<sup>104</sup> Water resources experience *water security threats* when they become inaccessible or unsuitable for satisfying the needs of humans and the ecosystem.<sup>105</sup> When conducting an assessment of the notion water security, it is necessary to investigate, ‘whether or not adequate quality water is available for use, and whether individuals and ecosystems have access to adequate water’.<sup>106</sup> The quantity of available water alone does not guarantee water security. Rather, the available water must be of acceptable quality state to meet a range of needs. Inadequate quality or quantity of water means that the security of people and ecosystems is under threat. Then there must be responsive and comprehensive institutional arrangements that control factors contributing for water insecurity at different levels.

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<sup>102</sup> UN, Human Development Report (2006). *Beyond Scarcity: Power, Poverty and the Global Water Crisis*, p. 3.

<sup>103</sup> David Garay, Claudia Sadoff (2007). ‘Sink or Swim? Water Security for Growth and Development’, *Water Policy*, p. 545.

<sup>104</sup> UN –Water Thematic Initiatives (2006). *Coping with Water Scarcity: a Strategic Issue and Priority for System-wide Action*, August 2006, p. 4.

<sup>105</sup> Ibid.

<sup>106</sup> Patrica Wouters (2010), *Water Security: Global, Regional and Local Challenges*, IPPR, p. 7.

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## 4.2 The degree of availability of adequate safe water

The earth is covered by around 1.4 billion km<sup>3</sup> of water in volume and, from this figure, fresh water constitutes only 2.5 per cent.<sup>107</sup> Around 97 per cent of the earth's water resources are salty water, which cannot be accessible without the process of desalination being carried out. Fresh water comprises a small portion of the earth's water, but its state of accessibility is constrained by the nature of its existence. Only 0.3 per cent of fresh water exists in lakes and rivers that are relatively easily available for human use.<sup>108</sup> Of the remaining fresh water, 30 per cent is ground water, while 70 per cent is situated within ice and snow cover in mountainous areas.<sup>109</sup>

Freshwater resources are not evenly distributed by place.<sup>110</sup> The availability of safe water resources varies regionally, seasonally and annually.<sup>111</sup> Periodic available water variation affects the availability of suitable water supplies.<sup>112</sup> Some geographical areas are humid, while others are semi-arid or arid; and even in humid zones water availability varies by place and time.

Analyzing the over-grazing of the pastureland by the commons, Hardin's commons theory widely focuses on demand regulation rather than the multifaceted, present-day water resources challenges. It seems that Hardin did not appreciate the challenges to water security that happen due to natural water scarcity. As has been discussed elsewhere, natural cause is one of the threats to water security.<sup>113</sup> Due to this, natural water scarcity challenges barely obtained recognition as contributing to water security challenges. The theory also fails to propose aspects relating to water supply management. Practically, it may not be possible to provide a proper solution to natural water security challenges by opting to manage water demand alone at all times and places.

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<sup>107</sup> United Nations Environment Programme, available  
<[http://www.unwater.org/statistics\\_res.html](http://www.unwater.org/statistics_res.html)> last accessed 03 Feb 2013

<sup>108</sup> Ibid.

<sup>109</sup> Ibid.

<sup>110</sup> Peter Gleick (1998). 'Water in Crisis: Paths to Sustainable Water Use', *Ecological Applications* 8(3), p. 574.

<sup>111</sup> UN-Water (2008). *Status report on Integrated Water resources Management and Water Efficiency Plans*, Prepared for the 16th session of the Commission on Sustainable Development- May 2008, p.3.

<sup>112</sup> William Howarth (2012), 'Planning for Water Security', *Journal of Planning & Environment Law*, p. 357.

<sup>113</sup> United Nations Department of Economic and Social Affairs (2012), *International Decade for Action: Water for Life 2005-2015*. available  
[www.un.org/waterforlifedecade/gender.shtml](http://www.un.org/waterforlifedecade/gender.shtml) last accessed 03 Feb 2013.

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On the other hand, human-induced pressures also threaten the availability of freshwater resources.<sup>114</sup> Water resources are wasted, polluted and mismanaged by users in a way that is unsustainable.<sup>115</sup> In particular, when the available water resources are becoming scarce, human-induced pressures exacerbate the challenges to water security.<sup>116</sup> As a result, the human-induced pressures reduce water security.<sup>117</sup> Although the precise impacts of climate change will be varied around the world, it is predicted that climate change may cause greater uncertainty in rainfall patterns. As a result, availability of water resources is likely to change significantly. Temperatures rising by 2 to 3°C due to climate change would expose between 1.1 and 3.2 billion people to water scarcity problems.<sup>118</sup> With increasing climate change challenges,

‘[t]he greatest vulnerabilities are likely to be in unmanaged water systems and systems that are currently stressed and unsustainably managed due to policies that discourage efficient water use and protection of water quality, inadequate watershed management, failure to manage variable water supply and demand...’<sup>119</sup> ‘In unmanaged systems there are few or no structures in place to buffer the effects of hydrological variability on water quality and supply.’<sup>120</sup> ‘Similarly, in unsustainably managed systems, water and land use can add stresses that heighten vulnerability to climate change.’<sup>121</sup>

In unmanaged or poorly managed water bodies, unsustainable water exploitation, unsustainable watershed exploitation and other environmental pressures bring water resources to the brink of depletion. Increased pressures in water resources

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<sup>114</sup> Janos Bogardi *et al* (2011). ‘Water Security for Planet under Pressures: Interconnected Challenges of Changing World Call for Sustainable Solution’, *Current Opinion in Environmental Sustainability* 2011, 4, pp. 1-2.

<sup>115</sup> UNDP, *Human Development Report (2006) Coping with Water Scarcity. Challenge of the Twenty-first Century*. UN-Water, FAO, 2007, available [www.fao.org/nr/water/docs/escarcity.pdf](http://www.fao.org/nr/water/docs/escarcity.pdf) last accessed, 23 August 2012.

<sup>116</sup> *Ibid.*

<sup>117</sup> Second World Water Forum, Declaration of the Hague, Ministerial Declaration of the Hague on Water Security in the 21st Century, available <http://www.worldwaterforum.net/index.html>, last accessed 03 Feb 2013.

<sup>118</sup> Intergovernmental Panel in Climate Change(IPPC), (2007), *WGII Fourth Assessment Report*, p. 6.

<sup>119</sup> IPCC, (2001). *Climate Change: Impacts, Adaption, and Vulnerability*, A Contribution of Working Group II to the Third Assessment Report of International Panel on Climate Change [Watson, R.T. and the Core Writing Team [eds.]Cambridge Press, Cambridge, United Kingdom, and New York, NY, USA. p. 9.

<sup>120</sup> *Ibid.*

<sup>121</sup> *Ibid.*

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result in increased vulnerability, whereas introducing many institutional arrangements that reduce the pressures will lessen this vulnerability.<sup>122</sup> This challenge is likely to exacerbate with increasing population growth.<sup>123</sup> This demonstrates that more safeguard measures may be needed to enhance water security by reducing human pressures.

### 4.3 Global trends of water resources scarcity

Globally, water scarcity has already threatened the earth.<sup>124</sup> In many parts of the world, the challenges to the security of water resources are expected to become critical.<sup>125</sup> The global water shortage map, which was published by Nature in September 2010, predicts that, by 2050, nearly 80% of the world's population will be exposed to high levels of water security threat.<sup>126</sup> Water security challenge continues to rise across the globe.<sup>127</sup>

Conventionally water scarcity was understood from semi-arid and arid countries perspectives. However, now, there are water security problems in both dry and wet countries.<sup>128</sup> Water security challenges are '... matters which are of wide geographical concern and extend well beyond the arid countries that have previously been seen as most vulnerable to threats of water insecurity.'<sup>129</sup> Water scarcity and drought affect both developed and developing countries, but the impacts are more damaging to economically developing countries<sup>130</sup> which are already experiencing water security problems.<sup>131</sup> Even in poor countries, the

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<sup>122</sup> Id., p. 31.

<sup>123</sup> COM/2007/ 414 final(2007), Communication from the Commission to the European Parliament and the Council Addressing the Challenge of Water Security and Droughts in the European Union, Brussels, p. 18.7.

<sup>124</sup> UNDP, Human Development Report (2006). 'Coping with Water Scarcity. Challenge of the Twenty-first Century.' *UN-Water*, FAO, 2007, available [www.fao.org/nr/water/docs/escarcity.pdf](http://www.fao.org/nr/water/docs/escarcity.pdf), last accessed 23 August 2012.

<sup>125</sup> Oregon State University, Transboundary Freshwater Dispute Database, Available [www.transboundarywaters.orst.edu/](http://www.transboundarywaters.orst.edu/) accessed on 01 Feb 2013.

<sup>126</sup> Vorosmary *et al*, (2010). 'Global Threats to Human Water Security and River Biodiversity', *Nature*, pp. 555-6.

<sup>127</sup> Wouters, *supra* note 106, p. 4.

<sup>128</sup> Howarth, *supra* note 112, p. 357.

<sup>129</sup> Martha Grekos (2005), 'Climate Change, Water Security and Flooding: EFRA Committee Publishes Its Report,' *Journal of Planning & Environment Law*, p. 47.

<sup>130</sup> UN, Human Development Report 2006, *Water Scarcity, Risk and Vulnerability*, pp. 156-158.

<sup>131</sup> UNDP, Human Development Report (2006). *Coping with Water Scarcity. Challenge of the Twenty-first Century*. UN-Water, FAO, 2007, World Water Day, p.8, available [www.fao.org/nr/water/docs/escarcity.pdf](http://www.fao.org/nr/water/docs/escarcity.pdf) last accessed 23 August 2012

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impacts of the problems in water security are likely to be high on the people 'such as small farmers, agricultural labourers and pastoralists'.<sup>132</sup>

#### 4.4 Water as public good

As water resources are movable, it is too difficult to apply the traditional concepts of property ownership.<sup>133</sup> Geches noted that '[w]ater is legally and historically a public resource. Although private property rights can be perfected in the use of water, it remains essentially public; private rights are always incomplete and subject to the public's common needs.'<sup>134</sup> In France, for instance, the Institutes of Justinian declared running water among things that could not be owned privately or by a few commons, although it recognized the private right to use them in a restricted fashion.<sup>135</sup> Similarly, in the Supreme Court of the United States, Justice Holmes noted that 'A river is more than an amenity, it is a treasure. It offers a necessity of life that must be rationed among those who have power over it.'<sup>136</sup>

Across the globe, public/state control of the water resources in a natural water body is common, where the largest number of people enjoy public rights whilst many individual users enjoy private rights, which entrusts the right to the use of the resources. The beneficiaries do not possess property rights like ordinary thing. In the United States, the federal government regulates the use of rivers and lakes, and controls waste disposal to ensure that waterways remain navigable.<sup>137</sup> Water resources have been seen as the 'public property of the nation'.<sup>138</sup> In the United Kingdom, navigable water resources are public property.<sup>139</sup>

Similarly, in Ethiopia, all natural resources, including water resources, are public property; the ownership is vested upon the state and the people of Ethiopia.<sup>140</sup> This type of property right is not a private or ordinary common right

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<sup>132</sup> Smakhtin, Revenga and Doll (2009). UN water Scarcity Index, Year, Available <http://www.grida.no/publications/vg/water2/> Accessed on 01 Feb 2013

<sup>133</sup> D. H. Getches (1997). *Water Law: In a Nutshell*. St. Paul, MN: West Publishing, p. 15.

<sup>134</sup> Ibid.

<sup>135</sup> David H. Geches (1990). *Water Law in Nutshell*, 2ed, St. Paul, MNN. West Publishing CO. p.15.

<sup>136</sup> *New Jersey V. New York* 283 U.S. 336, 342 (1931).

<sup>137</sup> *Gilman v. Philadelphia*, 70 US 713, 725(1865).

<sup>138</sup> Ibid.

<sup>139</sup> George Joseph Bell (1899), *Principles of the Law of Scotland*, Edinburgh: Law Society of Scotland, Butterworth, p. 299.

<sup>140</sup> The Constitution of Federal Democratic Republic of Ethiopia, Articles 40(3) and 51(11).

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which confers ownership to a person or specific group of people with restriction against outsiders to use and develop a resource. Accordingly, in Ethiopia, the federal government is empowered to regulate the use of water resources across the country.<sup>141</sup> Under public ownership of water resources, public property rights are imposed against water resources users.<sup>142</sup> This duty affects how water resources are exploited.<sup>143</sup>

#### 4.5 Water utilities privatization

Many environmental resources are not commoditized as ordinary resources. Privatization may not be seen as the right solution for those resources that are widely public in their nature, such as watersheds.<sup>144</sup> It is also impractical to allocate them in a proper sense, and allocation through creating private rights may favour some users and disfavour others.<sup>145</sup> It is contended that 'many things by law excepted from the ordinary rules of appropriation are reserved for the use of public'.<sup>146</sup> Due to these special characteristics a significant public intervention in resources such as freshwater is inevitable.<sup>147</sup>

In England, for instance, the privatization of the water utilities was a highly debated subject. There are arguments both for privatization and against it.<sup>148</sup> The opponents of privatization justify their resistance on the grounds of social equity. They contend that when control of the water services is transferred to the private sector, water users are seen as customers rather than citizens.<sup>149</sup> Normally, private companies work to maximize profit rather than to serve societal interests. They are answerable to the shareholders. In the fully privatized water sector, access to water resources is dependent on the 'willingness to pay', rather than enhancing access to water, particularly for those people who cannot afford to pay. The opponents to the privatization of water utilities doubt that the market creates economic efficiency, since water is naturally scarce, leading to a natural monopoly. Water privatization is considered to be simply replacing the state monopoly with a private monopoly,

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<sup>141</sup> Ibid.

<sup>142</sup> Daniel H. Cole (2002). *Pollution & Property: Comparing Ownership Institutions for Environmental Protection*, Cambridge University press, pp. 27-28.

<sup>143</sup> Ibid.

<sup>144</sup> Salzman and Thompson, *supra* note 1, p.7.

<sup>145</sup> Ibid.

<sup>146</sup> Bell, *supra* note 139 p. 299.

<sup>147</sup> FAO Land and Water Bulletin 3, (1995). *Water Sector Policy Review and Strategy Formulation ; A general Framework*, p.4.

<sup>148</sup> Karen Bakker (2002), 'From State to Market?: Water Mercandization in Spain', 34 *Environment and Planning, A*, P. 770.

<sup>149</sup> Ibid.

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unless mechanisms are put in place to control the behaviour of private water utilities.<sup>150</sup>

If water resources are a pure commodity, their abstraction depends upon the capacity to abstract, and the water service payments would depend on the willingness to pay. The private water industry may not want to manage demand, so to reduce the demand would increase the cost of the water supply, thus reducing revenue.<sup>151</sup> As water is exposed to 'state failure', it is also exposed to 'market failure'.<sup>152</sup> Neither water privatization nor public control is a panacea to sustain water resources. In such contexts, the key concerns involve the manner in which these polarities can be harmonized by striking a balance to ensure the security of water resources in both public and private water services companies.

#### 4.6. Participation

Hardin's assumptions and the solutions he suggested failed to favor inclusive management model, taking the community as part of the commons management to supplement coercive rules. Naturally, water resources problems are complex,<sup>153</sup> users are diverse,<sup>154</sup> the dynamics of water resources are uncertain,<sup>155</sup> the ecosystem is interconnected, and sources of water resources problems are not specific; therefore, providing one solution may not solve all ongoing water resources problems.<sup>156</sup> Natural resources management is not merely an economical or environmental construct; rather, it is a social, environmental and economic construct.<sup>157</sup> Upon water resources use and development, a given country needs to consider all possible consequences unsustainable resources exploitation. Specially, water resources security requires the governments that are committed to the objectives that address sustainable development.

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<sup>150</sup> Ibid.

<sup>151</sup> Greg Barrett and Margaret Wallace (2011). 'An Institutional Economics Perspectives: the Impact of Water Providing on Water Conservation in England and Australia', 25 *Water Resources Management*, p. 1326

<sup>152</sup> Karen J. Bakker (2003). 'A Political Ecology of Water Privatization', 70 *Studies in Political Ecology*, p.40.

<sup>153</sup> Pahl-Wostl (2007). 'The Implications of Complexity for Integrated Resources Management', 22 *Environmental Modelling & Software*, p. 561.

<sup>154</sup> Warner, Wester and Bolding (2008). 'Going with the Flow: River Basins as the Natural Units for Water Management', 10(2) *Water Policy*, p. 121.

<sup>155</sup> Ibid, p. 131.

<sup>156</sup> Ibid.

<sup>157</sup> Convention on Biological Diversity, Conference of the Parties (COP) 5, Principle 10.

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A government institution may not have all the necessary information and experts to manage natural resources.<sup>158</sup> Sometimes, taking a given action may trigger other unexpected problems.<sup>159</sup> Participants go through various experiences and find out information about water resources to uncover solutions for water resources problems.<sup>160</sup> Thus, water resource problems may not find all their solutions from governments or single levels or institutions; rather, public and stakeholder participation is needed.<sup>161</sup>

It is often said participation enhances the inclusion of stakeholders' needs and aspirations within water resources management policies, and facilitates implementation.<sup>162</sup> Stakeholder participation is also characterized as: a platform used to weigh conflicting interests and decision-making through the broader consideration of water resources use; the protecting of social interests rather than individuals' needs through balancing these interests; and used as a tool for conflict prevention and resolution among water resources users.<sup>163</sup>

In situations where the government is part of the problem of water resource unsustainable exploitation, participatory water resources management model is one of the key schemes to regulate government behaviors. It creates a forum that helps to discuss and provide solutions that can mitigate the interests of different people.<sup>164</sup> Public and stakeholder involvement in decision-making enhances the validity and legitimacy of government decisions,<sup>165</sup> limits the discretion of administrative authorities by giving the public and stakeholders the opportunity to exert their influence on public authorities to render negotiated or mitigated

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<sup>158</sup> Erik Mostert (2007). 'Social Learning in European river Management: Barriers and Fostering Mechanisms for 10 River Basins', *Ecology and Society* 12(1).

<sup>159</sup> Pahl-Wostl, *supra* note 153, p.561.

<sup>159</sup> Warner, Wester and Bolding, *supra* note 154, p. 131.

<sup>160</sup> Wolsink (2006). 'River Basin Approach and Integrated Water management: Governance Pitfalls for the Dutch Space-water-adjustment Management Principle', *37 Geoforum*, p. 473.

<sup>161</sup> Ibid.

<sup>162</sup> Ibid.

<sup>163</sup> International Institute for Water and Environment Engineering (2010). *Technical Manual for the Integrated Water Resources Management*, pp. 86-100' available [http://documentation.2ie-edu.org/cdi2ie/opac\\_css/doc\\_num.php?explnum\\_id=1524](http://documentation.2ie-edu.org/cdi2ie/opac_css/doc_num.php?explnum_id=1524) last accessed March 2011.

<sup>164</sup> Frank Jaspers (2005), 'Institutional Arrangements for Integrated River Basin Management', *5 Water Policy*, p. 243

<sup>165</sup> Jurgen Habermas, (1996). *Between Facts and Norms- contributions to a Discourse Theory of Law and Democracy* (Cambridge, MIT press) p. 228.

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decisions,<sup>166</sup> and enhances the public acceptance of decisions that are made by government authorities.<sup>167</sup>

The use of local knowledge is also assumed to be a tool that could enhance a more effective local steering by reducing transaction costs, helping stakeholders to learn from their experiences, and using traditional knowledge for maximizing natural resource conservation efforts.<sup>168</sup> Participatory decision-making promotes environmental justice and sustainable use of natural resources, as well as balancing the development and protection of natural resources.<sup>169</sup> However, participatory water resource management is meaningful in an open government that gives legal remit for the stakeholders to influence government actions. Naturally, the level openness of a government is fully dependant on the overall democratic process and stage of democratization in one country. The democratic level that allows the extent of space to participate affects the status institutional arrangements toward the management of water resources.

For example, the European Water Framework Directive (WFD) underlines that the success of sustainability of water resources depends on participatory decision-making.<sup>170</sup> Under the European Water Framework Directive, each member state has an obligation to encourage the active involvement of all interested parties in the implementation of the Directive and the development of River Basin Management Plans.<sup>171</sup> The involvement of stakeholders may start from initial planning to the overall implementation process. The level of their involvement is not limited and is at the discretion of member states. In the case of public participation, member states are obliged to ensure that competent bodies inform and consult the public, including water users, regarding the timetable and work programme for the production of river basin management plans and updates.<sup>172</sup> To this end, each member state must publish and make available draft river basin plans and, before these are finalized, they are required to gain opinions and comments from the general public. This suggests that participatory resource management can be meaningful in the water resources governance only if governments release accurate, timely and usable information to the public.

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<sup>166</sup> Jonas Ebbeson '(1997). The Notion of Public Participation in International Environmental law, 8 Year Book of International Environmental Law, p. 56.

<sup>167</sup> Birnie and Boyle, (2002). *International Law and the Environment*, (OUP) pp. 261-4.

<sup>168</sup> Elinor Ostrom, (1990), *Governing the Commons: the Evolution of Institutions for Collective Action* (New York, Cambridge University Press), pp. 90-105.

<sup>169</sup> Birnie and Boyle, *supra* note 167, pp. 261-4

<sup>170</sup> The European Water Framework Directive 2000, Preamble Para.14.

<sup>171</sup> *Id.*, Article 14.

<sup>172</sup> *Ibid.*

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Public participation and stakeholder involvement in water resources may not be without drawbacks. The cost of participation is often regarded as disadvantageous. The people who have stakes in water use are too many; stakeholder participation demands a high cost if a stakeholder forum is actually needed to operate effectively, when compared with traditionally centralized schemes of natural resources management.<sup>173</sup> The proper utilization of water resources may need relatively complex negotiation, which consumes time and money, in order for balanced solutions to be found. In particular, if countries are economically weak with chronic water scarcity, it is not easy in practice to change stakeholder participation in water resources management.

Obviously, competition between needs arises, and this makes it difficult for members of large groups to take part in the decision-making. This disadvantage may be managed through a representative mode of participation that involves some persons or groups who share interests, rather than involving the whole group.<sup>174</sup> The problems with participatory decision-making may not end simply by using a representative mode of participation because there must be the right representation of stakeholders and fully vibrant participants.

It has been noticed that, in the context where the environment is voiceless, nature may be in peril and the interest of future generations' may not be protected.<sup>175</sup> The voiceless interests are ignored, and the outcome for the environment is precarious. Those short-sighted and self-interested users continue benefiting until the water resources are ruined. Moreover, participants in natural resources management may not be in equal positions to influence and provide fair and balanced decisions, as a result of which the dominant groups continue to generate their benefits through the disguise of participation.<sup>176</sup>

Furthermore, the selection process of participants may not be impartial, and the decision-making processes may allow some groups to impose their wishes on the other groups and public interests. Held states that '[i]t is not the single, isolated individual who is active in historical and political processes, but rather human beings who live in definite relations with others and whose nature is defined through these relations.'<sup>177</sup> Naturally, such participatory decision-making is neither negotiated nor democratic by its nature. Rather, it serves the

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<sup>173</sup> Sarah Hendry (2008). 'River Basin Management and Water Framework Directive: in Need of a Little Help?', 19 *Water Law*, p. 150.

<sup>174</sup> Philppus Wester *et al* (2003). 'Stakeholder Representation in the River Basin Management in Mexico and South Africa', *World Development* 30(19), p. 797.

<sup>175</sup> Stone, *supra* note 91, p. 172.

<sup>176</sup> David Held (2006). *Models of Democracy* (3<sup>rd</sup> Polity Press, Cambridge ) p. 107

<sup>177</sup> *Ibid*, p. 97.

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interests of a few individuals at the expense of public interest.<sup>178</sup> On the other hand, a completely decentralized participatory decision-making process is unorganized when it comes to protecting common interests.<sup>179</sup> The danger of this type of decision-making may not differ too much from the tragedy of commons, which leads to uncontrolled resources being ruined by self-interested individuals.

## **5. Formal Rules toward the Control of Water Resources: Overview of Some Lessons from Europe's Experience**

When there are no proper rules regulating users' behavior or implementation strategies, the exploitation of water resources as the commons is not free from the dilemma of individual water users. In particular, the water resources are exposed to the tragedy when water resources are unregulated in terms of over-abstraction and water wastage. In addition, a lack of rules for water system management may expose water resources to ruin. Equally, the destruction of water systems and water pollution from both point and diffuse sources endanger the long-term availability of water. Open-access natural resources or resources that receive the least care will eventually become ruined.<sup>180</sup>

### **5.1 Water abstraction permits**

Developing responsive permit systems for water abstraction may limit the over-use of water as one of the tools to sustain water. For example, in England, the water abstraction permits were designed to protect the economic interests of permit holders through a 'first come, first served' principle.<sup>181</sup> The water regime was designed when water resources in England were perceived to be in surplus, and the population number was considerably smaller.<sup>182</sup> In England and Wales, at present, the Environment Agency nationally administers more than 50,000 licenses that are obtained by different sectors.<sup>183</sup> From this number, more than 80% of the permits are without a time-limit.<sup>184</sup> These licences are not

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<sup>178</sup> Hanna and Jentoft (2009). *Right to Nature: Ecological, Economic, Cultural, and Political Principles of Institutions for the Environment*, (Editors: Hanna, S., Carl Follke, F. and Makler, K. Island Press, Washington) pp. 35-47.

<sup>179</sup> Ibid.

<sup>180</sup> Hardin, *supra* note 2, p.1244; Cole, *supra* note 142, p. 178 & Bromley, *supra* note 63, p. 149.

<sup>181</sup> Environment Agency, *Alternative Ways to Allocate Water Final Report*, available [www.environment-agency.gov.uk/research/library](http://www.environment-agency.gov.uk/research/library), last accessed 23 Feb. 2013.

<sup>182</sup> Ibid.

<sup>183</sup> Ibid.

<sup>184</sup> Anglican Water and Frontier Economics (2011). *The Main Report, a Rights to Water?: Meeting the Challenges of Sustainable Development*, p.18.

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responsive to take immediate measures when availability is at risk unless compensation is paid for the permit owners or possessors.<sup>185</sup> They grant a historic right to the permit owner or possessor. The system did not accommodate the contemporary pressing concerns of water shortage.<sup>186</sup>

The Water Act of 2003 has introduced time-bounded permit system.<sup>187</sup> This new system requires permits to be issued on a time-limited basis and, starting from July 2012. In effect, the permit holders would no longer be entitled to claim compensation for any changes in their water abstraction permits under the circumstances determined by law.<sup>188</sup> The introduction of the new water abstraction system has many implications. Firstly, it shows that despite water property rights of permit holders over the volumes of water, water permits need to be seen differently from other property rights. Secondly, national interests on water security prevail over the property rights of individual licence holders.

The new water regime provides abstraction permits which normally expire after 12 years from their issuance with a common ending date.<sup>189</sup> The Environment Agency updates permit by considering the level of water resources in the catchment at any time.<sup>190</sup> However, the Water Act of 2003 does not fully shape the old permit system automatically. Changing this traditional permit system is expected to be formulated in the 2020s.<sup>191</sup> Until the 2020s, the Water White Paper promises to make better use of existing tools, and yet attempting to handle complex contemporary water resources problems.

## 5.2 Capacity to introduce regulatory tools

The tragedy of the commons does not demonstrate why the resources are open access and why there are no regulatory institutional arrangements. The discussion surrounding the tragedy of the commons demonstrates that averting the commons tragedy has been widely seen as needing the introduction of regulatory rules for the control of human behavior. It increasingly focuses on the

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<sup>185</sup> Environment Agency, *supra* note 181.

<sup>186</sup> *Ibid.*

<sup>187</sup> Water Act 2003, s.19.

<sup>188</sup> Water Act 2003, s.27.

<sup>189</sup> Environment Agency, How Time Limits on Abstraction Licenses Work, available [archive.defra.gov.uk/environment/quality/water/resources/abstraction/](http://archive.defra.gov.uk/environment/quality/water/resources/abstraction/), published on 31/08/2010.

<sup>190</sup> *Ibid.*

<sup>191</sup> Water White Paper, Lacks Ambition and Urgency, Warns Environment Food and Rural Affairs Committee, 05 July 2012, available <http://www.parliament.uk/business/committees/committees-a-z/commons-select/environment-food-and-rural-affairs-committee/news/water-white-paper-publication/> last accessed on 04/09/ 2014.

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non-availability of rules rather than the strength of existing rules to reshape the exploitation of unsustainable commons. Undoubtedly, the availability of rules regulating natural resources is decisive for the sustainability of the commons; however, this may not be a root cause. The economic development, the nature of the resources themselves and related factors matter in defining comprehensive rules and implementing them effectively.

A given country cannot introduce and implement the rules without costs.<sup>192</sup> In the member states of African Union, the introduction of water policies and laws has been growing over the last ten years. Many African countries have already introduced water policies and laws that encompass a range of water security management systems. However, the state of these developments varies considerably between African countries. Practice shows that, once African countries formulate water policies, it takes years to adopt an integrated water law that translates policy into practice.<sup>193</sup>

Even if many African countries have formulated water policies and law, the comprehensiveness of these instruments is dependent on the priority given to it by each country, and their strength and commitment to introducing proper institutional arrangements for water management. A recent empirical study of African water resources management indicated that the introduction of water policies and laws is not coherent between countries, and that implementation outcomes are too mixed.<sup>194</sup> Some African countries have managed to develop them while others are at different stages due to various reasons.<sup>195</sup> Many countries in Africa are still without ‘an operational water law’, and ‘in most countries the law is not yet fully implemented’.<sup>196</sup>

In many cases, lack of regulatory institutional arrangements and the capacity to implement them are root problems for natural resources degradation and unsustainable use. Within countries, the capacity to introduce such institutional arrangements and their implementation varies.<sup>197</sup> In African countries, including Ethiopia, the capacity to develop institutional arrangements for water security is

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<sup>192</sup> Carl Dahlman (1980). *The Open Field System and Beyond: Property Rights Analysis of an Economic Institution*, Cambridge: Cambridge University Press, PP 138-9.

<sup>193</sup> AMCOW, *Status Report on the Application of Integrated Approaches to Water Resources Management in Africa*, (2012), p. 10.

<sup>194</sup> Ibid, p.11.

<sup>195</sup> AMCOW, *supra* note 192, p. 17.

<sup>196</sup> Ibid, p.11.

<sup>197</sup> IPCC, (2001). *Climate Change: Impacts, Adaption, and Vulnerability: A Contribution of Working Group II to the Third Assessment Report of International Panel on Climate Change* [Watson, R.T. and the Core Writing Team [eds.] Cambridge Press, Cambridge, United Kingdom, and New York, NY, USA, PP.14-5

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low compared with developed countries.<sup>198</sup> The economic capacity and related problems adversely affect the pace and effectiveness of introducing institutional arrangements that avert the susceptibility of water resources to scarcity.<sup>199</sup>

The ultimate cause of environmental problems does not only stem from lack of regulatory institutional arrangements.<sup>200</sup> Defining such arrangements is too costly.<sup>201</sup> The challenge is the economic capacity to introduce effective institutional arrangements for water resources management and to develop strategies that facilitate implementation.<sup>202</sup> This difference in capacity that affects water insecurity may be solved through developing integration among scales and effective cooperation within shared water resources. As water resources problems are shared problems for a range of scales, there should be schemes to harmonize policy and law. This does not rule out the necessity of effective regulatory arrangements at local and national levels; these attempts may not hold water unless there are strategies for effective implementation.

### 5.3 Water pricing

Institutional arrangements for water efficiency are considered as the primary focus for reducing water wastage leading to water security threats.<sup>203</sup> Efficient water utilization makes a positive contribution towards enhancing water security.<sup>204</sup> For efficient water utilization, water pricing is seen as a key economic regulatory scheme for incentivizing water users. The basic assumption of internalizing the water services costs is an economic premise that seeks to fully internalize prices of services and water resources in water pricing thereby pushing up prices as a result of which demand will go down. The more the cost of water increases, the more consumption drops since water is a price elastic economic good.<sup>205</sup> Under-pricing will lead to the over-exploitation of water

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<sup>198</sup> Ibid.

<sup>199</sup> Ibid.

<sup>200</sup> Cole, *supra* note 142, pp 2-3.

<sup>201</sup> Yoram Barzel (2002). *Economic Analysis of Property Rights*, Cambridge, Cambridge University Press, p. 64.

<sup>202</sup> IPCC, *supra* note 197, pp.31-32.

<sup>203</sup> COM/2012/0673 final, Communication from the Commission to the European Union Parliament, the Council, the European Union and Social Committee and the Committee of the Regions a Blueprint to Safeguard Europe's Water Resources, available <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52012DC0673>, last accessed 08 Sep. 2013.

<sup>204</sup> Ibid.

<sup>205</sup> Simone Bach (2008). 'Perspectives for European Water Management Law Report of Conference in Brussels', *JEEPL* 5(3)(4). pp. 341-348.

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resources by failing to provide responsive incentive that shapes the behaviours of water users.<sup>206</sup> It assists to control water consumption.<sup>207</sup>

In water politics, internalizing the costs of water services and resources are disputed. Solanes notes that water is a special natural resource that makes it difficult for market forces such as demand and supply to regulate and allocate water for the users.<sup>208</sup> Likewise, Bach considers water as a heritage which must be protected through internalizing the costs of water services.<sup>209</sup> Such resistance to water cost internalization seems to emanate from the social dimension of water resources.

Within the European Union, the introduction of water pricing scheme was highly debated and had faced resistance.<sup>210</sup> Some countries have a long tradition of water pricing but other did not use it.<sup>211</sup> For instance, in Ireland, domestic water supplies were free, and the water supplies costs were covered through taxation.<sup>212</sup> Under the Water Framework Directive (WFD), member states are under an obligation to develop water pricing as a requirement.<sup>213</sup> Although water pricing was controversial when the WFD was adopted in 2000, the Directive introduced a rule for water pricing. Member states have to 'take account of' the principle of recovery of costs of water services and ensures adequate contribution of water users to the cost of water as an economic regulatory tool.<sup>214</sup> The member states oblige to internalize the costs of water services, including environmental and resource costs.<sup>215</sup>

Through the Water Framework Directive, the member states are expected to introduce water pricing policies that 'provide adequate incentives' for water consumers to use water efficiently.<sup>216</sup> The idea of water pricing aims to realise the sustainability of water resources by providing incentives for water users that

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<sup>206</sup> Ibid.

<sup>207</sup> B. Page & M. Kiaika, (2003). 'The EU Water Framework Directive: Part 2 Policy Innovative and Shifting Choreography of Governance', *European Environment*, Volume 13, p. 5.

<sup>208</sup> Miguel Solanes and Fernando Gonzalez-vilarral, (1999). 'The Dublin Principles for Waters as Reflected in Comparative Assessment of Institutional and Legal Arrangements for Integrated Water Resources Management', available <http://www.gwpforum.org/gwp/liberary/Tac3.pdf>, last accessed 20 January 2011.

<sup>209</sup> Bach, *supra* note 205, pp. 341-348.

<sup>210</sup> Page and Kaika *supra* note 207.

<sup>211</sup> Ibid.

<sup>212</sup> Ibid.

<sup>213</sup> WFD Article 9.

<sup>214</sup> Page and Kaika *supra* note 207; See also Water Framework Directive, Article 9

<sup>215</sup> Water Framework Directive, Article 9.

<sup>216</sup> Ibid.

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shape their behaviours and increase the appreciation of water use to enhance efficiency in water quality and quantity.<sup>217</sup> However, in cost recovery, the WFD did not come with rules that support its effective applicability throughout EU member states. The aspiration of full cost recovery was, for example, watered down by a vague statement which reads: 'to take into account the principle of recovery of cost'. This gives a wide room of discretion. As there is no common definition of water services, member states define it in their own way by flexibly narrowing down the concept.<sup>218</sup> That means its implementation is dependent on the willingness of each member state.

The practice has shown that within the water bodies of the European Union, cost internalization is not materialized effectively.<sup>219</sup> For the purpose of cost internalization, the scope of water services is often limited to drinking water and waste water treatment; this excludes regulation of major water consuming sectors, including water abstraction for agriculture.<sup>220</sup> Amongst the types of water uses, on average, 44 % of total water abstraction in Europe is used for agriculture, 40 % for industry and energy production, and 15 % for public water supply.<sup>221</sup>

Drinking water demand is the lowest in water consumption when it is compared with other sectors. As an economic incentive, the scope of application of water pricing needs to accommodate the realm of non-drinking water, and

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<sup>217</sup> Andrew Farmer,(2010). 'Challenges of Developing a European Union Strategic Approach to Water Security', *International Journal of Water Resources and Arid Environments* 1(3), pp. 153-162.

<sup>218</sup> COM/2007/ 414 Final, Communication from the Commission to the European Parliament and the Council Addressing the Challenge of Water Security and Droughts in the European Union, Brussels, 18.7, 2007). Available at [http://www.europarl.europa.eu/meetdocs/2004\\_2009/documents/com/com\\_com%282007%290414\\_/COM\\_COM%282007%290414\\_en.pdf](http://www.europarl.europa.eu/meetdocs/2004_2009/documents/com/com_com%282007%290414_/COM_COM%282007%290414_en.pdf) , last accessed: 05 Sep. 2013.

<sup>219</sup> COM/2012/0672 Final/, Communication from the Commission to the European Parliament, the European Economic and Social Committee and the Committee of the Regions on the Review of the European Water Scarcity and Drought Policy, available <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52012DC0672> , last accessed 08 Sep. 2013.

<sup>220</sup> Ibid.

<sup>221</sup> EEA, Water use by sectors, All Economic Sectors Need Water; Agriculture, Industry and Most Forms of Energy Production are not Possible without Water, Last modified: 18 Feb 2008, 12:34 PM, available <http://www.eea.europa.eu/themes/water/water-resources/water-use-by-sectors> last accessed 05 Sep. 2013.

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needs to accommodate environmental and resources costs.<sup>222</sup> With regard to water consumption by the agricultural sector in EU,

‘operational costs for the provision of water are only partly recovered for 10 member states and capital costs are often subsidized. An important share of water abstractions for agriculture in the EU is not priced, even in water stress areas, and there is no financial mechanism for recovering the environmental and resource costs of individual abstractions or for giving incentives to using water more efficiently’.<sup>223</sup>

Although water services require the inclusion of environmental and resources costs, both are left unconsidered.<sup>224</sup> In the Union, water pricing is not widely used and is hardly implemented beyond the sectors of drinking water supply and waste water treatment.<sup>225</sup> Water cost internalization policies do not generally take into account the level of sensitivity of water security challenges.<sup>226</sup> The Third Follow up Report to the Communication on water scarcity and droughts in the European Union indicated that many the European Union Member States including UK, the water-tariffs have been introduced recently or are under development in order to ensure water services cost recovery.<sup>227</sup>

The ‘right-price-tag’ on water services accommodates the full cost of water services.<sup>228</sup> In England, water cost internalization is not effective since water metering is not a compulsory requirement except in the areas where resources are in stress.<sup>229</sup> In many cases, in practice, regulatory rules for water resources do not accommodate compulsory rules obligating the installation of water meters for water used for a range of uses. Water prices are calculated at a flat-rate. In such circumstances, you are not expected to pay by the amount you use, and water bills hardly reflect the average price of water consumption.

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<sup>222</sup> Ibid.

<sup>223</sup> Ibid.

<sup>224</sup> COM/2012/0672 final, *supra* note 2019.

<sup>225</sup> COM/2007/ 414 final, *supra* note 2018.

<sup>226</sup> Ibid.

<sup>227</sup> European Commission, *Water Scarcity and Droughts in the European Union*, Report from the Commission to the European Parliament and the Council, Third Follow up Report to the Communication on Water Scarcity and Droughts in the European Union COM (2007) 414 final SEC(2011) 338 final, available [http://ec.europa.eu/environment/water/quantity/pdf/special\\_report.pdf](http://ec.europa.eu/environment/water/quantity/pdf/special_report.pdf), Last accessed 05 Sep. 2013.

<sup>228</sup> Page and Kaika *supra* note 207.

<sup>229</sup> Future Water (2008). the Government’s Water Strategy for England, pp. 26-28

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In developing countries, the capacity to introduce right rules for water cost internalization is low.<sup>230</sup> Defining right institutional arrangements is too costly.<sup>231</sup> In such countries, to internalize the cost of water services including environmental and resource costs may not be materialized without substantial assistance from developed countries.

#### 5.4 Water leakage management

Another problem related to water efficiency is leakage management. For instance, water leakage problems within European Union member states vary between 7% to 70% or more.<sup>232</sup> Although it may not be possible to avoid leakage altogether, introducing schemes that minimize water wastage within the European Union through leakages may contribute to reducing water security challenges. The idea of sustainable economic leakage levels is considered to benefit leakage problems within member states.<sup>233</sup> In England, water leakage was one of the concerns in respect of water availability.

Grekos noted the water companies need to do more to reduce leakage and the companies should take is to make best use of existing resources.<sup>234</sup> For instance, in England, the UK Government has set out its water security aspirations for 2030 and some water companies have incorporated leakage reduction options to meet this target through their water resources management plans.<sup>235</sup> Despite the benefits of this scheme within member states and water bodies, its implementation may not be realized without setting compliance mechanisms that regulate the efficiency of the infrastructures that are used in water development.

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<sup>230</sup> IPCC (2001). *Climate Change: Impacts, Adaption, and Vulnerability: A Contribution of Working Group II to the Third Assessment Report of International Panel on Climate Change* [Watson, R.T. and the Core Writing Team [eds.]Cambridge Press, Cambridge, United Kingdom, and New York, NY, USA, pp.14-15.

<sup>231</sup> Barzel, *supra* note 201, pp, 64, 178.

<sup>232</sup> COM/2012/0673 Final, *supra* note 2019, available <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52012DC0673>, last accessed 05 Sep. 2013.

<sup>233</sup> *Ibid*.

<sup>234</sup> Grekos, *supra* note 129, p.49.

<sup>235</sup> Defra (2011) *Review of Ofwat and Consumer Representation in the Water Sector*, available [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/69442/ofwat-review-2011.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/69442/ofwat-review-2011.pdf) last accessed 15 Sep. 2013, p. 44.

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### 5.5 Water system management

Water pollution increases the cost of water treatment and constrains the availability of water.<sup>236</sup> Generally water pollution comes from two sources: point and diffuse sources. The former pollution comes from a particular identifiable source, including factories, storm sewers or pollutant discharges in discrete sites. In contrast, the diffuse source pollution comes from multiple dispersed sites.<sup>237</sup> A regulatory system may not easily control diffuse pollution unlike point source pollution.<sup>238</sup> One measure to manage diffuse source pollution is the creation of awareness amongst farmers of the best farming practices.

In England and Wales the Catchment Sensitive Farming Project, which is voluntary in nature, is seeking to tackle the agricultural diffuse pollution.<sup>239</sup> In this project, the farmers voluntarily engage by gaining advice and receiving incentives. This approach does not use coercive regulation to tackle diffuse pollution problems; instead, it gives emphasis to actions taken at the grass roots level and integrates with other catchment delivery mechanisms. For instance, the example of the Wessex Catchment in England shows how the Catchment Sensitive Farming Project has been conducted at a very local level within small areas to control the nitrate problem.<sup>240</sup> The project aims ‘a low cost, sustainable solution to the pollution of drinking water.’<sup>241</sup>

Naturally, however, the lower level (catchment or below) is seen as appropriate to manage diffuse pollution problems. For instance, it has been estimated that water pollution alone costs England and Wales up to £1.3 billion per year.<sup>242</sup> From a pollutant-management point of view, the tragedy of the

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<sup>236</sup> National Audit Office, *Tackling Diffuse Pollution*, Printed July 2010, available [www.eurosaiwgea.org/Environmental%20audits/.../2010%20-%20United](http://www.eurosaiwgea.org/Environmental%20audits/.../2010%20-%20United) last accessed 10 Sep.2013, pp. 4-5.

<sup>237</sup> Defra, *Water for Life: Water and the Natural Environment*, Published on 08-12-201, available <http://archive.defra.gov.uk/environment/quality/water/documents/wwp-factsheet-natenvironment.pdf> last accessed 10 Sep. 2013.

<sup>238</sup> Environment Agency, *Diffuse source pollution*, Environment Agency 2012

<sup>239</sup> Bob Middleton (2011), *Delivering Outcomes Catchment Sensitive Farming*, CIWEM, Catchment Delivery Conference, London, 23 November 2011, available [www.ciwem.org/events/events-outputs.aspx](http://www.ciwem.org/events/events-outputs.aspx) last accessed 10 Sep. 2013.

<sup>240</sup> Luke de vial (2011), *Catchment Management in at Wessex Water Emerging Lessons*, CIWEM, 23 November 2011, available [www.ciwem.org/events/events-outputs.aspx](http://www.ciwem.org/events/events-outputs.aspx) last accessed 08 October 2013.

<sup>241</sup> *Ibid.*

<sup>242</sup> National Audit Office, *Tackling diffuse pollution*, printed July 2010, available <http://www.nao.org.uk/report/tackling-diffuse-water-pollution-in-england/> last accessed 05 Sep. 2013, p. 4

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commons does not consider contemporary diffuse pollution problems in water resources management. Rather, it focuses on the point source at which pollution is discharged into a water body. Likewise, the theory considers the threats to water resources purely from a water-resources user's point of view.

In addition to direct pollution control and awareness creation, designations of protected zones are used to protect water resources from pollution.<sup>243</sup> In England, the Environment Agency may ask the Secretary of State to designate areas as water protection zones.<sup>244</sup> For instance, in 1999, a water protection zone was designated in the River Dee.<sup>245</sup> Moreover, code of good agricultural practices has been developed and is used in the protected zones.<sup>246</sup> The Environment Agency issues discharge consent and permit systems.<sup>247</sup> The Environment Agency is also entrusted with the responsibility to regulate water quality deterioration through pollution, effluents discharge or sewerage.<sup>248</sup> Although land use planning may have significant contribution to enhance balanced utilization of water resources, clear rules are required.

Water uses within river basin are interdependent; water users impose costs of their overexploitation on others unless there are schemes to manage these externalities.<sup>249</sup> Naturally, the management of the quality and quantity of water resources requires water system management. Upstream water users may not be encouraged to engage in watershed management unless there are policy instruments that compensate for their efforts.<sup>250</sup> Unwise use of a water ecosystem may deteriorate its adjacent water bodies. In the context of the current Nile basin system Stebek notes that:

The current environmental degradation in upstream Eastern Nile basin is mainly attributable to the cumulative result of decades of deforestation and watershed mismanagement caused by the prolonged economic, social and political problems that Ethiopia has been forced to go through, and any external pressure towards this turmoil has directly contributed to the current state of the basin. Unless this trend is reversed, the forthcoming decades

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<sup>243</sup> Water Resources Act 1991, ss. 92, 93, 94.

<sup>244</sup> Water Resources Act 1991, s. 87

<sup>245</sup> National Audit Office, *Tackling Diffuse Pollution*, Printed July 2010, available <http://www.nao.org.uk/report/tackling-diffuse-water-pollution-in-england/> last accessed 05 Sep. 2014, p. 31

<sup>246</sup> Water Resources Act 1991, s. 97

<sup>247</sup> Water Resources Act 1991, s.89 ,89

<sup>248</sup> Water Resources Act 1991, s.84; Environment Act 1995 ss. 2(ii), 5

<sup>249</sup> FAO (1995). *Land and Water Bulletin 3, Water Sector Policy Review and Strategy Formulation ; A general Framework*, available <http://www.fao.org/docrep/v7890e/v7890e00.htm> last accessed 25 Sep. 2013, p.4.

<sup>250</sup> Ibid.

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might possibly witness the further degradation and desertification of the basin that could cause the eventual (albeit gradual) drying up of the watercourse and along with it: the probable end of Egyptian agriculture through surface fresh waters.<sup>251</sup>

The pastureland example used by Hardin illustrates how grassland sustainability can be adversely affected due to the over-exploitation of grassland by herders. In the case of water resources, the possible ruin of water resources can, according to Hardin's theory, be averted by regulating water users' over-exploitation. The linkage between the over-exploitation of one resource with another was not addressed by Hardin. Such isolated understanding of the commons problem may not enhance the sustainability of resources, but rather, enhance their demise. Not all water resources scarcity problems necessarily come from water over-use, wastage or water pollution. Indeed, the problems may be attributable to the degradation of adjacent or farther-away resources because such practices have their own adverse impact on water systems.

### 5.6 Transboundary challenges

The tragedy of the commons suggests government regulation towards individual behaviour regulation, but it does not consider the impact of government failures which may lead to the ruin of shared water resources. The theory does not thus include the government among the parties and factors that can contribute to the ruin of water resources. Even if the tragedy of the commons theory puts the government inside its theoretical ambit, it may be unlikely that the government could impartially regulate its behaviour through rules formulated by itself, particularly, if that government is part of the problem of natural resources over-use or quality deterioration. In shared water resources, tensions between governments are among the challenges in sustaining the resources.<sup>252</sup>

Notably, today, there are challenges in managing water resources in a way that is sustainable due to the action of governments for their short-term interests rather than riparian long-term common interests. A government may also run many large development projects that affect the availability of water and, as a government term of office is not long, short-term benefit-seeking by governments may be more problematic than by individuals.

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<sup>251</sup> E. Stebek (2007). 'Eastern Nile at Crossroads: Preservation and Utilization Concerns in Focus', *Mizan Law Review*, Vol. 1 No.1, p. 36.

<sup>252</sup> Lucia Dedtefno *et al* (2010). 'Mapping the Resilience of International River Basins to Future Climate Change –Induced Water Variability', 15 *Water Sector Board Discussion Paper Series*, the World Bank, p. 1.

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There is usually mismatch between water resources and administrative boundaries. As a result, action on one affects the other.<sup>253</sup> The people at the local level 'are closer to the problems, often understand them better, and have to live with the consequences of the environmental policy. At the same time, if the problem is one of transboundary pollution, the locals do not live with the consequences of their pollution. Those downstream do.'<sup>254</sup> In nature, exploitation of water resources in parts of the water system affects the water users in other parts. Many of the water challenges are interconnected and interrelated, and world is currently encountering changing realities to which traditional institutional arrangements that focus on water quantity might not be adequately responsive.<sup>255</sup>

Hardin's theory to water resources is inadequate to address present-day complex challenges, and its application towards addressing a range of water threats requires rethinking. While, water and its ecosystems should not be seen in isolation, the tragedy of the commons overlooks such linkages. The theory is more localized to the commons problems, rather than considering wider opportunities.

Water security challenges, whether local, national or global, are inextricably linked.<sup>256</sup> In climate change, for instance, it was contended that '[t]he linkage among local, regional, and global environmental issues, and their relationship to meeting human needs, offer opportunities to capture synergies in developing response options and reducing vulnerability to climate, although trade-off between issues may exist.'<sup>257</sup> Climate change impacts on the water resources are a transcending and shared problem, which adversely affects the global community.<sup>258</sup>

Naturally, in such contexts, the institutional arrangements need to accommodate a range of factors contributing to water insecurity.<sup>259</sup> In particular, water security cannot only be achieved through institutional arrangements introduced at a national level to regulate water users' behavior; rather, it requires comprehensive policy and law at various levels.<sup>260</sup> For instance, at the European Union level, there was no water law designed to manage water

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<sup>253</sup> See Salzman and Thompson, *supra* note 1, p.22.

<sup>254</sup> *Id.*, p.23.

<sup>255</sup> UNDEP (2004). Industry and Environment: Water and Development Industry's Contribution, 27:1 , January –March , 2004

<sup>256</sup> *Ibid*, p.29.

<sup>257</sup> IPCC, *supra* note 197, p.4.

<sup>257</sup> *Ibid*, p. 29.

<sup>258</sup> *Ibid*, p.4.

<sup>259</sup> *Ibid*, p. 3

<sup>260</sup> *Ibid*, p. 4

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resources by transcending administrative boundaries of member states. The laws and organizational structures were administrative boundary-oriented and fragmented, other than the ones that have been governed by treaties agreed upon between states sharing a water body.<sup>261</sup>

However, the European Water Framework Directive (WFD) has brought considerable change in the conventional water resources management organizational structures architecture of the Union. The WFD places water resources management at the river basin boundary level.<sup>262</sup> Upon completion of the first cycle of the WFD implementation period, however, the river basin approach was criticised for its inability to accommodate local needs in the planning process of water resources.<sup>263</sup> Markedly, river basin based water resources planning and management were contested for failure to accommodate 'local issues and locally planned action'.<sup>264</sup>

Across Europe, there are sixty-four transboundary water bodies that connect member states or non-member states.<sup>265</sup> The European Union shares many transboundary river basins with non-member states. The problems may be more complex when the water resources are shared with non-EU member state. In instances where a river basin crosses a boundary of a non-EU member state, the EU member state's obligation is to endeavour to secure cooperation through bilateral agreements.<sup>266</sup> Such cooperation is increasingly dependent on the willingness of the non-EU member state and the nature of their agreement.

The obligation of cooperation in shared water resources management between member states is relatively strict as compared to cooperation with non-member states.<sup>267</sup> This obligation is indispensable in the enhancement of integrated water resources protection and development. The failure of cooperation between states that share a river basin may not be an excuse to implement a WFD obligation, and a member state may implement this obligation within its administrative boundary, a sub-unit of a river basin.<sup>268</sup> The EU Water Framework Directive requires each member state to establish the

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<sup>261</sup> Jans and Vedder Jan Jans and Hans Vedder(2008), *Environmental law* (3ed , Europa Law), p. 348.

<sup>262</sup> Ibid.

<sup>263</sup> Damian Crilly (2011). *The Catchment Based Approach - Pilot Phase*, CIWEM, Catchment Delivery Conference, London, 23 November 2011, available [www.ciwem.org/events/events-outputs.aspx](http://www.ciwem.org/events/events-outputs.aspx) last accessed 05 Sep. 2013.

<sup>264</sup> Ibid.

<sup>265</sup> Wolf (1999). *International Rivers of the World*, 15 *International Journal of Water Resources Development* 387, pp. 404-8.

<sup>266</sup> WFD, Article 3(4).

<sup>267</sup> Ibid, Article 3 (4).

<sup>268</sup> Ibid, Article 3(5)

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river basin district within its own jurisdiction or a coordinated management for the water bodies that transcend national boundaries.<sup>269</sup>

With shared water resources, institutional arrangements developed by a single country or level may not differ from the unregulated individual behaviour that can lead to the ruin of resources. Each level of government acting in an isolated manner may tend to over-use the resources. These levels formulate and render decisions independently, unless there are schemes to harmonize their actions. The tragedy of the commons theory considers the government as a single body (that can regulate individual resources users), and it does not envisage the regulation of government actions by supranational bodies. It thus undermines the significance of a multilevel governance approach (through regional and global bodies) in shaping institutional arrangements for water resources. Naturally, a water body is a complex system thereby making it difficult to determine a proper boundary, which requires taking into account the interconnectedness of the water system beyond the usual administrative boundaries and linkages.<sup>270</sup>

## Conclusion

The major solutions suggested for solving the tragedy of the commons are either to appropriate the commons through developing institutional arrangements that confer private property rights prerogatives or, if the nature of the commons does not allow appropriation, to introduce coercive regulatory institutional arrangements that establish public rights and limit access to and use of the commons in relation to over-exploitation. For Hardin, the 'tragedy' is averted simply through the regulations introduced by the government to control over-exploitation and pollution by resource users.

In both remedies, the role of the government agencies is decisive. In the context of water resources insecurity, the remedies formulated by the tragedy of the commons introduce prescriptive regulation, regulatory institutional arrangements establishing public rights, whilst introducing private property rights to restrict access to and use of water resources. The core issue is whether the depletion and degradation of water resources can be effectively regulated solely through coercive rules. In this regard, the theory fails to propose non-coercive market rules and informal community arrangements that may be equally important to enhance water resources sustainability.

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<sup>269</sup> Ibid, Articles 3 (2), 3(3) 3(4)) & 3(5)

<sup>270</sup> WWF, (2000). *Adapted* from Integrated Water resources Management, Global Water Partnership Technical Advisory Committee Background Papers, No. 4, *Available* [wwf.panda.org/about\\_our\\_earth/about\\_freshwater/rivers/irbm\\_](http://wwf.panda.org/about_our_earth/about_freshwater/rivers/irbm_) last accessed: 07 July 2012

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Water resources have distinct characteristics from many other types of resource. This is mainly because water resource boundaries are usually large, the resources are uneven, uses and users are diverse and the resources are shared in a range of scales. Moreover, water availability is adversely affected not only by unsustainable water resources exploitation but also by water quality failures and water systems degradation. This is attributable to the interconnectedness of natural water systems with ecosystems. In many cases, water pressures transcend national boundaries, and water resources management cannot be effectively addressed in an isolated fashion. Actions in adjacent environments or in even farther locations may impact upon the availability of water. An isolated view of natural resources problems solely through the regulation of users' demands thus excludes a range of water pressures that transcend national frontiers.

The introduction of a more integrated water resources management is thus required to avert water insecurity. Water resources problems are interconnected and need to be approached holistically. By doing so, a wide range of water resources pressures must be recognized and managed at internal and cross-border levels. Hardin's theory hardly provides complete solutions to the contemporary water security challenges. Present-day water resources challenges thus need comprehensive solutions and institutional arrangements for water resources management.

It may require water demand regulation at a local level. However, regulatory institutional arrangements for water demand alone may not sustain water resources because the challenges may involve a range of water pressures. In addition to well defined and coercive regulatory institutional arrangements, water security may require non-coercive regulatory institutional arrangements and effective implementation mechanisms. Thus present day water security challenges may need fundamental change in managing the resources beyond Hardin's 'traditional' perspectives. In spite of the initiatives underway in water resources management, however, the concept of the 'tragedy of the commons' still has a big impact in the formulation of the policies, as a result of which there has not been much deviation from the 'traditional' way of managing water resources. ■

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