

BRINGING “TOP-DOWN” TO “BOTTOM-UP”: A NEW ROLE FOR ENVIRONMENTAL LEGISLATION IN COMBATING DESERTIFICATION

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I. INTRODUCTION: THE UNFULFILLED PROMISE OF THE UNITED NATIONS CONVENTION TO COMBAT DESERTIFICATION

By the outset of the twentieth century, colonial governments in Africa had identified a process that soon came to be called “desertification”¹ and prioritized conservation efforts to address it. Desertification occurred when land cover in the drylands was lost or removed, with the result that the soil became vulnerable and organic matter was readily washed or blown away. Salinization of soil can produce similar effects, leading to a reduction in land productivity. The symptoms were many and alarming and included the following: the migration and expansion of sand dunes; inundation of vegetation; diminished rainfall and water resources; depletion of pastures; massive erosion from winds and rain; and overall loss of biomass and biological integrity.² The process was hardly new, nor limited to Africa. In *Guns, Germs, and Steel*, geographer Jared Diamond describes the phenomenon as existing since the dawn of civilization:

Because of low rainfall and hence low primary productivity, (proportional to rainfall), regrowth of vegetation could not keep pace with its destruction, especially in the presence of overgrazing by abundant goats. With the tree and grass cover removed, erosion

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¹ British scholar Michael Mortimore attributes the term “desertification” itself to the French forester Andre Aubréville’s use of the term in his book, *CLIMATS, FORÊTS, ET DESERTIFICATION DE L’AFRIQUE TROPICALE* (1949). Mortimore quotes Aubréville:

The closed forests are shrinking and disappearing, like evaporating spots. The trees of the open forests and savannas become more and more spaced out. On all sides the bare skin of Africa appears as its thin green veil of savanna burns, releasing a grey fog of dust into the atmosphere. Arable land is carried away by the yellow waters of rivers in flood. Slabs of sterile truncated soil, bearing tufts of grass around uprooted bushes, recall a kind of leprosy that is spreading over the face of Africa . . .

MICHAEL MORTIMORE, *ROOTS IN THE AFRICAN DUST, SUSTAINING THE SUB-SAHARAN DRYLANDS* 21 (1998) (quoting AUBRÉVILLE, *supra*, at 341).

² For a thorough description of the evolution of the concept of desertification, see MORTIMORE, *supra* note 1, at 17–25.

proceeded and valleys silted up, while irrigation agriculture in the low-rainfall environment led to salt accumulation . . . Thus, Fertile Crescent and eastern Mediterranean societies . . . committed ecological suicide by destroying their own resource base.³

The resulting human suffering and ecological devastation has been extraordinary. Desertification is directly responsible for poverty,⁴ famines,⁵ reduction of biodiversity,⁶ masses of refugees,⁷ and even violence.⁸ Measured economically, the impact is simply staggering. In China alone, for example, it is thought that the direct annual loss associated with desertification reaches \$42 billion.⁹ The harm from desertification's indirect

³ JARED DIAMOND, GUNS, GERMS, AND STEEL: THE FATES OF HUMAN SOCIETIES 411 (1999).

⁴ PHILIP DOBIE, UNITED NATIONS DEV. PROGRAMME, POVERTY AND THE DRYLANDS (Sept. 2001) (citation omitted), available at <http://www.undp.org/drylands/docs/cpapers/PovertyandtheDrylands.doc>:

The most important contributing factor towards degradation of fragile lands in Sub-Saharan Africa is a nexus of poverty, rapid population growth and inadequate progress in increasing crop yields. Poor people in their quest for food and other livelihood needs are increasingly expanding cultivation into forests, steep hill-sides and other fragile areas . . . reducing fallow periods to the point where soils are inadequately rejuvenated, pursuing land management practices that deplete soil nutrients . . . overgrazing pasture . . . [and] cutting trees for fuelwood . . . When studying the location of poor people in different parts of the world, there is a clear correlation between those living in degraded areas and high levels of impoverishment.

See also KEVIN M. CLEAVER & GOTZ A. SCHREIBER, WORLD BANK, REVERSING THE SPIRAL: THE POPULATION, AGRICULTURE AND ENVIRONMENT NEXUS IN SUB-SAHARAN AFRICA (1994); MARK WINSLOW ET AL., DESERTIFICATION, DROUGHT, POVERTY AND AGRICULTURE: RESEARCH LESSONS AND OPPORTUNITIES (2004), available at http://www.iwmi.cgiar.org/Assessment/files/Synthesis/Land%20Degradation/DDPAARLO_text.pdf.

⁵ "Desertification contributes to famine. Famine typically occurs in areas that also suffer from poverty, civil unrest, or war. Drought and land degradation often help to trigger a crisis, which is then made worse by poor food distribution and the inability to buy what is available." United Nations Convention to Combat Desertification ("UNCCD") Secretariat, Fact Sheet 3: The Consequences of Desertification, <http://www.unccd.int/publicinfo/factsheets/showFS.php?number=3> (last visited Nov. 1, 2006) (on file with the Harvard Environmental Law Review).

⁶ The Millennium Ecosystem Assessment's Desertification Synthesis explains that the "manifestations of desertification are apparent in all categories of ecosystem services." ZAFAR ADEEL ET AL., WORLD RESOURCES INST., ECOSYSTEMS AND HUMAN WELL-BEING: DESERTIFICATION SYNTHESIS 6 (2005) [hereinafter MILLENNIUM ECOSYSTEM ASSESSMENT, DESERTIFICATION SYNTHESIS], available at <http://www.millenniumassessment.org/proxy/Document.355.aspx>.

⁷ Norman Myers, *Environmental Refugees*, 19 POPULATION & ENV'T 167, 167-82 (1997); see also William B. Wood, *Ecoimmigration: Linkages Between Environmental Change and Migration*, in GLOBAL MIGRANTS, GLOBAL REFUGEES 42-61 (Aristide R. Zolberg & Peter M. Benda eds., 2001).

⁸ Hans Günter Brauch, Desertification—A New Security Challenge for the Mediterranean?, NATO—CCMS & Science Committee Workshop, Valencia, Spain (Dec. 2-5, 2003), available at <http://www.nato.int/science/news/2003/docu/031211c-desertification.pdf>.

⁹ JARED DIAMOND, COLLAPSE: HOW SOCIETIES CHOOSE TO FAIL OR SUCCEED 368

contribution to natural disasters, such as the great floods of 1998 that affected 240 million Chinese, may be far greater.¹⁰

Yet it would take until the very end of the twentieth century for the international community to formulate a strategy to address this global scourge. The United Nations Convention to Combat Desertification in Those Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa (“UNCCD”)¹¹ is the somewhat prolix name for the instrument that emerged from two years of negotiation in October, 1994. The UNCCD was designed to provide a global response to desertification by directing strategy plans individually and regionally to prevent soil degradation and restore degraded lands.¹² Developed nations that are parties to the Convention are expected to help finance these activities.¹³

The UNCCD was ratified within two years.¹⁴ Today over 190 countries are parties to the Convention,¹⁵ making it among the most widely adopted of modern international environmental initiatives.¹⁶

The UNCCD’s central element is the National Action Program (“NAP”)—each affected country must formulate a detailed plan that lays out its strategy for mitigating and preventing desertification.¹⁷ The UNCCD

(2005) [hereinafter DIAMOND, COLLAPSE].

¹⁰ *Id.* at 365.

¹¹ United Nations Convention to Combat Desertification in Those Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa, June 17, 1994, art. 9, 33 I.L.M. 1328 [hereinafter UNCCD].

¹² *See id.* prologue, arts. 4, 5.

¹³ *See id.* art. 6.

¹⁴ By October 1996, the 115 nations required to activate the UNCCD had signed the convention, and it came into force ninety days later on December 26, 1996. UNCCD Secretariat, Status of Ratification and Entry into Force, <http://www.unccd.int/convention/ratif/doeif.php> (last visited Oct. 30, 2006) (on file with the Harvard Environmental Law Review) [hereinafter UNCCD Secretariat, Status of Ratification].

¹⁵ *Id.*

¹⁶ The U.N. has 192 member nations; thus, the UNCCD includes almost the entire international community. *See* United Nations, Growth in United Nations Membership, 1945–2006, <http://www.un.org/Overview/growth.htm> (last visited Nov. 21, 2006) (on file with the Harvard Environmental Law Review).

¹⁷ UNCCD, *supra* note 11, art. 9. The Convention provides:

National action programmes shall specify the respective roles of government, local communities and land users and the resources available and needed. They shall, *inter alia*:

- (a) incorporate long-term strategies to combat desertification and mitigate the effects of drought . . . ;
- (b) . . . be sufficiently flexible at the local level to cope with different socio-economic, biological and geo-physical conditions;
- (c) give particular attention to the implementation of preventive measures for lands that are not yet degraded . . . ;
- (d) enhance . . . the means to provide for drought early warning;
- (e) promote policies . . . [and] develop cooperation . . . between the donor community, governments at all levels, local populations and community groups . . . ;
- (f) provide for effective participation at the local, national and regional levels of non-governmental organizations and local populations, both women and men . . .

process for drafting NAPs emphasizes a “bottom-up,” participatory approach.¹⁸

Unfortunately, implementation of NAPs has been sluggish. In Africa, where the severity of desertification was the catalyst for the UNCCD,¹⁹ it was not until the year 2000 that the first country, Zimbabwe, submitted a NAP.²⁰ By 2004, thirty-four African nations had submitted NAPs.²¹ Yet demonstrated indicators of effective action and actual progress on the ground remain sparse.²²

The minimal progress in land reclamation (restoring land productivity) and economic progress²³ in drylands is often rationalized as the result of insufficient commitment of donor countries and the international community.²⁴ With some notable exceptions,²⁵ support of anti-desertification efforts through partnerships between first- and third-world nations has been extremely modest.²⁶

However, a dearth in international funding does not mean that drylands nations suffering from desertification need accept land degradation as inevitable. Many of the soil conservation measures required to prevent desertification and restore degraded lands have been available for nearly

Id. art. 10.

¹⁸ See *infra* Part III.B.

¹⁹ See *infra* Part III.A.

²⁰ See UNCCD Secretariat, Action Programmes, <http://www.unccd.int> (last visited Oct. 30, 2006) (on file with the Harvard Environmental Law Review) (providing roster of all nations that have submitted NAPs).

²¹ *Id.*

²² Hama Arba Diallo, executive secretary of the UNCCD, acknowledged in May 2005 during a review of the Convention’s implementation that the “mainstreaming trend [of linking NAPs to existing poverty reduction and investment strategies] is still more formal than operational. The UNCCD policy tool should be better integrated to [sic] existing environmental policies.” Press Release, UNCCD, UN Maps New Ways To Mainstream Desertification (May 12, 2005), available at http://www.unccd.int/publicinfo/pressrel/showpressrel.php?pr=press12_05_05.

²³ While economic progress has been encouraging in many developing regions in East Asia since 1981, the numbers of extreme poor in Sub-Saharan Africa have nearly doubled. JEFFREY D. SACHS, *THE END OF POVERTY: ECONOMIC POSSIBILITIES FOR OUR TIME* 21 (2005).

²⁴ *Id.* at 276–77.

²⁵ For example, over a billion dollars is scheduled to be distributed through the Strategic Partnership for UNCCD Implementation in Central Asian Countries to address sustainable land management in Central Asia. See The Global Mechanism, UNCCD, Central Asian Countries Initiative for Land Management (“CACILM”), <http://www.global-mechanism.org/initiatives/cacilm> (last visited Oct. 30, 2006) (on file with the Harvard Environmental Law Review).

²⁶ See UNCCD Secretariat, Status of the Contributions to the Convention’s Trust Funds, <http://www.unccd.int/secretariat/menu.php?newch=16> (last visited Oct. 30, 2006) (on file with the Harvard Environmental Law Review) (detailing national contributions to the UNCCD Trust, a fund overseen by the Convention Secretariat to implement the UNCCD that has been very poorly financed); The Global Mechanism, UNCCD, All Initiatives, <http://www.global-mechanism.org/initiatives/all-initiatives> (last visited Oct. 30, 2006) (on file with the Harvard Environmental Law Review) (providing the reports of the Global Mechanism, the financial initiative designed to facilitate partnerships under the UNCCD).

a century and indeed were default management practices millennia ago.²⁷ The policy challenge is primarily one of technology diffusion and intervention to prevent injurious land management practices.²⁸ Moreover, many of the drivers of desertification involve the unsustainable utilization of common resources by individual actors. Overgrazing, deforestation, the mining of water resources—all represent the “tragedy of the commons” paradigm.²⁹ In such cases, “top-down” legislation is often the most cost-effective, if bitter, medicine.³⁰

It is true that desertification poses a fundamentally unique environmental challenge, as it truly requires “sustainable *development*,” rather than a preservationist, anti-development orientation.³¹ Given the acute poverty in many affected countries, policing land use and limiting the modest economic activities that do exist can hardly be deemed a comprehensive solution, much less politically or economically feasible. Environmental law in developing countries will have to take a different form from legal paradigms in countries with developed economies.³² Viable economic oppor-

²⁷ DANIEL J. HILLEL, *OUT OF THE EARTH: CIVILIZATION AND THE LIFE OF THE SOIL* 85–102 (1991).

²⁸ Alon Tal, *A Slow Crawl Forward in the Dust: Desertification, the Environmental Orphan*, in *THE TURNING POINTS OF ENVIRONMENTAL HISTORY* (Christof Mauch et al. eds.) (forthcoming 2007) [hereinafter Tal, *A Slow Crawl Forward*]; see also UNCCD, Committee for the Review of the Implementation of the Convention, *Consideration of Ways and Means of Promoting Know-How and Technology Transfer for Combating Desertification and/or Mitigating the Effects of Drought as Well of Promoting Experience Sharing and Information Exchange Among Parties and Interested Institutions and Organizations*, U.N. Doc. ICCD/CRIC(3)/7 (Feb. 16, 2005), available at <http://www.unccd.int/cop/officialdocs/cric3/pdf/7eng.pdf>.

²⁹ Garret Hardin, *The Tragedy of the Commons*, 162 *SCIENCE* 1243, 1244–45 (1968) (arguing that individuals who share a common resource lack incentives to curtail individual usage, a dynamic which inevitably leads to overexploitation and ecological damage).

³⁰ Hardin suggested government regulation to restrict use of a common resource as one possible solution to the “tragedy of the commons.” *Id.* at 1245. In a real-life example, federal command-and-control regulation by the U.S. government reduced pollution of the ambient air—also a common resource—to produce an EPA-calculated societal savings of \$83 billion. See JANE A. SCOTT ET AL., *ENVTL. DEF., THE CLEAN AIR ACT* AT 35, at 9–11 (2005).

³¹ The Brundtland Commission’s original definition of “sustainable development” was “development that meets the needs of the present without compromising the ability of future generations to meet their needs.” *COMM’N FOR THE FUTURE, THE WORLD COMM’N ON ENV’T AND DEV., OUR COMMON FUTURE* 87 (Australian ed.) (1990). As the needs of millions of individuals living in drylands areas worldwide are presently not being met, further development will clearly be needed.

³² A proposed model for successful environmental regulation in developing countries is presented in William Andreen, *Environmental Law and International Assistance: The Challenge of Strengthening Environmental Law in the Developing World*, 25 *COLUM. J. ENVTL. L.* 17 (2000). Andreen proposes a legal regime that would gradually phase in the following: study of existing laws; establishment of a vision for reform; development of appropriate institutions for environmental management; recognition that such reform may extend beyond environmental law into other areas; creation of national ownership through public participation; and appropriate and long-term capacity building, including strengthening of non-governmental organizations. *Id.* at 26.

tunities appropriate for dryland environments must be available as alternatives to present, non-sustainable ventures.³³

Even so, it is useful to remember that many of the assistance programs upon which developing nations hang their hopes are often targeted at the symptoms of land degradation activities. Without legislation to prevent the recurrence of these dryland pathologies, enormous investment in development may be ineffective in the long run. Hence, the promotion of top-down legislation to prevent desertification should be a companion to present discussions and calls for greater investment in activities that combat desertification.

This Article argues that the assumption by which the UNCCD operates—that a “bottom-up” orientation constitutes the primary strategy to meet the world’s desertification crisis—needs to be called into question. As is the case with other environmental problems where the overall policy objective involves “technology forcing,” clear top-down signals from a national or regional government authority may be critical to future progress.³⁴ This top-down orientation will clearly have to respond to anticipated problems like local resistance (e.g., resentment of central authority) or a lack of basic resources for implementation. But given the reality that even ten years after UNCCD ratification sufficient funding to support these locally initiated efforts seems unlikely,³⁵ new approaches are required.

³³ For example, with wood collection for fuel exacerbating desertification in many developing regions, provision of alternative fuels offers a feasible and immediate alternative that will both save time (in searching for increasingly scarce woods) and vulnerable lands. See WOMEN’S COMMISSION FOR REFUGEE WOMEN AND CHILDREN, BEYOND FIREWOOD: FUEL ALTERNATIVES AND PROTECTION STRATEGIES FOR WOMEN AND GIRLS 17–19 (Mar. 2006), available at <http://www.womenscommission.org/pdf/fuel.pdf>.

³⁴ A review of the theory behind technology-forcing environmental policies and examples of success stories can be found in RENE KEMP, ENVIRONMENTAL POLICY AND TECHNICAL CHANGE: A COMPARISON OF THE TECHNOLOGICAL IMPACT OF POLICY INSTRUMENTS (1997). For a description of a successful instance of technology forcing, see David Gerard & Lester B. Lave, *Implementing Technology-Forcing Policies: The 1970 Clean Air Act Amendments and the Introduction of Advanced Automotive Emissions Controls* (May 2003), available at http://www.epp.cmu.edu/httpdocs/people/bios/papers/gerard/Gerard_Lave%20TF1.pdf.

³⁵ The Global Environment Facility (“GEF”), the major U.N.-affiliated environmental financing apparatus, agreed to include land degradation projects among the initiatives eligible for its support in 2002. GEF, Land Degradation, http://www.gefweb.org/projects/Focal_Areas/land/land.html (last visited Nov. 30, 2006) (on file with the Harvard Environmental Law Review). While the GEF inclusion of land degradation is an important milestone in UNCCD funding, it is hardly a panacea. For instance, while GEF concluded 2002 with \$3 billion in resources, these funds are to be used for all six of its focal areas: climate change, biodiversity, international waters, persistent organic pollutants, land degradation, and ozone-depleting substances in developing countries. GEF, Replenishment, <http://www.gefweb.org/Replenishment/replenishment.html> (last visited Nov. 28, 2006) (on file with the Harvard Environmental Law Review); GEF, Global Environmental Facility, <http://www.gefweb.org> (last visited Nov. 30, 2006) (on file with the Harvard Environmental Law Review). Finally, according to basic GEF policies, funding is only considered if the project has *global* significance. Robert C. Gustafson, Land Degradation and the GEF, http://www.gefweb.org/projects/Focal_Areas/land/documents/GuidelinesOP15Eng.pdf (last visited Nov. 30, 2006) (on file with the Harvard Environmental Law Review).

Legislative and regulatory measures are a critical step for land reclamation, afforestation, agricultural, and other development projects that can return degraded drylands to a healthier condition. Indeed, the UNCCD already insists that all parties begin addressing desertification through their domestic laws. Article 5(e) obliges signatories to: “provide an enabling environment by strengthening, as appropriate, relevant existing legislation and, where they do not exist, enacting new laws and establishing long-term policies and action programmes.”³⁶ Yet to date there has been no serious effort by UNCCD-affiliated institutions to encourage enactment of strong and proven legal regimes to combat desertification. Relevant legislation that has been adopted is often quite unrelated to the UNCCD *per se*.

There is certainly nothing new about laws that address the problem of land degradation in drylands. One can point as far back as the Bible, with its rules mandating crop rotation and leaving fields fallow every seventh year, to see that societies have often compelled their members to adopt land stewardship programs.³⁷ With the advent of modern soil conservation science in the twentieth century, many jurisdictions required such measures through governmental action—modern statutes and regulations.

In the international discourse about combating desertification, when legal aspects (particularly concrete regulatory measures) are considered at all, they tend to be addressed only superficially.³⁸ Any real expectation that domestic legislation would impose enforceable anti-desertification measures is conspicuously lacking. Even publications in environmental law journals have chosen to ignore this basic component of an integrated strategy to combat desertification, preferring to restate the vague expectations expressed in the provisions of the UNCCD.³⁹

This Article takes the view that legislation and other top-down policies are one critical part of any country’s national strategy to combat desertification in order to limit their reliance on international assistance. The Article focuses on specific examples of statutory measures enacted to this end and considers their universal applicability. Part II opens with a

³⁶ UNCCD, *supra* note 11, art. 5(e).

³⁷ “You may plant your land for six years and gather its crops. But during the seventh year, you must leave it alone and withdraw from it.” *Exodus* 23:10–11.

³⁸ For example, the final report of the most recent UNCCD Committee for the Review of the Implementation of the Convention session contains a section entitled “Legislative and Institutional Frameworks or Arrangements” that fails to specifically mention a single statute or substantive provision. UNCCD, The Committee to Review Implementation of the Convention, *Report of the Committee on its Third Session*, ¶ 23–26, U.N. Doc. ICCD/CRIC(3)/9 (June 23, 2005).

³⁹ See, e.g., Kyle W. Danish, *International Environmental Law and the Bottom-Up Approach: A Review of the Desertification Convention*, 3 *IND. J. GLOBAL LEGAL STUD.* 133 (1995); Alastair Iles, *The Desertification Convention: A Deeper Focus on Social Aspects of Environmental Degradation?*, 36 *HARV. INT’L L.J.* 207 (1995); *The “Rio” Environmental Treaties Colloquium*, 13 *PACE ENVTL. L. REV.* 111 (1995) (statement on the UNCCD by a U.N. official).

description of desertification processes. Part III then briefly reviews the international legal context for combating desertification and the Convention's traditional preference for a diffused, bottom-up strategy. Examples that illustrate the limitations of this approach highlight the need to balance bottom-up assistance with top-down normative directives. Part IV, the heart of this Article, presents examples of legislative, top-down policies that have been adopted to combat desertification by countries seeking a more aggressive, centralized response to the problem. The Article closes in Part V with a call for more vigorous legislation and greater technical and legal assistance for the crafting and enforcement of laws to combat desertification. Such a shift in orientation is critical in addressing a scourge characterized by the Millennium Ecological Assessment as "among the greatest contemporary environmental problems."⁴⁰

II. DESERTIFICATION EXPLAINED

A. What Is "Desertification"?

Dryland ecosystems⁴¹ cover nearly 54 million square kilometers of the earth's surface.⁴² Because of the general paucity of rainfall, they are extremely vulnerable to human over-exploitation and inappropriate land use. The global human challenges of "[p]overty, political instability, deforestation, overgrazing and bad irrigation policies can all undermine the productivity of the land."⁴³ Moreover, there remains disagreement among professionals addressing this issue.⁴⁴ There have been many different definitions of the global problem,⁴⁵ and these differences are "more than semantic."⁴⁶ The UNCCD defines desertification in Article 2 as "land degradation in arid, semi-arid and dry sub-humid areas resulting from various

⁴⁰ MILLENNIUM ECOSYSTEM ASSESSMENT, DESERTIFICATION SYNTHESIS, *supra* note 6, at 7.

⁴¹ World Resources Institute, *Drylands: Aridity Zones of the World*, http://earthtrends.wri.org/maps_spatial/maps_detail_static.php?map_select=459&theme=9 (last visited Nov. 29, 2006) (on file with the Harvard Environmental Law Review). Drylands include arid, semi-arid, and dry sub-humid area, and are primarily found in Asia and Africa. Drylands do not include true deserts, which are defined as hyper-arid areas.

⁴² *Id.*

⁴³ UNCCD Secretariat, The United Nations Convention to Combat Desertification [hereinafter UNCCD Secretariat, Explanatory Leaflet], *available at* http://www.unccd.int/convention/text/pdf/leaflet_eng.pdf (last visited Oct. 31, 2006) (on file with the Harvard Environmental Law Review) (explanatory leaflet about the UNCCD).

⁴⁴ Compare RIDLEY NELSON, DRYLAND MANAGEMENT: THE "DESERTIFICATION PROBLEM" 1 (World Bank Technical Paper No. 116, 1990) with DAVID S. G. THOMAS & NICHOLAS J. MIDDLETON, DESERTIFICATION: EXPLODING THE MYTH 8-10 (1994).

⁴⁵ See, for example, Michael Mortimore's definition: soil fertility decline, erosion by wind or water, dune formation, hydrological decline, biodiversity loss, deforestation, and declining bioproductivity. Michael Mortimore, *Dryland Development: Success Stories from West Africa*, ENVIRONMENT, Jan./Feb. 2005, at 8, 10.

⁴⁶ NELSON, *supra* note 44, at 1.

factors, including climatic variations and human activities.”⁴⁷ Desertification for the most part does not apply to hyper-arid lands (which lack meaningful amounts of soil to lose) but rather to lands in semi-arid and sub-humid areas that are damaged by activities such as deforestation, poor water management practices, erosive tilling, etc. It is also important to note that, with a few notable exceptions, “desertification does not refer to the expansion of existing deserts.”⁴⁸ “Land degradation,” in the context of arid, semi-arid and dry sub-humid areas, is defined as the following:

reduction or loss . . . of the biological or economic productivity and complexity of rainfed cropland, irrigated cropland, or range, pasture, forest and woodlands resulting from land uses or from a process or combination of processes, including processes resulting from human activities and habitation patterns, such as: (i) soil erosion, caused by wind and/or water; (ii) deterioration of the physical, chemical and biological or economic properties of soil; and (iii) long-term loss of natural vegetation.⁴⁹

The problem is particularly bad in Africa, where forty percent of the population lives in dryland areas.⁵⁰

While it may appear that the effects of desertification are irreversible, this is not always the case.⁵¹ Substantial research efforts are now being made in investigating how to restore degraded drylands.⁵²

There are four competing views about what drives the desertification process and how it functions:⁵³

- (1) The “structural” view emphasizes the structure of societal and economic conditions leading to over-exploitation and desertification. For example, there are those who assume that pastoral economies lead ineluctably to overgrazing and desertification.
- (2) The “human-error” approach holds that desertification is the result of poor planning and bad decisions across the board: from government policies and farming practices, to community land use traditions (including meth-

⁴⁷ UNCCD, *supra* note 11, art. 1(a).

⁴⁸ UNCCD Secretariat, Explanatory Leaflet, *supra* note 43.

⁴⁹ UNCCD, *supra* note 11, art. 1(f).

⁵⁰ Mortimore, *supra* note 45, at 10.

⁵¹ “It is dangerous, however, to assume that such sequences [of land degradation] are inevitable or cannot be reversed.” NELSON, *supra* note 44, at 3.

⁵² See, e.g., Klaus Kellner et al., The Use of Demonstration Sites for Restoring Degraded Arid and Semi-Arid Rangelands in South Africa, Presentation at Conference on Deserts and Desertification: Challenges and Opportunities (Nov. 7, 2006).

⁵³ NELSON, *supra* note 44, at 16.

ods of farming, types of livestock, and means of watering).

- (3) The “population” view emphasizes carrying capacity. Arid lands cannot accommodate the demands imposed by the increase in the human and animal populations.
- (4) The “climatic determinism” approach, arguing that natural events cause desertification, is the only non-anthropocentric approach of the four different outlooks. Proponents postulate, for example, that drought brought about by a long-term shift in rainfall can change the climate and in turn have the effect of desertification.

With the exception of “climatic determinism,” these views can readily accommodate a shift to a more top-down policy orientation. When structural factors are the source of a local problem, changes in societal norms and practices by definition will probably not come from within the society but are more likely to be expedited by an accepted outside arbiter imposing unambiguous rules. Human errors in the present context are largely driven by local circumstances and traditions that may need to be tempered by more objective and expert external intervention.⁵⁴ Finally, if desertification is essentially a problem of carrying capacity, then a central authority can most effectively ration common resources.⁵⁵

B. Impacts of Desertification

In 2002, the United Nations reported that “[o]ver 250 million people are directly affected by desertification, and about one billion people in over one hundred countries are at risk. These people include many of the world’s poorest, most marginalized and politically weak citizens.”⁵⁶ In Africa alone, 325 million people—almost half of the continent’s population—are threatened by desertification.⁵⁷ The U.N. Millennium Ecosystem Assessment (“MA”),⁵⁸ arguably the closest thing to a scientific consen-

⁵⁴ See, e.g., Adrian Carillo et al., *Arid Rangelands Desertification: Overgrazing, Conservation and Social Perceptions in Mexico*, Presentation at Conference on Deserts and Desertification: Challenges and Opportunities (Nov. 7, 2006) (noting that lack of internal grazing rules in Mexican communal property systems to promote shareholders or efficient animal production levels has led to the deterioration of natural resources).

⁵⁵ See *supra* note 30.

⁵⁶ UNCCD Secretariat, Explanatory Leaflet, *supra* note 43.

⁵⁷ U.N. Comm’n on Sustainable Dev., *Letter Dated 18 March 2002 from the Permanent Representative of Niger to the United Nations Addressed to the Chairman of the Commission Acting as the Preparatory Committee*, annex at 3, U.N. Doc. A/Conf.199/PC/16 (Apr. 15, 2002) [hereinafter U.N. Comm’n on Sustainable Dev., *Letter from Permanent Representative of Niger*].

⁵⁸ This assessment of the ecological state of the planet was the product of consultation by some 1,300 experts from 95 countries and was funded by the United Nations along with a variety of international agencies, including the World Bank. See generally Millennium Ecosystem Assessment, <http://www.maweb.org> (last visited Nov. 28, 2006) (on file with the

sus about desertification that has ever been achieved, estimated that of the two billion people who live in drylands, as many as six percent live in desertified areas, with much larger numbers under threat from further desertification.⁵⁹

The most immediate ramification of desertification is economic. Hama Arba Diallo, the UNCCD Executive Secretary, argued that “[d]esertification stands at the root of persistent poverty in Africa, Asia and Latin America. For millions of people around the globe, losing productive land means entering the vicious poverty cycle.”⁶⁰ According to the MA, desertification even has an impact on non-dryland areas: “The biophysical impacts [of desertification] include dust storms, downstream flooding, impairment of global carbon sequestration capacity, and regional and global climate change. The societal impacts relate notably to human migration and economic refugees, leading to deepening poverty and political instability.”⁶¹

The precise causal connection between desertification and poverty is still the subject of academic debate, but some association is clearly established. The poverty of local communities creates a pressure for inappropriate land use whereby short-term benefits are preferred over sustainable long-term use, which results in a shrinking resource base and exacerbation of destitution.⁶² Once the cycle has started, “poverty is both a cause and a consequence of land degradation, and the poor are both agents and victims of the process.”⁶³ By objective indicators, poverty levels are higher in dryland areas and those affected by desertification than in other regions. For example, the MA reports that “the average infant mortality rate (about 54 per 1000) for all dryland developing countries exceeds that for non-dryland countries (forests, mountains, islands, and coastal areas) by twenty-three percent or more. The difference is even starker—ten times higher—when compared with the average infant mortality rate in industrial countries.”⁶⁴

Harvard Environmental Law Review).

⁵⁹ MILLENNIUM ECOSYSTEM ASSESSMENT, DESERTIFICATION SYNTHESIS, *supra* note 6, at 1.

⁶⁰ Press Release, UNCCD, UN Desertification Talks Start in Bonn To Promote Stronger National Action (May 2, 2005), *available at* http://www.unccd.int/publicinfo/pressrel/showpressrel.php?pr=press02_05_05 (on file with the Harvard Environmental Law Review).

⁶¹ MILLENNIUM ECOSYSTEM ASSESSMENT, DESERTIFICATION SYNTHESIS, *supra* note 6, at 2.

⁶² Iles, *supra* note 39, at 208.

⁶³ U.N. Comm’n on Sustainable Dev., *Letter from Permanent Representative of Niger*, *supra* note 57, annex at 3.

⁶⁴ MILLENNIUM ECOSYSTEM ASSESSMENT, DESERTIFICATION SYNTHESIS, *supra* note 6, at 7.

III. THE UNCCD AND ITS BOTTOM-UP STRATEGY

The two elements that make the UNCCD unique among international environmental agreements are its focus on Africa and its commitment to a bottom-up orientation. The following section explores the antecedents and meaning of these two features.

A. *The UNCCD: An Environmental Agreement for Africa*

As the full title of the UNCCD suggests,⁶⁵ while desertification is a global phenomenon, from its inception the Convention has focused particularly on the African continent. This is hardly a coincidence; large swaths of the African continent have experienced acute land degradation during the past century, including a severe drought during the late 1960s in the Sahel region.⁶⁶ Due to the drought, Lake Chad shrunk to one-third its original size,⁶⁷ startling numbers of people were killed from famine, disease ran rampant, livestock was devastated, and poverty worsened.⁶⁸ This drought prompted the U.N. General Assembly to adopt a resolution for international action to combat desertification.⁶⁹

The U.N. Conference on Desertification (“UNCOD”) met in September 1977 in Nairobi, Kenya, representing the first major effort to address the problem of desertification on an international scale.⁷⁰ Out of the UNCOD, the U.N. adopted the Plan of Action to Combat Desertification (“PACD”), a non-binding instrument calling for full initiation of the Plan of Action by the year 2000.⁷¹ The PACD turned out to be a disappointment, and the UNCOD is generally regarded as an unsuccessful experiment.⁷² The reasons for the failure were many: insufficient funding was available for the anti-desertification projects under the PACD; only about one-fifth of the countries affected by desertification implemented national plans as the PACD recommended; and evaluation of PACD impacts was inadequate,

⁶⁵ The United Nations Convention To Combat Desertification in Those Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa.

⁶⁶ See William S. Ellis, *Africa's Sahel: The Stricken Land*, NAT'L GEOGRAPHIC, Aug. 1987, at 140, 153.

⁶⁷ William C. Burns, *The International Convention To Combat Desertification: Drawing a Line in the Sand?*, 16 MICH. J. INT'L L. 831, 849 (1995).

⁶⁸ Leslie C. Clark, Comment, *A Call to Restructure Existing International Environmental Law in Light of Africa's Renaissance: The United Nations Convention To Combat Desertification and the New Partnership for Africa's Development*, 27 SEATTLE U.L. REV. 525, 531–32 (2003).

⁶⁹ International Co-operation To Combat Desertification, G.A. Res. 3337 (XXIX), U.N. Doc. A/RES/3337(XXIX) (Dec. 17, 1974).

⁷⁰ Ninety-five nations, fifty U.N. offices, and sixty non-governmental organizations were represented at the UNCOD. Tal, *A Slow Crawl Forward*, *supra* note 28.

⁷¹ Clark, *supra* note 68, at 531; *Report of the United Nations Conference on Desertification*, U.N. Doc. A/CONF.74/36 (1977).

⁷² Clark, *supra* note 68, at 533–34.

contributing to difficulties in coordination and planning among countries.⁷³

Still, the UNCOD and the PACD succeeded in raising awareness about the severity of the desertification problem. This helped to put the issue on the table at the 1992 U.N. Conference on the Environment and Development (“UNCED”) in Rio de Janeiro, Brazil. There, participants grappled with and began to translate vague notions of “sustainable development” into a global strategy, ultimately transforming that concept into a centerpiece of international environmental policy and governance.⁷⁴

In the initial stages of negotiations, two UNCED instruments, the Rio Declaration and Agenda 21, set out principles for environmentally sustainable development but did not directly address the problem of desertification. Dissatisfied with the attention paid to that problem at the summit, the African nations sought a commitment for a new international initiative in the area of desertification.⁷⁵ Accordingly, the Rio Earth Summit ultimately included an entire section in Agenda 21 that called for examination of the desertification issue by the U.N. and an intergovernmental negotiating committee.⁷⁶ Later that year, the U.N. adopted a resolution that established the Intergovernmental Negotiating Committee for the Elaboration of an International Convention to Combat Desertification (“INCD”).⁷⁷

At the fifth INCD session in June 1994 in Paris,⁷⁸ the Committee approved the final text of the United Nations Convention To Combat Desertification.⁷⁹ The UNCCD was deposited for signature on October 14, 1994, requiring that fifty countries ratify the Convention before it could take effect. By international standards, this process did not take long. By September 17, 1996, fifty countries had ratified the Convention, and the UNCCD became effective ninety days later.⁸⁰ The underlying goal of the

⁷³ Burns, *supra* note 67, at 853–54.

⁷⁴ PATRICIA BIRNIE & ALAN BOYLE, *INTERNATIONAL LAW AND THE ENVIRONMENT* 43–47 (2002).

⁷⁵ Burns, *supra* note 67, at 854–55:

The proposal [for a desertification convention] was initially resisted by several developed nations for several reasons. The United States contended that it might be more judicious to address the root causes of desertification, such as forestry, climate change, and water resources in separate treaties. Additionally, several industrialized nations, led by Great Britain, resisted the proposal on financial grounds. Ultimately, the impasse was broken and Western governments tepidly backed the proposal.

⁷⁶ Marc Pallemmaerts, *International Environmental Law in the Age of Sustainable Development: A Critical Assessment of the UNCED Process*, 15 J. L. & COM. 623, 671 (1996).

⁷⁷ Burns, *supra* note 67, at 855.

⁷⁸ The first of five intergovernmental Negotiating Committee sessions was held in Nairobi, Kenya in May 1993. By the fourth meeting in Geneva, the Committee had reached a proposed text for a convention and drafts of regional implementation programs. Danish, *supra* note 39, at 149.

⁷⁹ Burns, *supra* note 67, at 856.

⁸⁰ UNCCD Secretariat, Status of Ratification, *supra* note 14.

UNCCD is to combat desertification and to mitigate the effects of drought, particularly in African countries.⁸¹ The text of the UNCCD recognizes that there are no quick fixes for preventing desertification,⁸² largely because of the diverse causes of desertification and their complex nature.⁸³ The Convention “seeks to impose binding obligations on state parties either to take measures to control and prevent the spread of desertification in their territories or to transfer appropriate technical support and funds to states that suffer from desertification.”⁸⁴ It recognizes that humans “are at the centre of concerns to combat desertification and mitigate the effects of drought.”⁸⁵

In the U.N. framework, the UNCCD does not stand alone, but fits in with other major goals of poverty eradication and global sustainable government.⁸⁶ The UNCCD is often cited as an important device for reaching the U.N. Millennium Development Goals (“MDGs”), which constitute a comprehensive strategy put forward for combating global poverty.⁸⁷ Specific targets are set for providing sanitation and safe drinking water as part of the overall goal of ensuring environmental stability.⁸⁸ While none of these targets directly address desertification and its effects, if countries are able to significantly curb desertification and restore degraded lands it will have a dramatic effect on local poverty cycles.⁸⁹

B. UNCCD's Bottom-Up Approach

From the outset of the UNCCD's negotiations, both developing and developed countries embraced a view that prioritized the involvement of local populations as a prerequisite to launching activities. The vernacular

⁸¹ UNCCD, *supra* note 11, art. 2(1).

⁸² For example, the Convention acknowledges both the impact international trade can have on the environment and that sustainable economic growth is a priority for affected developing countries. UNCCD, *supra* note 11, prologue.

⁸³ UNCCD Secretariat, Explanatory Leaflet, *supra* note 43.

⁸⁴ Iles, *supra* note 39, at 207.

⁸⁵ UNCCD, *supra* note 11, prologue.

⁸⁶ For instance, beginning in 1993, the U.N. General Assembly declared October 17 the “International Day to Eradicate Poverty.” The years 1997–2006 were declared “the first United Nations Decade for the Eradication of Poverty.” See U.N. Department of Economic and Social Affairs, First United Nations Decade for the Eradication of Poverty 1997–2006, <http://www.un.org/esa/socdev/poverty/poverty.htm> (last visited Oct. 31, 2006) (on file with the Harvard Environmental Law Review).

⁸⁷ Millennium Project, About the Goals, <http://www.unmillenniumproject.org/goals/index.htm> (last visited Oct. 18, 2006) (on file with the Harvard Environmental Law Review).

⁸⁸ *Id.*

⁸⁹ Dr. Zafar Adeel, a co-author of the Millennium Ecosystems Assessment, stated that “[t]he Millennium Development Goals, a suite of objectives globally agreed by the world leaders in 2000 to be met by 2015, cannot be met without addressing the problem of desertification effectively.” Many of 2 Billion Dryland Dwellers at Risk as Land Degrades, http://www.terraily.com/reports/Many_Of_2_Billion_Dryland_Dwellers_At_Risk_As_Land_Degrades.html (last visited Oct. 18, 2006) (on file with the Harvard Environmental Law Review).

term for this approach was “bottom-up,” although that particular phrase does not appear in the UNCCD. Land degradation was thought to be fundamentally a diffuse problem whose solution required “ownership” of sustainable land management practices by local residents. This bottom-up approach was further encouraged by the general atmosphere coming out of the Rio UNCED summit, which had been fueled by active and productive participation by civil society. The general perception among negotiators was that community-based organizations must be involved in the UNCCD’s implementation or it would not succeed. Additionally, while there was never explicit mention of corrupt governmental regimes, an additional subtext was the interest of donor countries in bypassing potentially untrustworthy African governments and going directly to the field.⁹⁰

The specific provisions mandating bottom-up policies in the UNCCD itself are fairly minor. There are two sentences that direct NAPs to:

(e) promote policies and strengthen institutional frameworks which develop cooperation and coordination, in a spirit of partnership, between the donor community, governments at all levels, local populations and community groups, and facilitate access by local populations to appropriate information and technology; [and]

(f) provide for effective participation at the local, national and regional levels of non-governmental organizations and local populations, both women and men, particularly resource users, including farmers and pastoralists and their representative organizations, in policy planning, decision-making, and implementation⁹¹

However, an implicit tradition of relying on a bottom-up approach was already clearly entrenched and drove subsequent implementation activities around the world. A guide to the Convention published by the UNCCD Secretariat explains this perspective:

The people of developing country drylands are their greatest resources. They know their land better than anyone. They have just as much skill in making a living off it as the American grain producer or the rice-grower of China. In some ways their skills may be greater, for they have to work in far more difficult conditions, with much more fragile soils, a much harsher climate, and far fewer resources The convention breaks new ground by enshrining a bottom-up approach in international law. It re-

⁹⁰ Telephone Interview with Pamela Chasek, Assoc. Professor of Gov’t, Manhattan College (Oct. 12, 2006).

⁹¹ UNCCD, *supra* note 11, art. 10(e), (f).

peatedly emphasizes the importance of full participation, and specifically underlines “the important role played by women.”⁹²

While the original motivation for the bottom-up approach was largely pragmatic, a justifying ideology quickly took hold. Political scientist Minna Jokela offers a fairly vague, theoretical “democratic” model to justify UNCCD’s bottom-up processes:

[B]y prioritizing the bottom-up process [the UNCCD] is able to capture the self-organizing dynamics This means searching for order in disorder, for coherence in contradiction and for continuity in change Control mechanisms often emerge out of path-dependent conditions and then pass through lengthy processes of either evolution and maturation or decline and demise. In order to acquire legitimacy, successful mechanisms of government are more likely to evolve out of bottom-up than top-down processes.⁹³

Such a sanguine vision of spontaneously self-organizing local efforts, unfortunately, has little basis in empirical research. Indeed, the disorder, incoherence, and lack of continuity painted as virtues in Jokela’s theory can have disastrous implications when they fail to prevent irreversible environmental damage.

C. Beyond Bottom-Up

There is no doubting the theoretical virtues of programs that seek consensus and put their faith in the wisdom, indigenous knowledge, and commitment of communities affected by desertification. Unfortunately, when actual performance (land restoration and prevention of degradation) is used as the evaluative criterion, it is not always clear that a bottom-up ideology can be translated into a successful operational strategy.

For example, in Kenya, preventing desertification appears to be of utmost importance to the government, as millions of its citizens still periodically face famine despite the country’s general economic progress. But this is yet this is not yet reflected in aggressive and effective public

⁹² GEOFFREY LEAN, UNCCD SECRETARIAT, *DOWN TO EARTH: A SIMPLIFIED GUIDE TO THE CONVENTION TO COMBAT DESERTIFICATION, WHY IT IS NECESSARY AND WHAT IS IMPORTANT AND DIFFERENT ABOUT IT* 19 (1995), available at http://www.unccd.int/public_info/downtoearth/downtoearth-eng.pdf. An underlying assumption of the Convention is that women are underrepresented at the national level, and thus their empowerment should be a specific goal of bottom-up strategies. *Id.*

⁹³ Minna Jokela, *Desertification as a Global Problem* 7, presented at the Open Meeting of the Global Environmental Change Research Community, Rio de Janeiro, Brazil (Oct. 6–8, 2001), available at http://sedac.ciesin.org/openmeeting/downloads/1005753109_presentation_rio.wpd.

policies. The Kenyan Ministry of Agriculture has opted for a bottom-up approach to addressing its problem of over-grazing, but results have been unimpressive. A National Agriculture and Livestock Extension Program (“NALEP”) was established to improve animal husbandry and productivity, using “a range of simple on-farm techniques to control soil loss, improve rainwater utilization for crop and livestock production and to enhance soil fertility.”⁹⁴ The program, following the recommendations of the UNCCD, operates through community involvement. Farmers receive education and technical assistance from the government and NGOs, and are ultimately responsible for their land, including conservation and high levels of production. Kenya’s national report explains: “Governments and collaborating institutions create the necessary economic and operational environment to encourage individual farmers to invest in long-term improvements of the land.”⁹⁵

It is not at all clear that this approach has been effective in changing pastoral practices and reducing the cumulative pressures produced by the livestock of a growing population. Sustainability expert Lester Brown writes that as of 2003, “Kenya is being squeezed by spreading deserts and desertification affects up to a third of the country’s 32 million people. As elsewhere, the unholy triumvirate of overgrazing, overplowing, and overcutting of trees are all contributing to the loss of productive land.”⁹⁶

The situation is similar in India, home to one of the largest livestock populations in the world; with only 0.5% of the world’s grazing area, it has 18% of the world’s cattle population.⁹⁷ However, India’s parliament has not yet officially enacted a national policy regarding land use or grazing issues. Since the mid-1980s, the government has followed a bottom-up approach in the form of a National Land Use Policy Outline, followed by a Draft Grazing and Livestock Management Policy in 1994.⁹⁸ Neither has been memorialized in legislation. The declared purpose of the National Land Use Policy Outline is to increase productivity while preventing further land deterioration and rehabilitating previously degraded land. By the government’s own admission, the policy “did not make the de-

⁹⁴ REPUBLIC OF KENYA, MINISTRY OF ENV’T & NATURAL RES., THIRD NATIONAL REPORT ON THE IMPLEMENTATION OF THE UNITED NATIONS CONVENTION TO COMBAT DESERTIFICATION (UNCCD) § 5.2.1.8 (2004) [hereinafter KENYA’S THIRD NATIONAL REPORT], available at <http://www.unccd.int/cop/reports/africa/national/2004/kenya-eng.pdf>.

⁹⁵ *Id.*

⁹⁶ LESTER BROWN, PLAN B: RESCUING A PLANET UNDER STRESS AND A CIVILIZATION IN TROUBLE 47 (2003).

⁹⁷ I INDIA, MINISTRY OF ENV’T. & FORESTS, NATIONAL ACTION PROGRAMME TO COMBAT DESERTIFICATION 18, 24 (Sept. 2001) [hereinafter INDIA’S NATIONAL ACTION PROGRAM], available at <http://www.unccd.int>.

⁹⁸ INDIA, MINISTRY OF ENV’T. & FORESTS, INDIA: NATIONAL REPORT ON IMPLEMENTATION OF THE UNITED NATIONS CONVENTION TO COMBAT DESERTIFICATION 15 (Apr. 2000) [hereinafter INDIA’S FIRST NATIONAL REPORT], available at <http://www.unccd.int/cop/reports/asia/national/2000/india-eng.pdf>.

sired impact, mainly due to the fragmented handling of different components of agriculture like land and soil.”⁹⁹

Examples abound of other ineffective bottom-up programs in affected countries. This is not to argue that there have not been bottom-up initiatives that have worked, given proper funding and assistance.¹⁰⁰ Nor is it to imply that a return to a patronizing top-down technocracy is needed. Engaging local populations, to the extent possible, is critical for any centralized initiative regarding land use. It often appears, however, that in their well-meaning zeal to embrace a non-confrontational, democratic strategy to combat desertification, international and local initiatives have been lacking a critical component.

The presence of a legal infrastructure upon which to base NAPs is as much a part of the UNCCD normative framework as allusions to bottom-up coordination. And when centralized, legislative provisions are combined with a genuine commitment to community involvement and consultation, the resulting combination of carrot and stick may well be synergistic. International donors, who face political pressures at home to increase the effectiveness of their foreign aid, will undoubtedly be better able to justify their investment in poverty reduction and anti-desertification programs when their money goes to well-managed, top-down initiatives in affected nations. Additionally, legislation that sends a clear message about societal commitment in dealing with desertification educates the general public about the severity and urgency of the problem.

IV. TOP-DOWN: NATIONS' LEGISLATIVE STRATEGIES AND POLICIES

A. *Desertification Legislation in the Framework of the UNCCD*

The legislative expectations of the UNCCD are relatively modest. Parties are requested to strengthen existing relevant legislation and to enact new statutes where none currently exist.¹⁰¹ The specific provisions in the Convention that address the National Action Programs, the UNCCD's key operational mechanism, are silent with regard to the role of legislative efforts.¹⁰² Instead, the Convention emphasizes the need to “identify the factors contributing to desertification and practical measures necessary to combat [it],”¹⁰³ “formulate national policies for sustainable development,”¹⁰⁴ “incorporate long-term strategies to combat desertification,”¹⁰⁵ “promote

⁹⁹ *Id.* at 15.

¹⁰⁰ *See, e.g.*, Mark Winslow, Stimulating Dryland Soil Fertility Improvement by Small-Scale Farmers in Sub-Saharan Africa Through “Microdosing,” Presentation at Conference on Deserts and Desertification: Challenges and Opportunities (Nov. 6, 2006).

¹⁰¹ UNCCD, *supra* note 11, art. 5(e).

¹⁰² *Id.* arts. 9, 10.

¹⁰³ *Id.* art. 10(1).

¹⁰⁴ *Id.* art. 9(1).

¹⁰⁵ *Id.* art. 10(2)(a).

policies and strengthen institutional frameworks,”¹⁰⁶ and “provide for effective participation at the local, national and regional levels of non-government organizations and local populations.”¹⁰⁷ There are no firm guidelines to help nations implement environmental or anti-desertification specific legislation. Legislation or other top-down regulatory interventions are only mentioned in a few places, mainly referring to nations’ existing legislation and/or policies.¹⁰⁸ Nowhere could an affected party that does not have strong environmental or anti-desertification statutory infrastructure gain advice about the substance or form of ratifying laws. Furthermore, the Secretariat has not filled this gap with reports or compendiums of model legal instruments. Unlike other international environmental conventions, where clear expectations are set forward for laws that ban, limit, or regulate,¹⁰⁹ the UNCCD remains amorphous and unfocused in this regard.

There have been scattered attempts to address this problem. At the second Conference of Parties (COP2) in 1998, the UNCCD Parties for the first time gave recognition to parliaments and Parliamentary Round Tables came into existence with the support of the Inter-Parliamentary Union (“IPU”) and the UNCCD Secretariat.¹¹⁰ The Round Tables function as “a platform for exchange of views and interaction among parliamentarians on desertification issues.”¹¹¹ The priorities of the Parliamentary Round Tables include developing public policies that support conservation and sustainable land use activities, strengthening environmental legislation, and promoting initiatives to build institutional capacity.¹¹² However, subsequent meetings of the group have lacked a clear orientation toward developing legislative initiatives.¹¹³ Furthermore, a draft summary of the Round Tables’

¹⁰⁶ *Id.* art. 10(2)(e).

¹⁰⁷ UNCCD, *supra* note 11, art. 10(2)(f).

¹⁰⁸ See *id.* arts. 16(g), 17(c), 18; *id.* annex III, art. 10(1)(f) regarding respectively: Parties’ provision of advice to other nations on review of national legislation; the exchange of local and traditional knowledge subject to Parties’ national legislation; research and development of traditional and local knowledge and practices subject to Parties’ national legislation; and promotion, financing, and facilitation of technology in accordance with Parties’ national legislation.

¹⁰⁹ See, e.g., Barcelona Convention for the Protection of the Mediterranean Sea Against Pollution, Feb. 16, 1976, 15 I.L.M. 290; International Convention for the Regulation of Whaling, Dec. 2, 1946, art. V, 62 Stat. 1716, 1718, 161 U.N.T.S. 72; Convention on International Trade in Endangered Species of Wild Flora and Fauna, Mar. 3, 1973, 27 U.S.T. 1087, 993 U.N.T.S. 243.

¹¹⁰ The IPU is the international organization of Parliaments of sovereign states. See Inter-Parliamentary Union, What Is the IPU?, <http://www.ipu.org> (last visited Oct. 31, 2006) (on file with the Harvard Environmental Law Review).

¹¹¹ UWE HOLTZ, IMPORTANT OUTCOMES OF THE PREVIOUS FIVE ROUND TABLES OF MEMBERS OF PARLIAMENT ON THE UNITED NATIONS CONVENTION TO COMBAT DESERTIFICATION 20 (2005), available at <http://www.unccd.int/cop/cop7/docs/report5parl-eng.pdf>.

¹¹² These goals were outlined in the declaration adopted at the UNCCD’s First Parliamentary Round Table at Dakar in 1998. First Round Table of Parliamentarians, Declaration by Members of Parliaments Regarding the Process of Implementation of the United Nations Convention To Combat Desertification (Dec. 7, 1998), available at <http://www.unccd.int>.

¹¹³ See HOLTZ, *supra* note 111, at 31–53 (reprinting declarations of the Round Tables). The 2000 Parliamentary Round Table focused on domestic funding and enhancing techni-

results offers little insight for legislators seeking statutory or regulatory solutions to address the many drivers of desertification.¹¹⁴

Notwithstanding these parliamentary initiatives, relatively few nations have enacted desertification-specific legislation and binding centralized policies. On the other hand, many parties to the Convention have general environmental legislation involving protection of natural resources or ecological integrity that may contribute to combating desertification. Part III.C explores some examples.

B. Influence: The Impact of the UNCCD on National Institutions and Legislation

As mentioned, the UNCCD anticipates the preparation and execution of Action Programs that detail national or regional strategies to combat desertification. While not required as part of the implementation of NAPs, several countries have enacted specific and centralized legislation to combat desertification; other formal governmental responses have been limited to adopting general policies that indirectly contribute to anti-desertification efforts. Typically, however, affected countries have taken the view that strategies, guidelines, and goal-oriented policies are of greater practical importance than binding environmental legislation. Often countries rely on such measures to the exclusion of national legislation.¹¹⁵

cal and financial assistance to countries most affected by desertification. *Id.* at 16. The 2001 Round Table focused on addressing connections between poverty and sustainable development. *Id.* at 39–43. At the 2003 Havana conference, the three main subjects were parliamentarians' role in promoting effective implementation of desertification and poverty eradication policies; support for parliamentarians at the national level to ensure adoption of national legislation within the framework of the MDG goals; and the importance of parliamentarians seeking full support of the GEF to implement the UNCCD's goals. In addition, the declaration of the fifth Round Table proposes a Parliamentary Network on the UNCCD ("PNoUNCCD"), under the IPU, with the goal of "increasing parliamentary involvement and efficiency in the fields of combating desertification, soil erosion and land degradation, [of] pooling information and [of] ensuring greater parliamentary input into international negotiations and organizations. . . ." Fifth Round Table of Members of Parliament, Declaration Adopted by Members of Parliament (Sept. 5, 2003), available at <http://www.unccd.int/cop/cop6/roundtable/declaration-eng.pdf>. Unfortunately, it is hard to identify meaningful follow-up to such discussions.

¹¹⁴ See HOLTZ, *supra* note 111.

¹¹⁵ Kenya, for example, is a country whose primary emphasis in combating desertification has been on generalized local policy frameworks and sectoral instruments rather than targeted legislation. See KENYA, NAT'L ENVTL. SECRETARIAT, NATIONAL ACTION PROGRAM: A FRAMEWORK FOR COMBATING DESERTIFICATION IN KENYA IN THE CONTEXT OF UNCCD ¶ 2.2 (Apr. 2002) [hereinafter KENYA'S NATIONAL ACTION PROGRAM], available at <http://www.unccd.int>. Kenya, under its Environmental Management and Coordination Act ("EMCA") of 1999, established a National Environment Management Authority ("NEMA") that was given a mandate to coordinate and supervise all matters related to the environment—including desertification. KENYA'S THIRD NATIONAL REPORT, *supra* note 94, § 2.4. While NEMA's establishment was a good beginning, it does not wield sufficient force to ensure compliance. As Kenya's 2004 National Report acknowledges: "There is need for awareness creation among the local community for improved compliance to EMCA, 1999 . . ." *Id.* While building policy, legal and institutional frameworks, nowhere does it men-

At the other extreme, many countries have upgraded their NAP into binding, formal legislation. China is an example of a nation that has chosen a top-down, prescriptive approach, taking the operational aspects of its NAP and transforming them into an expansive and ambitious anti-desertification law.¹¹⁶ This was possible because of the detailed format of China's NAP. Written in 1996, China's NAP is unique both in its specificity and its level of ambition, contrasting dramatically with many NAPs that are vague or lacking in specific strategies and implementation methods.¹¹⁷ The Chinese program establishes three strategic phases spanning 1996–2000, 2001–2010, and 2011–2050. The first two phases have specific targets for the number of hectares of land to be rehabilitated or controlled. China's NAP has established a host of clearly defined projects focused on the proximate causes of desertification as well as specific quantitative objectives for restoration.¹¹⁸ While projects take place at the local level, the overall vision and targets come down from the top.

China is not the only country that has seen fit to enact its NAP through legislation. Several African countries have adopted legislation to implement their NAPs or otherwise establish procedures to combat desertification.¹¹⁹ South and Central American countries have passed similar laws.¹²⁰

But the vast majority of affected countries have over the years adopted top-down legislative measures that are not formally related to the imple-

tion more specific legislation.

¹¹⁶ The Law of Desertification Prevention and Control (promulgated by the Standing Comm. Nat'l People's Cong., Aug. 31, 2001, effective Jan. 1, 2002) (P.R.C.) (translation on file with the Harvard Environmental Law Review).

¹¹⁷ See, e.g., SYRIAN ARAB REPUBLIC, MINISTRY OF STATE FOR ENVTL. AFFAIRS, NATIONAL ACTION PLAN TO COMBAT DESERTIFICATION IN THE SYRIAN ARAB REPUBLIC (2002), available at <http://www.unccd.int/actionprogrammes/asia/national/2002/syria-eng.pdf>.

¹¹⁸ The NAP projects that 3.177 million hectares of lands affected by wind erosion and 4.3 million hectares affected by water erosion will be rehabilitated; 12.15 million hectares of degraded land will be revegetated; 2 million hectares of salinized land will be treated; and 6.905 million hectares of artificial plantation will be established. CHINA, NATIONAL ACTION PROGRAM TO COMBAT DESERTIFICATION (ABSTRACT), § 2.1.1 (1996) [hereinafter CHINA, NATIONAL ACTION PROGRAM], available at <http://www.unccd.int/actionprogrammes/asia/national/2000/china-eng.pdf>.

¹¹⁹ See, e.g., Décret No. 2001-0108/PR/MAEM of June 6, 2001, Portant approbation du Programme d'Action National pour la lutte contre la désertification ("PAN") (Djib.) (on file with the Harvard Environmental Law Review) (approving Djibouti's NAP); Arrêté ministériel No. 6816 M.ENV-DC-PAGF2 of June 23, 2000, Portant création et fonctionnement du Projet agroforestier de Lutte contre la Désertification (Sen.) (on file with the Harvard Environmental Law Review) (creating an agroforestry project to fight desertification in Senegal); Décret no. 2000-130/PRN/ME/LCD of Apr. 21, 2000, Déterminant les attributions du Ministre de l'environnement et de la lutte contre la désertification, Journal officiel de la République du Niger no. 15, Aug. 1, 2000, 482 (Niger) (on file with the Harvard Environmental Law Review) (giving authority to Niger's Minister of Environment in the fight against desertification).

¹²⁰ Resolución No. 648 of Nov. 12, 2004, Gaceta Oficial, Nov. 30, 2004, 44 (Pan.) (on file with the Harvard Environmental Law Review) (adopting a regulation declaring Panama's intent to prevent or mitigate the effects of desertification pursuant to the UNCCD); Resolución No. 302/04 of Apr. 14, 2004 (Arg.) (on file with the Harvard Environmental Law Review) (adopting a law similar to that of Panama).

mentation of the UNCCD in general or their National Action Programs in particular, even though in practice these measures may be extremely relevant to efforts to combat desertification. For example, in 2003 Brazil enacted legislation to establish the Program for Combating Drought in order to research local water supplies and eliminate the water deficit.¹²¹ Chile has passed measures to rehabilitate degraded land.¹²² While these statutes may not have been direct responses to the UNCCD, all can contribute greatly to national and regional efforts to mitigate direct and indirect causes of deforestation and to restore degraded drylands.

A key objective of the UNCCD is to ensure that all affected countries have a lead agency that has the power to coordinate domestic desertification policy and to marshal the requisite forces, budget, and activities.¹²³ In many legal systems, such process requires statutory authorization. Some countries have granted oversight status to an existing body, such as China's Forestry Administration, which is in charge of monitoring the status of desertified land and cooperates with other governmental bodies with authority over relevant subject areas.¹²⁴ Alternatively, new institutions can be formed.¹²⁵ Frequently, nations create centers of research that de facto serve to coordinate desertification efforts.¹²⁶

Institution-building often begins with information collection and the establishment of a clear database mapping out problems and land vulnerabilities. Even this preliminary stage often requires legislation.¹²⁷ Once insti-

¹²¹ Lei No. 10.638 of Jan. 6, 2003, D.O., July 1, 2003 (Braz.) (on file with the Harvard Environmental Law Review).

¹²² Decreto No. 113 of Mar. 28, 2001, D.O., Aug. 5, 2001 (Chile) (on file with the Harvard Environmental Law Review); Decreto No. 600 of Feb. 16, 2001, D.O. de 16.02.2001 (Chile) (on file with the Harvard Environmental Law Review).

¹²³ A list of the individual national "focal point" institutions responsible for reporting on UNCCD implementation and coordinating with the Secretariat can be found on the UNCCD website. In addition, the Convention's Regional Annexes call for the establishment of sub-regional focal points in Africa and Latin America. UNCCD, *supra* note 11, annex I, art 10(1)(a); *id.* annex III, art. 7(1)(a).

¹²⁴ The Law of Desertification Prevention and Control (promulgated by the Standing Comm. Nat'l People's Cong., Aug. 31, 2001, effective Jan. 1, 2002), arts. 14, 15 (P.R.C.) (translation on file with the Harvard Environmental Law Review).

¹²⁵ For example, in 2005 Tunisia adopted a regulation creating a national council to fight against desertification. Décret No. 2005-1747 of June 13, 2005, Portant création d'U.N. conseil national de lutte contre la désertification et fixant ses attributions, sa composition et son fonctionnement, Journal Officiel de la République Tunisienne, June 17, 2005, 1360 (Tunis.) (on file with the Harvard Environmental Law Review).

¹²⁶ Israel, for example, created the Blaustein Institutes for Desert Research ("BIDR") in 1972. BIDR, <http://bidr.bgu.ac.il/bidr> (last visited Nov. 28, 2006) (on file with the Harvard Environmental Law Review).

¹²⁷ Costa Rica, for example, has enacted a law to create a commission to assess degraded lands. Decreto 27.258-MINAE, May 20, 1998, Crea la Comisión Asesora sobre Degradación de Tierras [Creating the Advisory Commission on the Degradation of Land], La Gaceta: Diálogo Oficial [D.O.], Sept. 11, 1998 (Costa Rica) (on file with the Harvard Environmental Law Review); Decreto 29.279-MINAE-MAG, Nov. 1, 2000, D.O., Feb. 12, 2001 (Costa Rica) (on file with the Harvard Environmental Law Review). For other examples, see Medida Provisória 151, Dec. 18, 2003 (Braz.) (on file with the Harvard Environmental Law Review) (creating institute to promote scientific and technological development of

tuted, these entities presumably will be able to provide an empirical basis for their countries to set goals, monitor progress, and direct their operational activities in the future.

Other countries have opted to forego a centralized, institutional approach. While this may be a sign of the low priority afforded the issue, it also may be a function of a country's size or governmental system. Should countries choose to adopt a more top-down approach, a centralized coordinating agency would undoubtedly help expedite geographic consistency and policy diffusion.

With its federal system of government, Australia is one example of a UNCCD party that has not established a centralized body to coordinate policy. Rather, it is the State and Territory governments that are responsible for implementing environmental legislation and policies. In 1992, these entities established an Intergovernmental Agreement on the Environment to coordinate environmental management by the federal, state, and local governmental bodies.¹²⁸

Although Australia has not drafted a National Action Program, its States have implemented a substantial body of legislation, policies, and strategies at all government levels for sustainable natural resource management.¹²⁹ The governmental bodies have joined forces to implement two federal plans addressing natural resource degradation: the Natural Heritage Trust, and the National Action Plan for Salinity and Water Quality.¹³⁰

This diffuse institutional strategy does not indicate national indifference, at least legislatively. Australia's National Report indicates that around 300 individual Acts concerning land management and environmental legislation have been enacted in each State and Territory, and "[a]ll jurisdic-

Brazil's semiarid areas); CHINA, NATIONAL ACTION PROGRAM, *supra* note 118, §§ 3.5–7 (creating several research centers).

¹²⁸ COMMONWEALTH INTERGOVERNMENTAL WORKING GROUP FOR THE UNCCD, AUSTRALIAN ACTIONS TO COMBAT DESERTIFICATION AND LAND DEGRADATION 5 (2002) [hereinafter AUSTRALIA'S NATIONAL REPORT], available at <http://www.unccd.int/cop/reports/asia/national/2002/australia-eng.pdf>.

¹²⁹ While the federal government is responsible for national environmental issues and implementation of international treaties, the state and territory governments are responsible for land management, water use, and environmental protection. Jim Allan, Soil Conservation Programs in Australia, Presentation at Conference on Deserts and Desertification: Challenges and Opportunities (Nov. 7, 2006).

¹³⁰ It does not appear that any anti-desertification legislation has directly evolved out of these two plans; however, the programs direct the governmental sectors to "invest in priority actions under agreed natural resource management plans developed for Australia's catchments and regions." *Id.* at 6 (sidebar). In practice, the programs constitute joint efforts between central governments and local communities. For example, the programs help the communities to establish long-term goals for the next ten to twenty years and within those, short-term targets that are achievable and focus on management and capacity-building. The communities are not expected to reach these goals on their own, so the State and Territory governments are mandated to invest in and to help implement the plans. The government's investment should support the community's "development of skills, knowledge and [necessary] information," and the long-term goals of reversing land degradation. *Id.* This bottom-up partnership fits into the general model presented by the UNCCD.

tions have legislation covering aspects of natural resource management, including land use planning, water quality and management, environmental protection, soil conservation and biodiversity conservation.”¹³¹

C. Legislative Format: Comprehensive Versus Driver-Specific Laws To Combat Desertification

A threshold question regarding top-down legislation and desertification involves the form that laws should take. Just as environmental laws tend to be divided according to environmental medium, statutes addressing symptoms of desertification have traditionally been narrow in their orientation, focusing on a particular driver of desertification rather than a holistic pathology.¹³²

Given the many causes of desertification, ensuring the existence of a broad toolbox of legal instruments will presumably enable policy makers to implement a more thorough strategy to combat land degradation. A single integrated statute is surely preferable for ensuring consistent and coordinated public policies. Yet frequently inter-ministerial rivalries or the political difficulties in parliaments regarding contentious issues like land use make the promotion of such a law difficult. In such cases, surely “perfection is the enemy of the good,” and well-crafted, enforceable driver-specific legislation should be considered a positive legislative outcome.

Indeed, from the advent of the twentieth century, Western nations and colonial governments have enacted such rules in various forms to control grazing, encourage afforestation, reduce agricultural erosion, promote sustainable water management, and more. For many developing nations, there is nothing new about laws that thus serve to combat desertification.¹³³

Israel, for example, has been relatively aggressive in regulating land use activities to prevent desertification, but does so through a labyrinthine series of subject-specific statutes and secondary regulations. Strategies to combat desertification and erosion rely on statutes from the colonial period of the British Mandatory Government, which ruled between 1918 and 1948. The Sand Erosion Ordinance¹³⁴ and the Forestry Ordinance¹³⁵ were enacted within a few years of the beginning of British rule in Israel in response to the pervasive overgrazing and deforestation that had taken place.

¹³¹ *Id.*

¹³² Whether or not there is anything inherently inefficient about this dispersed legal approach is a subject of debate. For some time, many scholars have argued for integrated environmental regulation based on a comprehensive statute as more coherent for government and ultimately easier for the regulated community. Advocates of a more holistic approach to desertification legislation surely have a sound theoretical basis for their position.

¹³³ For example, many of Tanzania's fifty environmental laws date from the colonial period. Andreen, *supra* note 32, at 5.

¹³⁴ Sand Drift Ordinance, 2 LAWS OF PALESTINE 686 (Moses Doukhan ed., 1922).

¹³⁵ *Id.*

These laws are still in force today and have only been modified by modest amendments over the years.

Kenya's case, on the other hand, suggests that a colonial legacy of legislation to address desertification is no guarantee of efficacious UNCCD implementation today. Efforts to curb desertification in Kenya began in earnest during the 1940s, when the government created myriad policy and legal instruments to address what was perceived as a major environmental problem.¹³⁶ Since that time, however, implementation of these laws has not evolved. In retrospect, many commentators argue that early efforts were only moderately successful because the affected communities were inadequately involved, initiatives were poorly monitored, and there was insufficient follow-up.¹³⁷ But a democratically elected local regime has not improved the implementation of the conservation strategies needed.

A comparative international review of legislation that addresses desertification problems suggests that while a rich variety of relevant statutes have been adopted and are presently in force, many of these were not specifically designed to tackle the issue of desertification, much less expedite implementation of the UNCCD. Indeed, the survey seems to reflect a relatively low profile for the UNCCD among lawmakers. This seems true even in jurisdictions where the UNCCD enjoys prominent stature within the national government.¹³⁸

This ostensibly indifferent attitude toward the Convention can be found amongst the legal codes in the newest of countries as well. Uzbekistan, for example, while an enthusiastic party to the UNCCD,¹³⁹ has yet to

¹³⁶ See MORTIMORE, *supra* note 1, at 160–63 (describing the early soil conservation program in Kenya's Machakos district).

¹³⁷ Monica Mwamgi & Zein Nsheiwat, Review of the Implementation of Kenya's National Action Program (Jan. 2006) (unpublished internal academic report, Ben Gurion University, Isr., on file with author).

¹³⁸ Kenya, for instance, is home to the United Nations Environment Program and hosted the 1978 United Nations Conference on Desertification (UNCOD) as well as the recent Conference of the Parties (COP7) in October 2005. The country's Third National Report on Implementation of the UNCCD lists several pieces of legislation and other initiatives that have been enacted or implemented since Kenya ratified the UNCCD. See KENYA'S THIRD NATIONAL REPORT, *supra* note 94, at 24. However, of these, only Kenya's 2002 Water Act has language that relates directly to the UNCCD. *Id.* at 20. Recently, Kenya seems to be seeking a broader legislative orientation after years of working with subject-specific laws and regulations. In 1999, two years after Kenya ratified the UNCCD, the Environmental Management and Co-Ordination Act was passed, with the goal of harmonizing a variety of sectoral environmental laws, including those which can be employed to combat desertification. See Law No. 8 of 1999, Jan. 14, 2000, The Environmental Management and Co-Ordination Act (Kenya) (on file with the Harvard Environmental Law Review).

¹³⁹ The Republic of Uzbekistan ratified the UNCCD in August 1995, only five years after declaring its independence from the former Soviet Union. It was the first of the Asian states to ratify the UNCCD. MAIN ADMIN. ON HYDROMETEOROLOGY (GLAVGIDROMET) AT THE CABINET OF MINISTERS OF THE REPUBLIC OF UZBEKISTAN, NATIONAL REPORT OF THE REPUBLIC OF UZBEKISTAN ON THE IMPLEMENTATION TO COMBAT DESERTIFICATION (CCD) [sic] 4 (2002), available at <http://www.unccd.int/cop/reports/asia/national/2002/uzbekistan-eng.pdf> [hereinafter UZBEKISTAN NATIONAL REPORT].

enact legislation that is explicitly anti-desertification in orientation or that declares itself a direct response to its ratification of the UNCCD.¹⁴⁰

Australia, located on the driest of the world's continents, and with a long history of soil degradation, has several disparate laws that address numerous aspects of desertification dynamics.¹⁴¹ For example, Parts 3 and 4 of Australia's Coastal Protection and Management Act of 1995 are designed to manage erosion-prone areas of the coast.¹⁴² The Minister may declare an area a coastal management "control district"¹⁴³ and the chief executive may give a "coastal protection notice" in order to protect the vulnerable land and/or to stop an activity that "is likely to have a significant effect on coastal management; or cause wind erosion."¹⁴⁴ In addition, these notices could require people to build, plant, or preserve vegetation for erosion prevention, to restore the land, or to remove stock from the land.¹⁴⁵ Victoria's Land Conservation (Vehicle Control) Act of 1972 aims to prevent soil erosion and other damages to land from vehicles, problems that are most salient in its ubiquitous drylands.¹⁴⁶ Australia also has long had federal statutes regarding soil and land conservation on its books.¹⁴⁷

¹⁴⁰ In its National Report of 2002, Uzbekistan claims that "[i]mprovement of the legislative framework of environmental protection and desertification control is among [its] top priority tasks." *Id.* at 26. While it has integrated environmental protection provisions into its constitution and passed several statutes in areas such as water regulation and land management and protection, thus far no statutes directly linked to the UNCCD have been initiated. *Id.* at 31.

¹⁴¹ Australia became a party to the UNCCD in September 2000 as a developed, affected party to the Convention. The major problems facing Australia's agricultural land are soil erosion, loss of vegetation covering, and excess water irrigation. The principle causes of desertification in Australia include "over-grazing by introduced and native herbivores (total grazing pressure), mechanical removal of vegetation cover, woody weed invasion and land management without regard to climate variability. The effects of these processes include increased soil erosion, soil degradation, altered stream flow regimes, increased soil salinity and loss of biodiversity." AUSTRALIA'S NATIONAL REPORT, *supra* note 128, at 4.

¹⁴² See Act No. 41 of 1995, Coastal Protection and Management Act 1995, *reprinted* Mar. 30, 2006 (Queensl.) (on file with the Harvard Environmental Law Review).

¹⁴³ *Id.* § 47.

¹⁴⁴ *Id.* § 52(2)(b).

¹⁴⁵ *Id.* § 52(4).

¹⁴⁶ Act No. 8379/1972, Land Conservation (Vehicle Control) Act 1972, Dec. 19, 1972, *reprinted* Dec. 31, 2003 (Vict.) (on file with the Harvard Environmental Law Review).

¹⁴⁷ The State of Western Australia has a Soil and Land Conservation Act, written in 1945, which includes measures to mitigate the effects of erosion. This is accomplished by the Commissioner serving a soil conservation notice on individuals who are involved in degrading agricultural practices or who need to take action to prevent soil erosion. Soil and Land Conservation Act 1945, Jan. 9, 1946, *reprinted* June 12, 1999 (W. Austl.) (on file with the Harvard Environmental Law Review). The Northern Territory of Australia's Soil Conservation and Land Utilization Act, enacted in 1970, provides another example of a soil and land conservation statute. This statute appoints a Commissioner of Soil Conservation and conservation officers, who are to advise the Minister on soil conservation issues and to report recommendations to the Minister; the Minister may alert the public and declare certain areas to be of erosion hazard. Act No. 9, Apr. 8, 1970, Soil Conservation and Land Utilization Act, *reprinted* July 15, 2001 (N. Terr.) (on file with the Harvard Environmental Law Review).

With acute desertification problems throughout its territory,¹⁴⁸ China has probably gone further than any other nation in enacting an all-encompassing, top-down law to combat desertification.¹⁴⁹ The objectives of the final phase of the Chinese program are ambitious and call for the complete rehabilitation of the ecosystem so that by 2050 “nearly all desertified land will be brought into control.”¹⁵⁰ Accordingly, the scope of the China Desertification Prevention Law is expansive by design—all activities preventing desertification are governed by this law,¹⁵¹ which is based chiefly on the substantive provisions of China’s NAP.¹⁵²

China’s Desertification Prevention Law obliges organizations and individuals to proactively prevent desertification on the land they are using and rehabilitate land that has already suffered from desertification.¹⁵³ Many groups of stakeholders, beyond those with rights to use state-owned land, are affected by the law by being directly required to adopt desertification prevention measures. For instance, organizations and individuals who operate for-profit desertification control activities must submit an application to the local government showing their compliance with the National Action Program.¹⁵⁴ Organizations that control publicly used land (such as railroads and roads) are also responsible for combating desertification.¹⁵⁵ The law also integrates desertification considerations into the physical planning process. Those who wish to build in desertified areas must submit an environmental impact report and are required to convey provisions relating to desertification prevention and control in advance to the local government.¹⁵⁶

Violation of China’s Desertification Prevention Law can result in a governmental order to cease the illegal activity, the loss of land use, or a monetary fine.¹⁵⁷ For example, the government may withdraw land-users’ rights

¹⁴⁸ Sixty percent of China’s population lives in areas affected by desertification. The effects of desertification have been extreme: wind and sand storms threaten about 13 million hectares of arable land, having already degraded about 100 million hectares of land and water resources. Rails and highways have also been destroyed. CHINA, NATIONAL ACTION PROGRAM, *supra* note 118, § 1.

¹⁴⁹ See *supra* notes 116–118 and accompanying text.

¹⁵⁰ CHINA, NATIONAL ACTION PROGRAM, *supra* note 118, §§ 2.3, 2.3.1.

¹⁵¹ The Law of Desertification Prevention and Control (promulgated by the Standing Comm. Nat’l People’s Cong., Aug. 31, 2001, effective Jan. 1, 2002), art. 2 (P.R.C.) (translation on file with the Harvard Environmental Law Review).

¹⁵² *Id.* art. 3(1).

¹⁵³ *Id.* art. 6.

¹⁵⁴ *Id.* art. 26.

¹⁵⁵ *Id.* art. 30.

¹⁵⁶ All levels of government are required to implement plans to combat desertification based on the recommendations and schedules of the NAP, and their plans and progress are to be reported to the appropriate government bodies at the higher level; any changes to the original plan must be approved by the original ratifying body. *Id.* arts. 16–18. The state and local governments are also directed to include desertification prevention activities in their social and economic development plans. States are to establish targets for desertification prevention and control. See CHINA, NATIONAL ACTION PROGRAM, *supra* note 118, § 4.

¹⁵⁷ The Law of Desertification Prevention and Control (promulgated by the Standing

to use state-owned land if violators fail to implement desertification control measures to rehabilitate the land.¹⁵⁸ The law also creates incentives to reward individuals who rehabilitate degraded land. For example, those who have implemented desertification control activities on already desertified state-owned land may be given land-use rights for a period not exceeding seventy years,¹⁵⁹ and the government may give economic compensation to individuals who have rehabilitated land to be allocated as a protected area or natural reserve.¹⁶⁰

The Chinese legislative approach appears to be superior in its scope, its integrative strategy (which coordinates the responses to the diverse direct drivers of desertification), and its hard-nosed approach to enforcement. Local players are not ignored; indeed, they are the lead actors in the field. But there is clear centralized oversight and objective standards by which progress can be judged.

The following section examines responses by lawmakers in a variety of different countries to four major causes of desertification. What emerges is a picture of legislative potential that could easily be adopted by countries that wish to supplement conventional bottom-up approaches to desertification with more substantial, top-down legal measures.

D. Driver-Specific Legislation: Erosion; Afforestation/Deforestation; Grazing; Water Management

For many countries desertification has remained such an insoluble environmental problem because of its divergent causes. As discussed, there are clear advantages to integrated as opposed to driver-specific statutes. But most important is that whatever legal approach is selected, all the key drivers of desertification are addressed by a clear and effective normative framework that is overseen by a central authority. The following section considers top-down laws that address direct drivers of desertification. These drivers include:

- (1) erosion from cultivation;
- (2) overgrazing;
- (3) deforestation; and

Comm. Nat'l People's Cong., Aug. 31, 2001, effective Jan. 1, 2002), art. 40 (P.R.C.) (translation on file with the Harvard Environmental Law Review).

¹⁵⁸ *Id.* art. 39. Additionally, vegetation destruction in protected areas is an illegal activity, and the government must order the individual committing the act to stop and forfeit any illegal gains garnered as a result. *Id.* art. 38. If a government agency violates this law by failing to report land deterioration or erect sand- and windbreaks, by approving cultivated land in vegetative areas, or by developing and constructing on unapproved areas, the overseeing administrative body will be sanctioned. *Id.* art. 43.

¹⁵⁹ *Id.* art. 34.

¹⁶⁰ *Id.* art. 35.

(4) water mismanagement.¹⁶¹

1. Erosion from Cultivation of Drylands

Traditional soil erosion prevention laws offer powerful tools for combating desertification and preventing further land degradation.¹⁶² Policy orientation is perhaps the most fundamental element of these laws. Some establish “command-and-control” regulatory systems and/or economic incentives. Others merely create administrative frameworks for technical assistance. While strict, regulatory laws are far less common instruments in combating desertification, this Article will emphasize them as providing promising and proven models for supplementing the more pervasive bottom-up approach.¹⁶³

In the United States, a top-down regulatory approach to soil erosion has been successful at the national and local levels, but historically the American approach has varied considerably. Early U.S. conservation legislation envisioned a regulatory role for local soil conservation districts.¹⁶⁴ Due to local politics and anticipated local opposition, however, almost all soil conservation districts balked at this notion and opted for cost-sharing and educational programs.¹⁶⁵ Subsequent federal initiatives, such as the Food

¹⁶¹ While legislation and effective implementation in these areas will go a long way toward solving land degradation in drylands regions, it is worth mentioning that this Article does not address the “indirect” causes of desertification. This is an important caveat, since dynamics such as gender roles, overpopulation, land tenure, and so on may be much thornier for legislative intervention, both politically and technically. Limiting regulatory responses to direct causes may ultimately leave the root cause of many countries’ desertification problem unaddressed, only touching on the symptoms created by the indirect drivers.

¹⁶² Many nations with ample precipitation have ambitious erosion statutes that operate effectively with no connection to desertification *per se*. See, e.g., Décret no. 2005-117 of Feb. 7, 2005, Journal Officiel de la République Française, Feb. 12, 2005, 2421 (France) (on file with the Harvard Environmental Law Review) (anti-erosion decree). There is also nothing new about erosion legislation. The U.S. Congress, for instance, passed the Soil Erosion Act in 1935. Pub. L. No. 74-46, 49 Stat. 163 (1935) (codified at 16 U.S.C. § 590(a)-(q) (2006)). For a history of U.S. soil erosion legislation, see generally John B. Braden & David L. Uchtmann, *Soil Conservation Programs Amidst Faltering Environmental Commitments and the “New Federalism,”* 10 B.C. ENVTL. AFF. L. REV. 639 (1982). Brazil has similarly had soil erosion laws since the mid-1970s. Lei No. 6.225, July 14, 1975, Diário Oficial, July 15, 1975 (on file with the Harvard Environmental Law Review) (creating environmental plans for soil erosion prevention).

¹⁶³ The relative effectiveness of command-and-control laws in changing agricultural behavior was established empirically within the context of non-point source water pollution statutes over a decade ago. See generally Al Rosenthal (Alon Tal), *State Agricultural Pollution Regulation: A Quantitative Assessment*, 2 WATER ENV’T & TECH. 1 (1990) [hereinafter Tal, *State Agricultural Pollution*]. Indeed, water quality concerns, because of the clear externalities involved, have catalyzed the imposition of command-and-control standards on agricultural activities, thus reducing erosion and its on-site damages. *Id.*

¹⁶⁴ J.W. Looney, *GATT and Future Soil Conservation Programs in the United States: Some Lessons from Australia*, 28 TULSA L.J. 673, 687 (1993).

¹⁶⁵ See James Arts & William Church, *Soil Erosion, The Next Crisis?*, 1982 Wis. L. REV. 535, 604–06 (discussing the historic evolution of this attitude toward regulatory soil

Security Act of 1985,¹⁶⁶ have used a balance between bottom-up and top-down strategies under which farmers are paid to take erosion-prone lands out of production or offered considerable subsidies and cost-sharing for adoption of soil conservation practices.¹⁶⁷ Participation is voluntary, although the encouragement of Soil Conservation Service or university extension agents¹⁶⁸ through price supports, the possibility of lost subsidies and technical assistance and encouragement give the program a top-down administrative flavor.

But the Food Security Act also contains unapologetically top-down provisions.¹⁶⁹ In 1985, the U.S. Department of Agriculture (“USDA”) established a compliance mechanism popularly known as the “sod-busters” program,¹⁷⁰ which required farmers of highly erodible lands to adopt conservation plans by 1990.¹⁷¹ The plans were to contain an optimal combination of land management practices to reduce erosion. Penalties for non-compliance involved the loss of USDA program benefits including price supports, crop insurance, and disaster payments.¹⁷² Given the economic reality of American agriculture, this was tantamount to a regulatory requirement.

The U.S. Congress also gave the USDA a mandate to set acceptable levels of erosion control.¹⁷³ In June 1986 the USDA did just that, with an interim rule that required farmers to limit erosion to the soil-loss tolerance—or “T” level.¹⁷⁴ In cases of exceptional hardships, 2T control levels (twice the allowable soil loss level) were also deemed acceptable. Although resistance by the agricultural community slowed initial implementation,¹⁷⁵

conservation programs in the United States).

¹⁶⁶ 16 U.S.C. §§ 3801–62 (2006).

¹⁶⁷ See generally Dean Massey, *Land Use Regulatory Power of Conservation Districts in the Midwestern States for Controlling Nonpoint Source Pollutants*, 33 *DRAKE L. REV.* 35 (1984).

¹⁶⁸ Land grant universities across the United States operate extension services to provide technical aid to the farming community and a link between advances in academic agricultural research and the field. See, e.g., University of Minnesota Extension Service, <http://www.extension.umn.edu/index.html> (last visited Nov. 28, 2006) (on file with the Harvard Environmental Law Review). In 1994, the U.S. Department of Agriculture (“USDA”) established the Cooperative State Research, Education, and Extension Service (“CSREES”) to coordinate and support the research of the sundry state extension services. USDA, CSREES, Background, <http://www.csrees.usda.gov/about/background.html> (last visited Nov. 23, 2006) (on file with the Harvard Environmental Law Review).

¹⁶⁹ For a critique of the USDA’s implementation of the Act, see Alon Rosenthal (Tal), *Going with the Flow: USDA’s Dubious Commitment to Water Quality*, 5 *ENVTL. F.* 15 (1988).

¹⁷⁰ See ROGER CLAASSEN ET AL., *USDA, ENVIRONMENTAL COMPLIANCE IN U.S. AGRICULTURAL POLICY: PAST PERFORMANCE AND FUTURE POTENTIAL* (May 2004), available at <http://www.ers.usda.gov/Publications/aer832/aer832d.pdf>.

¹⁷¹ *Id.* at 14.

¹⁷² *Id.* at 3–4.

¹⁷³ 7 U.S.C. § 1631 (2006).

¹⁷⁴ This is a site-specific performance standard which can be defined as the level of erosion at which a given soil can maintain its productive capacity. It is measured annually in tons per acre of soil erosion. 7 C.F.R. § 12.21(a) (1996).

¹⁷⁵ Agricultural policy expert David Ervin, for example, reaches the conclusion that the

the USDA eventually enforced the policy. Twenty years after inception, official reports suggest that this federal program has been highly successful throughout the country. Ongoing “Compliance Status Reviews” indicate that some ninety-eight percent of participating farms are implementing conservation plans with impressive environmental results:

Cropland erosion fell from 3.1 billion tons in 1982 to about 1.9 billion tons in 1997, a reduction of 1.2 billion tons or just under 40 percent. Wind erosion declined by 542 million tons per year (40 percent), while water erosion declined by 633 million tons per year (38 percent).¹⁷⁶

While much of the improvement took place on soils that are not “in drylands,” the regulatory lesson appears to be applicable in dryland jurisdictions. If farmers are receiving price supports, a government can, like the United States, make subsidies contingent on demonstrated adoption of anti-erosion measures.

Regulatory programs that mandate practices to control erosion are not limited to the national level. Australia chose a bottom-up, decentralized approach in the 1980s, in which states generally chose to rely on voluntary programs to control agriculture-caused erosion.¹⁷⁷ Yet some states have adopted top-down regulatory approaches. Western Australia, for example, authorizes its Commissioner of Soil Conservation to issue notices to farmers if he believes that land degradation is occurring or likely to occur. These notices can limit land use activities (such as land clearing) or can require implementation of erosion-prevention measures.¹⁷⁸ In 1986, New South Wales, Australia’s fourth-largest state, enacted similar legislation creating special authorities in “areas of erosion hazard.”¹⁷⁹ While it is far too early to declare definitive success (for instance, relatively high rainfall might confound land rejuvenation), Australia’s government reported in 2001 that national indicators of erosion control were for the first time showing improvement.¹⁸⁰ While it is difficult to prove causality, the influence of the tougher top-down erosion policies can be inferred.

political obstacles for implementing regulatory programs in the area of soil conservation are sufficiently great to justify continued reliance on economic incentives. See David Ervin, *Shaping a Smarter Environmental Policy for Farming*, 14 ISSUES SCI. & TECH. 73 (1998).

¹⁷⁶ Roger Claasen, *Compliance Provisions for Soil and Wetland Conservation*, in AGRICULTURAL RESOURCES AND ENVIRONMENT INDICATORS 184, 187–88 (Keith Wiebe & Noel Gollehon eds., 2006), available at http://www.ers.usda.gov/publications/arei/eib16/eib16_5-3.pdf.

¹⁷⁷ Allan, *supra* note 129.

¹⁷⁸ Soil and Land Conservation Act 1945, Jan. 9, 1946, reprinted June 12, 1999, § 32 (W. Austl.) (on file with the Harvard Environmental Law Review).

¹⁷⁹ Act No. 10 of 1938, Soil Conservation Act 1938, reprinted Feb. 9, 1999 (N.S.W.) (as amended by the Soil Conservation (Amended) Act 1985) (on file with the Harvard Environmental Law Review).

¹⁸⁰ ANN HAMBLIN, BUREAU OF RURAL SCIS., AUSTRALIA STATE OF THE ENVIRONMENT

Chinese law is characteristically stringent when it comes to erosion prevention, and the legislative product is notable. China's Desertification Prevention Law, for example, sets out a blanket prohibition on cultivation of land in desert margins, woodlands, and grasslands.¹⁸¹ China's 1991 soil and water conservation law also promotes rehabilitative measures to restore eroded soil.¹⁸² The law recognizes that natural and human factors cause erosion and that a comprehensive system is needed to correct the damage and to restore the land. It therefore includes a section on legal responsibility, imposing restoration duties on those who cultivate on forbidden hill slopes or dig, quarry, or tree-fell in erosion-prone areas without the approval of the Department of Water Administration.¹⁸³ Such sweeping and specific proscriptions offer sufficiently clear directives to facilitate implementation by local officials. Moreover, there are penalties to back up the expectations, as the Chinese law imposes a fine on any "enterprise or institution" that causes soil erosion during construction or production and does not rehabilitate the land.¹⁸⁴ In addition to carrying out their restoration activities under China's NAP, local governments are expected to create windbreaks, prevent cutting of vegetation, and strengthen grassland, grazing, watershed, and water resource management.¹⁸⁵ In short, the Chinese law offers proof that legal instruments coupled with political will can change the terms of reference in areas facing acute desertification.

The Israeli experience is instructive, as it shows that regulatory programs to promote soil conservation and address desertification are also politically feasible in countries with active democracies and powerful agricultural lobbies.¹⁸⁶ Israel has conferred regulatory powers on its Minister of Agriculture to address erosion problems. This approach is actually the continuation of a policy that was begun by the British colonial administration during the 1920s.¹⁸⁷ The old British regulations, translated into He-

REPORT 2001 (THEME REPORT): LAND (2002), available at <http://www.deh.gov.au/soe/2001/land/pubs/land.pdf>.

¹⁸¹ The Law of Desertification Prevention and Control (promulgated by the Standing Comm. Nat'l People's Cong., Aug. 31, 2001, effective Jan. 1, 2002), art. 20 (P.R.C.) (translation on file with the Harvard Environmental Law Review).

¹⁸² Law on Water and Soil Conservation (promulgated by the Standing Comm. Nat'l People's Cong., June 29, 1991), art. 1 (P.R.C.) (translation on file with the Harvard Environmental Law Review).

¹⁸³ *Id.* arts. 33–35.

¹⁸⁴ *Id.* art. 36.

¹⁸⁵ A general summary of the Chinese government's erosion program can be found in CHINA, DEP'T OF WATER & SOIL CONSERVATION, MINISTRY OF WATER RES., THE WATER AND SOIL EROSION AND THE CONTROL MEASURES IN CHINA [sic], available at <http://www.lanl.gov/chinawater/documents/niucongheng.pdf>.

¹⁸⁶ For a general overview of Israel's activities in the field, see ALON TAL, NATIONAL REPORT OF ISRAEL 2006 TO THE UNITED NATIONS CONVENTION TO COMBAT DESERTIFICATION (July 2006), available at <http://www.unccd.int>.

¹⁸⁷ Although Israel has chosen not to submit a NAP pursuant to the UNCCD, it has a rich and diverse legislative history of regulating land use activities to prevent desertification, dating back to the colonial period of the British Mandatory Government after World War I. Indeed, among the first ordinances promulgated by the High Commissioner

brew but otherwise hardly amended, have remained intact as the primary basis for addressing soil erosion.

The old British Soil Erosion (Prevention) Ordinance of 1941 serves as a strong basis for promulgation of secondary legislation, empowering Israel's Minister of Agriculture to promulgate regulations in five general areas:

- (1) regulations to impose soil testing on lands declared to be "special regions";
- (2) regulations that proscribe grazing in special regions;
- (3) regulations to prohibit land cultivation in special regions;
- (4) regulations that prohibit land clearing activities or delimit them in a special region; and
- (5) regulations that impose standards on any development in special regions.¹⁸⁸

Israeli laws also contain criminal provisions for violations, though these are rarely, if ever, invoked.¹⁸⁹ In practice, the Israeli agricultural lobby has been influential enough to sustain a public policy where much of the soil conservation activity conducted by farm operations receives a fifty percent subsidy from the Ministry of Agriculture.¹⁹⁰ Yet the existence of a regulatory alternative in the background undoubtedly changes the nature and outcome of the negotiations between farmers and the government.

Israel's Sand Drift Ordinance creates a process whereby the "Chief Forest Officer" is granted authority to specify practices that prevent additional soil deterioration once erosion with the potential to damage farmland is detected.¹⁹¹ The government can offer compensation for any related restoration activities.¹⁹²

Israel's Minister of Agriculture amended the British administrative framework in 1960 when he published the Soil Conservation Regulations.¹⁹³ The new system is ostensibly consensual, relying on "Soil Conservation Plans" for lands lying inside watersheds that are particularly vulnerable to flooding and erosion. Directors of local "Soil Conservation Authori-

were a Sand Drift Ordinance and a Forestry Ordinance. *See supra* notes 134, 135.

¹⁸⁸ Soil Erosion (Prevention) Ordinance, 1958, S.H. 37, §2.

¹⁸⁹ Interview with Zvi Revhon, Dir., Dep't of Soil Conservation, Isr. Ministry of Agric., in Beit Dagan, Isr. (Mar. 5, 2006).

¹⁹⁰ Interview with Shmuel Arbel, Dir., Isr. Soil Erosion Prevention Station, in Beit Dagan, Isr. (Mar. 5, 2006).

¹⁹¹ Sand Drift Ordinance, 2 LAWS OF PALESTINE 686 (Moses Doukhan ed., 1922). A catastrophic level of desertification took place during the millennium of Ottoman occupation, leaving the vast majority of the once heavily forested mountains around Jerusalem as virtual deserts. With a surprisingly strong sense of stewardship, the British Mandatory Government attempted to reverse the trend when it assumed power after World War I. *See* ALON TAL, POLLUTION IN A PROMISED LAND: AN ENVIRONMENTAL HISTORY OF ISRAEL 36-40, 46 (2002) [hereinafter TAL, POLLUTION IN A PROMISED LAND].

¹⁹² *Id.* at 40.

¹⁹³ Soil Conservation Regulations, 1960 KT 1036 (amended by 1961 KT 1341; 1969 KT 2055; 1982 KT 1292).

ties” must approve these plans and the control measures they contain for erosive activities such as plowing or grazing.¹⁹⁴ But there is an implicit regulatory threat. Soil Conservation Authorities are empowered to act independently and undertake whatever measures are necessary to prevent erosive activities, including issuing administrative orders or land-moving initiatives.¹⁹⁵

2. Grazing

Overgrazing is among the more important global drivers of desertification. At the same time, no driver of desertification is more easily given to effective top-down regulatory controls. Just as legislation that controls access to renewable commons can produce sustainable yields,¹⁹⁶ grazing laws can quickly ensure that the physical thresholds associated with resource carrying capacity are not exceeded. Even a cursory survey of grazing laws reveals a diverse collection of countries that have chosen not to wait until local communities spontaneously find the requisite self-discipline to control foraging, or until the damage to rangelands reaches catastrophic dimensions. Rather, central and regional governments have been able to enact statutes that specifically impose limitations to control cattle-related pests,¹⁹⁷ prevent livestock disease,¹⁹⁸ protect vegetation,¹⁹⁹ and compensate for damaged lands.²⁰⁰

¹⁹⁴ These agencies are not independent local units, but staffed by agents from the Israeli Ministry of Agriculture. Shmuel Friedman, Dir. of Grazing Dep't, Isr. Ministry of Agric., Lecture at Symposium on Grazing and Desertification (June 13, 2006).

¹⁹⁵ Soil Conservation Regulations, 1960 KT 1036 (amended by 1961 KT 1341; 1969 KT 2055; 1982 KT 1292), reg. no. 32.

¹⁹⁶ See, e.g., Fisheries Act 1996, 1996 S.N.Z. No. 88 (N.Z.); Sustainable Fisheries Act, 16 U.S.C. § 1801 (1996). At most recent report, in 2004 New Zealand fish exports reached \$1.2 billion with an impressive eighty-two percent of stocks at or near target levels. See New Zealand Ministry of Fisheries, New Zealand Fisheries at a Glance, <http://www.fish.govt.nz/en-nz/Fisheries+at+a+glance/default.htm> (last visited Nov. 28, 2006) (on file with the Harvard Environmental Law Review).

¹⁹⁷ Land Protection (Pest and Stock Route Management) Act 2002, Apr. 22, 2002, *reprinted* May 19, 2005 (Queensl.) (on file with the Harvard Environmental Law Review).

¹⁹⁸ See, e.g., Legge Regionale N. 4, Feb. 9, 2004, *Disciplina Della Movimentazione di Ovini e Caprini a Scopa di Pascolo*, Bollettino Ufficiale della Regione Emilia-Romagna, Feb. 9, 2004 (Italy) (on file with the Harvard Environmental Law Review); Orden APA/3187/2003, Nov. 10, 2003, Programa integral coordinado de vigilancia y control de las encefalopatías espongiformes transmisibles de los animales, B.O.E. 203, 40, 340–41 (Spain) (on file with the Harvard Environmental Law Review).

¹⁹⁹ See, e.g., Law No. 543-I, Dec. 26, 1997, ob ochrane I ispolyeovanii rastityelnovo mira [On protection and usage of vegetation], art. 12 (Uzb.) (translation on file with the Harvard Environmental Law Review).

²⁰⁰ See, e.g., Law No. 768, June 24, 1993, ob usilenii otvetstvennosti za potravu posevov I povrezhdyeniye selskohozyaystvennih kultur, tutovnika I nasazhdyenie [On strengthening responsibility for damage caused to sown areas by grazing and damage of agricultural crops, mulberry groves, and plantations] (Taj.) (summary on file with the Harvard Environmental Law Review).

In Israel, legislators initially chose not to declare war against pastoral and nomadic activity in general. Rather, regulators targeted goats, which at one point were considered more aggressive in their foraging, and more damaging to land cover, than other livestock. The general orientation of grazing laws has been one of command-and-control since before the state's inception. Grazing prohibitions imposed by the British Mandate government²⁰¹ were expanded soon after the country came into being. Long before other environmental and natural resource protection statutes were seriously considered, in 1950 (only a year after independence), Israel's Parliament enacted the Plant Protection (Damage by Goats) Law.²⁰² The law prohibits the grazing of goats on public lands—some ninety-three percent of the nation's real estate.²⁰³ This prohibition is in fact not absolute: the Minister of Agriculture can issue grazing permits which set stocking levels based on foraging standards in order to prevent overgrazing. Like most of Israel's environmental legislation, the Damage by Goats law is a criminal statute.²⁰⁴ Although rarely employed, penalties include six months' imprisonment and fines.²⁰⁵

Even private landowners are not excluded from the provisions of the law, although there is greater flexibility for private lands where goats are fenced in and secured.²⁰⁶ The Ministry of Agriculture's inspectors are authorized to enforce the grazing standards, which include the right to enter on private lands²⁰⁷ and even confiscate animals should densities exceed the allowable levels.²⁰⁸ In practice, the law has had an effect on the makeup of local herds with numbers now maintained at a steady, presumably sustainable state, and the extent of damage caused by grazing has been reduced dramatically. Yet, like any command-and-control statute, it has not been popular with those who are regulated. During periods of more strenuous enforcement, the law exacerbated tensions between the government and the Bedouin "pastoral" minority tribes living in Israel's Negev southlands.²⁰⁹

While relative to some countries, such as the United States and Australia, Israeli standards take a rather simple form, they are not uniform, and

²⁰¹ The Forests Ordinance, 1926, 1 LAWS OF PALESTINE 710 (1933).

²⁰² Plant Protection (Damage by Goats) Law, 5710-1950, 4 LSI 181 (1949-50) (Isr.).

²⁰³ For a review of Israel's land status and policies, see generally Arie Shachar, *Reshaping the Map of Israel: A New National Planning Doctrine*, 555 ANNALS OF THE AM. ACAD. OF POL. & SOC. SCI. 209 (1998).

²⁰⁴ Alon Tal, *On Protected Societal Values and the Criminality of Environmental Offenses*, 40 HA PRAKLIT, J. ISRAELI BAR ASS'N 413-20 (1992) (in Hebrew).

²⁰⁵ Friedman, *supra* note 194.

²⁰⁶ Plant Protection (Damage by Goats) Law, 5710-1950, 4 LSI 181 (1949-50), § 5 (Isr.).

²⁰⁷ *Id.* § 6.

²⁰⁸ *Id.* § 7.

²⁰⁹ TAL, POLLUTION IN A PROMISED LAND, *supra* note 191, at 345-53. There are some who argue that the grazing policies have more political than ecological motivation. See Tawfiq S. Rangwala, *Inadequate Housing, Israel, and the Bedouin of the Negev*, 42 OS- GOODE HALL L.J. 415, 443 (2004).

attempt to take into account ecological constraints and carrying capacities. The Israeli policy is based specifically on a double-tiered standard. To ensure that carrying capacity is not exceeded, only one goat is allowed for each hectare of rainfed lands, or each four hectares of irrigated land.²¹⁰ If specific conditions on the land require site-specific stock limits, the Director of the Ministry's Soil Conservation Branch is vested with the authority to stipulate specific instructions for grazing activities in special areas, including an outright ban on all livestock in them.²¹¹ With time, and new ecologically informed perspectives, regulators also adopted a more conciliatory policy towards the local goat populations.²¹²

The United States was among the first nations to enact a comprehensive legislative program for controlling grazing in its drylands. By the late 1800s, land degradation affecting the regenerative capacity of arid and semi-arid regions of the United States was clearly linked to the excessively heavy grazing of livestock.²¹³ Then in 1934 the country faced a national crisis when dust storms devastated farmers in large tracts of the American West, greatly exacerbating the Great Depression.²¹⁴ The U.S. Congress quickly moved to pass the Taylor Grazing Act.²¹⁵ (Legislators reputedly recessed from their deliberations over the bill to step outside the Capitol and marvel at the dark noon-hour skies caused by the airborne particulates arriving from the Midwest.)²¹⁶ The ostensible objective of the Act was to combat the land degradation (desertification) taking place in the Great Plains, largely due to excessive pressure of livestock on the land. While the law created enormous potential regulatory powers for the U.S. Secretary of the Interior to intervene in rangeland management, in practice it fell short of a tough command-and-control statute clearly establishing criteria for carrying capacity on public drylands and limiting livestock presence accordingly.

²¹⁰ Plant Protection (Damage by Goats) Law, 5710-1950, 4 LSI 181 (1949-50), § 1 (Isr.).

²¹¹ Soil Conservation Regulations, 1960 KT 1036 (amended by 1961 KT 1341; 1969 KT 2055; 1982 KT 1292).

²¹² The anti-goat bias, in retrospect, began with the British, who were convinced that these animals were the primary cause of the severe land degradation that had taken place in Palestine. Other neighboring colonies, such as Syria and Trans-Jordan, adopted similar approaches. Over time, however, senior officials at Israel's Ministry of Agriculture reached the conclusion that properly controlled goats were beneficial and their "omnivorous" proclivities held biodiversity and fire prevention benefits for open space and forestry management. Interview with Mordechai Weitz, former Dir. of the Soil Conservation Dep't, Isr. Ministry of Agric. (Mar. 5, 2006).

²¹³ See S. L. Rundle, Note, *The Once and Future Federal Grazing Lands*, 45 WM. & MARY L. REV. 1803, 1807 (2004).

²¹⁴ For an excellent historical description of the "dust bowl" conditions leading up to the legislation, see MARC REISNER, *CADILLAC DESERT: THE AMERICAN WEST AND ITS DISAPPEARING WATER* 149-51 (2d ed. 1993).

²¹⁵ Pub. L. No. 73-482, 48 Stat. 1269 (codified as amended at 43 U.S.C. §§ 315-16 (2006)).

²¹⁶ Reisner quotes a Nebraska physician who reported "[w]ind forty miles an hour and hot as hell. Two Kansas farms go by every minute." REISNER, *supra* note 214, at 149.

The Taylor Grazing Act authorizes the Secretary of the Interior to establish grazing districts on “vacant, unappropriated, and unreserved land” from any parts of the public domain, excluding Alaska, which are not national forests, parks, and monuments.²¹⁷ Once these are established, the law requires the Secretary to provide for the “protection, administration, regulation, and improvement” of the grazing districts. He is allowed to conduct research about erosion and flood control to that end, as well as adopt regulations and enter into cooperative agreements. The Taylor Grazing Act even goes as far as allowing the Secretary to regulate occupancy and use with the goal of “preserv[ing] the land and its resources from destruction or unnecessary injury,” with willful violations of the law punishable by fine.²¹⁸

Yet many commentators felt that the Act fell short of offering the tough medicine that was needed to address chronic loss of topsoil and land degradation in American drylands.²¹⁹ For example, the law empowers the Secretary to establish regulations that will allow for “the free grazing within such districts of livestock kept for domestic purposes.”²²⁰ Moreover, the statute does not take a clear stand regarding the competing economic interests that contribute to desertification. Accordingly, § 315d states that “nothing contained in this subchapter shall prevent the use of timber, stone, gravel, clay, coal, and other deposits by miners, prospectors for mineral, bona fide settlers and residents, for firewood, fencing, buildings, mining, prospecting, and domestic purposes within areas subject to the provisions of this subchapter.”²²¹ The maximum allowable fine of five hundred dollars for violations of the Act²²²—unchanged even today—also raises doubts about the seriousness of the government’s intention of deterring those who would knowingly deplete rangelands in contravention of the express conditions set forth by the government. The modest levels of compliance²²³ are striking when contrasted with the ostensible success in implementing

²¹⁷ 43 U.S.C. § 315 (2006). An excellent summary of the Act can be found at CTR. FOR WILDLIFE LAW, UNIV. OF N.M. SCH. OF LAW, FEDERAL WILDLIFE LAWS AND RELATED LAWS HANDBOOK, available at <http://ipl.unm.edu/cwl/fedbook/taylorgr.html> (last visited Oct. 18, 2006).

²¹⁸ 43 U.S.C. § 315a.

²¹⁹ BETSY CODY & PAMELA BALDWIN, GRAZING FEES AND RANGELAND MANAGEMENT (Cong. Research Serv., CRS Report for Congress No. 96006, 1998) 2, available at <http://ncseonline.org/NLE/CRSreports/Agriculture/ag-17.cfm> (stating that environmentalists have “pushed for a more open process for federal rangeland management decisions” and “have criticized agency methods and argue that the loss of native grasses has had disastrous effects on associated species, and that damage from grazing in some areas, particularly riparian (streamside) areas, is threatening the ecological functions of rangelands.”).

²²⁰ 43 U.S.C. § 315d.

²²¹ *Id.*

²²² *Id.* § 315a.

²²³ COMM. ON RANGELAND CLASSIFICATION BD. ON AGRIC., NAT’L RESEARCH COUNCIL, RANGELAND HEALTH: NEW METHODS TO CLASSIFY, INVENTORY, AND MONITOR RANGELANDS 139 (1994) (describing “extensive resource damage on [federally]-managed rangelands caused by livestock grazing”).

another U.S. program, the “sod-busters” anti-erosion provisions.²²⁴ This suggests that a top-down regulatory program may be more effective when aggressive command-and-control enforcement proscriptions are integrated with more cooperative initiatives that incorporate economic incentives for soil conservation activities.

China has long suffered the effects of overgrazing and has identified it as a major source of desertification.²²⁵ When China enacted its sweeping Law of Desertification Prevention and Control, it chose to empower local governments to be responsible for rangeland management.²²⁶ While this constitutes a recognition of the importance of engaging pastoral society and a pragmatic concession to bottom-up dynamics, as in all of China’s anti-desertification efforts, the guiding hand of central government is conspicuous. Article 18 states:

Local governments at all levels in grassland regions should strengthen grassland management and development. The administrative department in charge of agriculture (animal husbandry) shall be responsible for guiding and organizing farmers and herders to establish artificial pasture land, control animal numbers, adjust livestock composition, improve livestock varieties, promote livestock stabling and grazing rotation, eliminate rodent and insect pests, protect grassland vegetation and prevent grassland degradation and desertification.²²⁷

The statute continues with strong, clear guidelines for local management: “The carrying capacity of livestock should be determined by grass production. The administrative department in charge of agriculture (animal husbandry) should formulate standards and regulations for carrying capacity, and organize their implementation.”²²⁸ Criminal penalties may be imposed on anyone who engages in activities in protected areas in contravention of the livestock limitations.²²⁹

The situation in Australia is similar to that of the United States. States have enacted laws relating to livestock management. Some examples are New South Wales’ Rural Lands Protection Act, which regulates the management of livestock reserves, animal health and protection, and pest control,²³⁰ and South Australia’s Pastoral Land Management and Conservation

²²⁴ See *supra* notes 170–176 and surrounding text.

²²⁵ Eric W. Orts, *Environmental Law with Chinese Characteristics*, 11 WM. & MARY BILL RTS. J. 545, 553 (2003).

²²⁶ The Law of Desertification Prevention and Control (promulgated by the Standing Comm. Nat’l People’s Cong., Aug. 31, 2001, effective Jan. 1, 2002) (P.R.C.) (translation on file with the Harvard Environmental Law Review).

²²⁷ *Id.* art. 18.

²²⁸ *Id.*

²²⁹ *Id.* art. 38.

²³⁰ Act No. 143, Dec. 8, 1998, Rural Lands Protection Act 1998, *reprinted* July 1, 2005

Act.²³¹ The latter Act establishes a board to manage pastoral land through monitoring, prevention of degradation, and rehabilitation of damaged land.²³² The board may require a lessee under a pastoral lease to submit plans regarding management of pastoral lands and declaration of stock levels;²³³ it may also require lessees to remove stock from land.²³⁴ Additionally, the pastoral control boards are empowered to regulate pastoral movement. For example, persons who travel with livestock will be fined if they do not follow specified routes, or if they otherwise misuse the land.²³⁵ Another example of Australia's livestock legislation is Queensland's Pest Protection Act. This Act establishes guidelines on pest control, land monitoring, stock route management, and fence development.²³⁶

Pursuant to its National Action Plan, Australia has also launched two relevant national initiatives: the National Strategy for Rangelands Management and the National Drought Policy.²³⁷ The National Strategy for Rangelands Management is a joint governmental and non-governmental initiative that advances ecologically sustainable development of industry in the rangeland areas. The Federal and State governments implemented the Australian Rangelands Information System to monitor the environmental conditions and degradation of the rangelands.²³⁸ The National Drought Policy, established in 1992, encourages rural populations to develop self-reliant approaches to management during periods of extreme climate stress with a goal of protecting themselves from the effects of drought.²³⁹

The size of the herds grazing on Australian rangelands is also of great concern to the rangeland pastoralists. Australia's report to the UNCCD suggests different strategies for regulating the size of domestic herds as opposed to the native species (e.g., kangaroos) that can also contribute to land degradation: "[g]razing intensity of stock can be managed through best practice grazing management, and populations of native species are regulated through natural processes."²⁴⁰

Other nations, especially poor ones, have found actual implementation of top-down regulations for regulating pastoralists problematic for both po-

(N.S.W.) (on file with the Harvard Environmental Law Review).

²³¹ Pastoral Land Management and Conservation Act 1989, Sept. 7, 1989, *reprinted* June 23, 2005 (S. Austl.) (on file with the Harvard Environmental Law Review).

²³² *Id.* arts. 4, 12.

²³³ *Id.* art. 41.

²³⁴ *Id.* art. 43(1)(a).

²³⁵ *Id.* art. 46.

²³⁶ Land Protection (Pest and Stock Route Management) Act 2002, Apr. 22, 2002, *reprinted* May 19, 2005 (Queensl.) (on file with the Harvard Environmental Law Review).

²³⁷ AUSTRALIA'S NATIONAL REPORT, *supra* note 128, at 6.

²³⁸ *Id.*

²³⁹ See Linda Courtenay Botterill, *Late Twentieth Century Approaches to Living with Uncertainty: The National Drought Policy*, in FROM DISASTER RESPONSE TO RISK MANAGEMENT: AUSTRALIA'S NATIONAL DROUGHT POLICY 86-98 (Linda Courtenay Botterill & Donald A. Wilhite eds., 2006).

²⁴⁰ AUSTRALIA'S NATIONAL REPORT, *supra* note 128, at 7.

litical and logistical reasons. Although seemingly simple in their form, grazing controls require substantial manpower, for which funding is not always available. Kenya, for example, has had grazing regulations on the books for over sixty years. In response to the 1933-34 droughts, Kenya created the African Land Development Board to “improve basic infrastructure and promote proper agricultural practices.”²⁴¹ The Board introduced de-stocking, grazing control schemes, programs for afforestation of steep slopes, and soil erosion control mechanisms.²⁴² After independence during the 1960s, the Range Management Division of the Ministry of Agriculture was authorized to conserve rangelands and ensure proper grazing management as well as to ensure equality for pastoralists. However, despite its continued formal commitment to reducing land degradation from grazing (as stated in its National Action Program),²⁴³ the Division has by its own admission been less effective than it envisioned and has explained that “a major constraint to the Division was [the] lack of an enabling legal framework on rangeland management.”²⁴⁴ This suggests that it is not funding alone which limits many African countries’ efforts to address desertification but also the absence of a sufficient normative infrastructure.

Kenya’s case offers a good example of the necessary interplay in policy strategy between top-down regulation and bottom-up cost-sharing, which for developing countries will have to come from international assistance. For many of the developing countries facing overgrazing crises, results will not be satisfactory without international assistance for both top-down government implementation and for bottom-up assistance to pastoral communities for restoring degraded rangelands (or even direct assistance to subsistence herders during periods when they must curtail their grazing activities). In a country where farmers are very poor, the notion of private investment in public rangelands is unimaginable. The absence of such financial resources may explain why most countries have not adopted a statutory response to overgrazing, despite the growing recognition of its long-term repercussions and contribution to desertification.

3. Afforestation/Deforestation

Because deforestation is a major driver of desertification, afforestation laws (promoting the planting of trees in new areas, not just the replanting of cleared regions) constitute both a preventative measure and a pro-

²⁴¹ KENYA’S NATIONAL ACTION PROGRAM, *supra* note 115, § 2.4.1.

²⁴² *Id.*

²⁴³ In its “Agriculture and Pastoralism” section, Kenya’s National Action Program lists several proposed actions to deal with the problems of carrying capacity and overgrazing that degrade the land. KENYA’S NATIONAL ACTION PROGRAM, *supra* note 115, § 5.5. These include: “formulat[ing] policies and enact[ing] legislation to provide for appropriate land use and tenure” and “promot[ing] adoption of [suitable] livestock, crops and trees in drylands.” *Id.* § 5.5.3.

²⁴⁴ *Id.* § 2.4.2.

active strategy for restoring degraded lands. Unfortunately, arid-lands forestry has not enjoyed a high profile in the international discourse on the issue.²⁴⁵ Many countries in temperate climates have traditionally enacted top-down laws to promote forest growth and development and to regulate afforestation by companies and individuals.²⁴⁶ Relevant legislation for dryland jurisdictions is comparable in its top-down character, involving traditional interventions by the central government to protect trees from logging and ensure preservation of land cover as well as laws that encourage planting.

Strategically, many arid nations have considered it important to define the percentage of national lands that need to remain wooded. This is an excellent example of the critical role of top-down policy objectives that set clear parameters for local planners and developers, without which the commons will not be utilized optimally. One such example is Israel's National Master Plan Number 22, passed in 1995, that designates ten percent of national lands as forests. This comes in addition to twenty-five percent of the lands that are set aside as nature reserves.²⁴⁷ Forests need to be established in lands where precipitation is sufficient to support them, limiting the kinds of saplings that may be introduced, especially in arid regions. Yet savanna regions have flourished in areas with very little rainfall.²⁴⁸

India's National Forest Policy of 1988 was adopted to supplement its formal forestry legislation.²⁴⁹ It makes a commitment to the preservation, maintenance, and management of woodlands.²⁵⁰ The Policy is driven by top-down targets, with the national government setting clear objectives: a "national goal should be to have a minimum of one-third of the total land

²⁴⁵ See generally Melanie Steiner, *The Journey from Rio to Johannesburg: Ten Years of Forest Negotiations, Ten Years of Successes and Failures*, 32 GOLDEN GATE U. L. REV. 629 (2002). Temperate and tropical forests are generally the focus of international discussions and agreements. See, e.g., International Tropical Timber Organization, www.itto.or.jp (last visited Nov. 28, 2006) (on file with the Harvard Environmental Law Review).

²⁴⁶ For example, Bulgaria's Forestry Law establishes a forest fund run by the National Department of Forests that, among other responsibilities, creates new forests through "collecting, obtaining and producing forest reproduction material, afforestation, growing, stock taking of the forests, support of the natural renewal and soil conservation." Law of the Forests, Dec. 29, 1997, reprinted 2005, art. 40 (Bulg.) (on file with the Harvard Environmental Law Review). Individuals and organizations can submit applications for their afforestation activities and their technical plans. Some examples of applicants include schools that carry out afforestation projects through voluntary labor, universities or government departments that develop scientific trials with fast growing species, and owners of forests and farm lands who create protective forests. See *id.* art. 42.

²⁴⁷ TAL, POLLUTION IN A PROMISED LAND, *supra* note 191, at 102, 157.

²⁴⁸ This technique involves creating water-enriched patches in low-rain areas. These patches become home to parks consisting of clusters of trees. The resulting landscape resembles an African savanna rather than a forest. See Moshe Shachak et al., *Ecosystem Management of Desertified Shrublands in Israel*, 1 ECOSYSTEMS 475, 475 (1998).

²⁴⁹ The Forest (Conservation) Act, No. 69 of 1980, 22 CIV. COURT MANUAL (Central Acts) 783 (1995) (India).

²⁵⁰ GOV'T OF INDIA, MINISTRY OF ENV'T & FORESTS, NATIONAL FOREST POLICY (1988) [hereinafter INDIA'S NATIONAL FOREST POLICY], available at <http://www.nlsenlaw.org/resources/res7/files/Forest%20Policy>.

area of the country under forest or tree cover.”²⁵¹ Yet the program is also pragmatic in its implementation strategy and relies heavily on engaging local populations.

The main objectives of the Indian National Forest Policy are to conserve the remaining natural woodlands, to increase forest, tree cover, and forest productivity, and to control soil erosion.²⁵² The principal objective is “to ensure environmental stability and maintenance of ecological balance”²⁵³ The Policy recognizes that a massive afforestation program is necessary in India, with an emphasis on fuel-wood and fodder development and on rehabilitating degraded lands.²⁵⁴ The key components of the overall afforestation program are encouraging tree-planting, developing tree-crops and fodder on community lands not required for productive purposes, and creating technical assistance programs.²⁵⁵ These strategies enlist the involvement of citizens in implementing the national policy and assume cooperation with the forest department in dealing with state forest management,²⁵⁶ grazing and carrying capacity,²⁵⁷ tribal peoples,²⁵⁸ damage from fires and grazing,²⁵⁹ forest education,²⁶⁰ and research.²⁶¹

Given the reliance of local populations on trees as a fuel source, these populations must support such national forestry programs or they will be impossible to enforce. In 1990, India created the Joint Forest Management (“JFM”) program, which encourages local communities to work jointly with the forest department to protect and develop degraded forests.²⁶² The JFM emerged from the radical policy shift brought on by the 1988 National Forest Policy “with conservation becoming a priority, along with an emphasis on meeting the subsistence requirements of forest-dependent people.”²⁶³ In accordance with measures that both prevent damage and restore already degraded forests, India’s Forest (Conversion) Act of 1980 monitors diversion of forestland for non-forest purposes; when forests are diverted for industry and development purposes, compensatory afforestation is required.²⁶⁴

²⁵¹ *Id.* § 4.1.

²⁵² *Id.* § 2; *see also* INDIA’S NATIONAL ACTION PROGRAM, *supra* note 97, at 69.

²⁵³ INDIA’S NATIONAL FOREST POLICY, *supra* note 250, § 2.2.

²⁵⁴ *Id.* § 4.2.1.

²⁵⁵ *Id.* § 4.2.

²⁵⁶ *Id.* § 4.3.

²⁵⁷ *Id.* § 4.3.4.

²⁵⁸ *Id.* § 4.6.

²⁵⁹ INDIA’S NATIONAL FOREST POLICY, *supra* note 250, § 4.8.

²⁶⁰ *Id.* § 4.11.

²⁶¹ *Id.* § 4.12.

²⁶² Joint Forest Management, What is JFM?, <http://www.jfmindia.org/whatjfm.htm> (last visited Oct. 18, 2006) (on file with the Harvard Environmental Law Review).

²⁶³ Joint Forest Management, JFM in India, <http://www.jfmindia.org/jfmindia.htm#policy> (last visited Oct. 18, 2006) (on file with the Harvard Environmental Law Review).

²⁶⁴ The Forest (Conservation) Act, No. 69 of 1980, 22 CIV. COURT MANUAL (Central Acts) 783, § 5.1.3 (1995) (India).

These laws and policies seem to be producing positive results. India's 2003 State of Forest Report indicates that since 2001, after years of net loss, the total forest and tree cover has increased by 0.65% and woodlands currently constitute 23.68% of the country's geographical area.²⁶⁵ The economic basis for continued progress, both in terms of supporting rangers to protect and foresters to replant, remains an open question.

U.S. afforestation policy is somewhat different, and should be of particular interest to countries with significant private land holdings. Because of the general hesitancy to regulate individual land use, tax incentives have emerged as a key instrument for encouraging landowners to plant trees. Some forty American state codes are designed to offer tax breaks for afforestation activities.²⁶⁶ Many of these statutes prioritize forestry that prevents erosion, especially wind erosion.²⁶⁷ The alternative approach to subsidizing afforestation is regulation. Several U.S. states in arid regions have passed laws that protect trees, even on private lands;²⁶⁸ however, for tactical reasons, enforcement is generally consensual, or bottom-up, in character.²⁶⁹

Few countries have made a greater commitment to drylands afforestation than Israel. With the country's native woodlands almost completely eliminated at the time of independence, the country has made expansion of woodlands a major national priority. Israel is a water-scarce country composed almost entirely of drylands.²⁷⁰ During the country's first fifty years of independence, over 240 million trees were planted.²⁷¹ If top-

²⁶⁵ Forest Survey of India, Ministry of Env't & Forests, *State of Forest Report 2003*, <http://www.fsiorg.net/fsi2003/index.asp> (last visited Oct. 31, 2006) (on file with the Harvard Environmental Law Review); cf. MINISTRY OF ENV'T & FORESTS, INDIA'S INITIAL NATIONAL COMMUNICATION TO THE UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE 8 (2004), <http://unfccc.int/resource/docs/natc/indnc1.pdf> (graphing historic forest cover trends in India 1987–2001). JFM seems to have made a difference. See INDIA, MINISTRY OF ENV'T & FORESTS, ANNUAL REPORT 2005-2006, available at <http://envfor.ic.in/report/report.html>. Under the JFM program, local village communities are assigned forest areas to protect. Spurred on by the context of a national mission, JFM reaches out to local communities, utilizing a bottom-up approach, and it "has brought about a welcome change in the relationships between local communities and forest officials, besides improving the condition of forests, reducing encroachments and increasing the income of the local people." B.S. Padmanabhan, *For Sustainable Solutions*, 22 FRONTLINE, Mar. 12–25, 2005, available at <http://www.hinduonnet.com/fline/fl2207/stories/20050408001710300.htm>; see also GOVT. OF ORISSA, DEP'T OF FOREST & ENV'T, REPORT ON ACTIVITIES OF FOREST AND ENVIRONMENT DEPARTMENT § 5 (2004–05), available at <http://orissagov.nic.in/forest&environment/Annual%20Report%2004-05.pdf>.

²⁶⁶ See generally Thomas Lundmark, *Methods of Forest Law-Making*, 22 B.C. ENVTL. AFF. L. REV. 783, 798–900 (1995).

²⁶⁷ *Id.* Wisconsin has had a law in force to this end since 1927. WIS. STAT. § 77.01–16 (2006) (originally enacted in 1927).

²⁶⁸ Nevada's law imposes criminal penalties for non-compliance. NEV. REV. STAT. § 528.090 (2006).

²⁶⁹ Sharon E. Duggan, *Citizen Enforcement of California's Private Land Forest Practice Regulations*, 8 J. ENVTL. L. & LITIG. 291, 300–05 (1994).

²⁷⁰ TAL, NATIONAL REPORT, *supra* note 186, at 3.

²⁷¹ Jewish National Fund, History, <http://www.jnf.org/site/PageServer?pagename=history>

down afforestation policies in semi-arid regions ever sought a poster child, this country's national experience would provide a strong candidate.

The legislative antecedents of Israeli policy can be found in the colonial period that preceded its independence. A Forestry Ordinance was first enacted in 1920²⁷² and amended soon thereafter. To this day it provides the formal normative framework for forestry in Israel.²⁷³ The Ordinance grants Israel's Minister of Agriculture the authority to declare public lands as forest reserves.²⁷⁴ Because over ninety percent of lands in Israel are public, in theory, vast tracts of lands can potentially be so designated;²⁷⁵ in practice, however, such declarations are rare. The Ordinance bans a wide range of activities in the reserves that might damage the trees or their ecosystem. Violations of these provisions are criminally punishable by year-long imprisonment, fines, or assessment of damages against the violator.²⁷⁶ In addition, violators can also be forced to pay the actual damages caused by their illegal activities.²⁷⁷

In an interesting development, new legislative incentives are being offered for afforestation in order to increase carbon sequestration and combat climate change.²⁷⁸ This constitutes an opportunity for drylands communities to enter the sundry markets that are emerging for ecosystem services,²⁷⁹ in particular those associated with reduction of greenhouse gases. While carbon credits under the Kyoto Accord have not been easily awarded to new forests in temperate zones (largely because of the difficulty in

(last visited Nov. 28, 2006) (on file with the Harvard Environmental Law Review). Through support of donors around the world, the Jewish National Fund has planted over 240 million trees since its founding in 1901. *Id.*

²⁷² Woods and Forest Ordinance, 1 LAWS OF PALESTINE 710 (1920).

²⁷³ Woods and Forest Ordinance, 1964, S.H. 140.

²⁷⁴ *Id.* At present, Israel's government is in the process of declaring all of its formally planned forest—roughly ten percent of total lands in the country—as forest reserves. Gershon Avni, Dir. of Land Dev. Auth., Address at the Keren Kayemeth LeIsrael Board Meeting (Feb. 16, 2006).

²⁷⁵ WALTER LEHN & URI DAVIS, JEWISH NATIONAL FUND 114 (1988).

²⁷⁶ The prohibited activities in forest reserves include uprooting any tree by its roots, allowing cattle grazing in or near the reserve, taking any wood products, burning or removing bark from trees, burning any weeds without taking precautions necessary to prevent the spread of fires, cultivating any lands that lie within reserves, damming waterways, and taking up residence within reserves. The Forestry Ordinance, 1936, § 5, 1 LAWS OF PALESTINE 710 (1937). In recognition of the traditional reliance of local Arab populations on the forests for firewood, the law allows villagers living near forest reserves to remove fallen trees, but they must do so according to the conditions of a government-issued permit. The law also stipulates that any local resident living within a five kilometer radius of the forest must help fight fire in the event of conflagration. *Id.* § 6.

²⁷⁷ *Id.* § 17.

²⁷⁸ Trees and plants “sequester” carbon dioxide from the atmosphere and store it in sugars, starch, and cellulose, releasing oxygen. Carbon sequestration refers to the expansion of these carbon sinks. U.S. EPA, Carbon Sequestration in Agriculture and Forestry, Frequent Questions, <http://www.epa.gov/sequestration/faq.html> (last visited Nov. 28, 2006) (on file with the Harvard Environmental Law Review).

²⁷⁹ James Salzman, *Creating Markets for Ecosystem Services: Notes from the Field*, 80 N.Y.U. L. REV. 870, 874 (2005).

proving “net increases” in biomass), dryland afforestation credits may be more promising. This “synergism” between desertification and global warming has been recognized for some time,²⁸⁰ but only recently has legislation emerged that will allow desertification programs to take advantage of the many win-win opportunities provided by these new climate change-related laws. The Australian state of New South Wales, for example, has modified its property laws to recognize a unique legal interest in forested land for carbon sequestration potential.²⁸¹ Legislation that supports afforestation in response to climate change may prove to offer meaningful economic benefits to dryland residents. As these international markets become better established, it is likely that landowners will respond without statutory encouragement. At the same time, these legislative initiatives offer excellent examples of how top-down intervention can serve to catalyze and expedite bottom-up activities to combat desertification, through the creation of government-offered economic incentives that influence land-usage decisions.

4. Water Management

Effective water management is critical to almost any strategy to combat desertification. For example, while irrigation is a key component of modern agriculture in the drylands, it can lead to salinization,²⁸² a problem that already affects a full one-third of irrigated land worldwide.²⁸³ Additionally, when sewage treatment of wastewater is inadequate, reuse can contaminate ground- and surface-water supplies and create enormous public health problems as well as exacerbate soil salinization. This is a pressing problem as wastewater recycling emerges as a critical source of water, the

²⁸⁰ See, e.g., Karen Jorgensen, Report of the Chair, Expert Meeting on Synergies Among the Conventions on Biodiversity, Climate Change, Combating Desertification and the Forest Principles (Mar. 17–20, 1997), <http://www.bgu.ac.il/BIDR/events/synergy/chair.html> (on file with Harvard Environmental Law Review); see also Salvano Briceno, Institutional Linkages Among Multilateral Environmental Agreements: An Organizational and Educational Development Perspective 10 (July 14–16, 1999) (presented at the Int’l Conference on Synergies and Coordination Between Multilateral Environmental Agreements, UNU, Tokyo), available at <http://www.geic.or.jp/interlinkages/docs/Briceno.PDF>.

²⁸¹ Crown Lands Legislation Amendment (Carbon Sequestration) Act, 2006, No. 85 (N.S.W.) (on file with the Harvard Environmental Law Review). Among the jurisdictions actively developing “forest-related” climate laws are the European Union, Canada, Peru, Spain, and Denmark. KENNETH ROSENBAUM ET AL., CLIMATE CHANGE AND THE FOREST SECTOR: POSSIBLE NATIONAL AND SUBNATIONAL LEGISLATION 21–28 (2004).

²⁸² Soil salinization can occur due to a variety of mechanisms. When underlying ground-water is salty and the levels rise and reach the ground, salt can be added to the soil. Irrigation can also contribute to soil salinity, as it can deliver water with high concentrations of salt. When plants use the water, or the water evaporates, they leave behind residual salts on the land. DANIEL HILLEL, WORLD BANK, SALINITY MANAGEMENT FOR SUSTAINABLE IRRIGATION 23 (2000).

²⁸³ Leena Ninan, *Fighting Against Ourselves: Efforts To Combat Desertification & Land Degradation*, 10 CURRENTS: INT’L TRADE L.J. 65, 68 (2001).

availability of which will increase as the drylands population becomes increasingly urbanized.²⁸⁴

The first legislative challenge in ensuring that water issues do not contribute to desertification involves guaranteeing the sustainability of water yields in arid and semi-arid regions. Because surface waters evaporate quickly, groundwater is particularly critical to sustainable development of drylands. Management strategies need to take into account storage capacity and recharge rates.²⁸⁵ With the advent of inexpensive pumps and the proliferation of deep “tube wells,” water extraction has become relatively easy for farmers of even modest means in drylands that lie over groundwater of moderate depth.²⁸⁶ Low-cost access to previously inaccessible aquifers offers a breakthrough in the agricultural potential of developing dryland countries and their ability to generate biomass in arid and semi-arid regions. Yet at the same time, the existence of countless, diffuse hydrological interventions by private individuals creates the very real potential of a water management disaster.

Countries like Israel and the United States have long transformed desert regions through the tapping of groundwater through costly deep wells. But without a clear sense of limits,²⁸⁷ “mining” groundwater is not sustainable.²⁸⁸ Reaching a hydrological equilibrium through careful evaluation of recharge has yet to drive overall strategy. In many developing dryland nations, the lack of centralized guidance that characterizes water management administration, coupled with the diffusion of inexpensive pumps and the new economic reality, has produced a bottom-up anarchy.

²⁸⁴ According to one estimate, urban people will begin to outnumber rural residents beginning in 2007, and most of the anticipated expansion of urbanized populations will be in dryland, developing nations. Joel Cohen, *Human Population Grows Up*, *Sci. AM.*, Sept. 2005, at 48.

²⁸⁵ See generally Wendy B. Davis, *Reasonable Use Has Become the Common Enemy: An Overview of the Standards Applied to Diffused Surface Water and the Resulting Depletion of Aquifers*, 9 *ALBANY L. ENVTL. OUTLOOK J.* 1 (2004) (discussion of different legal mechanisms for ensuring sustainable recharge).

²⁸⁶ Tube wells reach the aquifer through narrow tubes rather than through traditional excavating. See, e.g., Sandra Postel, *When the World's Wells RU.N. Dry*, *WORLD WATCH*, Sept/Oct. 1999, at 30.

²⁸⁷ For a description of the system of water rights allocation for groundwater in the South Dakota drylands, see John H. Davidson, *South Dakota Groundwater Protection Law*, 40 *S.D. L. REV.* 1, 23–24 (1995) (addressing South Dakota’s no-mining statute, which prohibits mining of groundwater aquifers if the amount of water withdrawn annually exceeds the quantity of the average estimated annual recharge of water because it is not sustainable).

²⁸⁸ For instance, the rapid drawdown of the Ogallala aquifer across the plains region of the United States has been on hydrological radar screens for decades, but the lackluster legislative and policy response that allowed for the crisis to reach its present dimensions shows little signs of changing. See, e.g., Patrick E. Corbett, Note, *The Overlooked Farm Crisis: Our Rapidly Depleting Water Supply*, 61 *NOTRE DAME L. REV.* 454 (1986). The long-term implications for global food security are ominous. See Lester Brown, President, Earth Policy Inst., *State of the Planet 4–5* (2006), <http://www.pbs.org/journeytoplanetearth/stateofthepланet/index.html> (on file with the Harvard Environmental Law Review).

Farmers in India, for example, have invested about \$12 billion for pumps and digging boreholes during the past twenty years.²⁸⁹ The availability of subsidized electricity makes the mining of water particularly lucrative. Water-intensive rice, sugarcane, alfalfa and cotton have become popular crops in local drylands regions, even as their production rapidly depletes hydrological resources. In other cases, farmers simply sell water as a commodity to industry and to households.²⁹⁰ The results, sadly, have been predictable. In a classic manifestation of the tragedy of the commons,²⁹¹ aquifers that took millennia to fill up are quickly disappearing as individual farmers reap only short-term benefits. For example, in the state of Gujarat, already some 15,000 dry wells have been abandoned around Coimbatore, the state capital.²⁹² The consequent human toll of this hydrological boom-gone-bust on the farming community has been enormous, involving massive rural-urban migration and a rash of suicides.²⁹³ From the perspective of land management, the ultimate results find desertification winning another round. Such dynamics are played out across the globe, from the impoverished Gaza Strip, to Vietnam, to large sections of the American West.²⁹⁴ Using groundwater resources as a sustainable basis for agricultural development in the drylands requires top-down, highly specific legislation.²⁹⁵

India has adopted a series of national environmental policies and programs that ostensibly create a framework for addressing this issue. For example, the 1987 National Water Policy gave drought-prone areas priority for water conservation measures and water resource development projects.²⁹⁶ In 2002, a theoretically top-down National Water Policy was announced with a continued emphasis on the important role of water resource management.²⁹⁷ However, the political will necessary to strictly regulate the private sector and enact legislation that can curb the pumping of water in

²⁸⁹ FRED PEARCE, *WHEN THE RIVERS RUN DRY: WATER—THE DEFINING CRISIS OF THE TWENTY-FIRST CENTURY* 36 (2006).

²⁹⁰ *Id.*

²⁹¹ See Hardin, *supra* note 29, at 1244–45.

²⁹² Fred Pearce, *Asian Farmers Sucking Continent Dry*, *NEW SCIENTIST*, Aug. 28, 2004, at 6.

²⁹³ PEARCE, *supra* note 289, at 37.

²⁹⁴ Among the many excellent books dedicated to this topic are the following: MARC DE VILLERS, *WATER* (1999); ROBERT GLENNON, *WATER FOLLIES: GROUNDWATER PUMPING AND THE FATE OF AMERICA'S FRESH WATERS* (2002); DIANNE RAINES WARD, *WATER WARS: DROUGHT, FLOOD, FOLLY AND THE POLITICS OF THIRST* (2002).

²⁹⁵ Payal Sampat, *Groundwater Shock: The Polluting of the World's Major Freshwater Stores*, *WORLD WATCH*, Jan./Feb. 2000, at 10–21. For a warning about the potentially disastrous ecological consequences of a decentralized water system in Spain see James J. Friedberg, *Views Of Donana: Fragmentation And Environmental Policy in Spain*, 3 *COLUM. J. EUR. L.* 1, 48 (1996–97).

²⁹⁶ INDIA'S NATIONAL ACTION PROGRAM, *supra* note 97, at 67.

²⁹⁷ MINISTRY OF ENV'T & FORESTS, INDIA: *SECOND NATIONAL REPORT ON IMPLEMENTATION OF THE UNITED NATIONS CONVENTION TO COMBAT DESERTIFICATION* (2002), available at <http://www.unccd.int>.

drylands is still lacking.²⁹⁸ The road from farm failures in the drylands to future desertification is not a long one as croplands dry up and are eventually abandoned, with the subsequent loss of land cover making soils vulnerable to degradation by the elements.

Many African countries that face desertification problems have begun to enact legislation to manage water. In 2004, Namibia passed the Water Resources Management Act that oversees the management and conservation of all water in the nation.²⁹⁹ Namibia, which technically has not drafted a NAP, included the not-yet enacted Act in a list of policies in its UNCCD National Report.³⁰⁰ While the Act contains no mention of efforts to sustain extraction or to prevent desertification, it has several provisions addressing irrigation. It empowers the Minister to “declare an area as an irrigation area, and to establish an irrigation board for such area.”³⁰¹ Another provision regulates the transfer of conserved irrigation water from one individual to another.³⁰²

Swaziland passed a Water Act in 2003 that, like laws in Namibia and Kenya, attempts to conserve the nation’s water resources by granting rights and establishing institutions and irrigation districts.³⁰³ Swaziland’s NAP, prepared in 2000, makes mention of the importance of water conservation and management and the strategies necessary to accomplish these goals.³⁰⁴ Yet these laws lack the specificity and quantifiable standards necessary to control extraction to sustainable levels. Given the compelling short-term economic disincentive for environmentally sustainable policies, and the potential windfall associated with non-compliance, it is critical that expectations (and penalties) be very clearly spelled out by governments in their rulemaking for users as well as for suppliers.³⁰⁵

Just as many of the nations that are parties to the UNCCD do not address desertification in their general land management legislation, many na-

²⁹⁸ See Robert Cassen & Pravin Visaria, *India: Looking Ahead to One and a Half Billion People*, 319 BRIT. MED. J. 995, 997 (1999) (“Perhaps the scarcest resources for India’s next 50 years will be institutional capacity and political will.”).

²⁹⁹ Water Resources Management Act, No. 284 (2004), GOVERNMENT GAZETTE OF THE REPUBLIC OF NAMIB. No. 3357, at 1 (on file with the Harvard Environmental Law Review).

³⁰⁰ DESERT RESEARCH FOUND. OF NAMIB., NAMIBIA’S THIRD NATIONAL REPORT ON THE IMPLEMENTATION OF THE UNITED NATIONS CONVENTION TO COMBAT DESERTIFICATION 15 (2004), available at <http://unccd.int/cop/reports/africa/national/2004/namibia-eng.pdf>.

³⁰¹ Water Resources Management Act, No. 284 (2004), GOVERNMENT GAZETTE OF THE REPUBLIC OF NAMIB. No. 3357, at 1 (on file with the Harvard Environmental Law Review).

³⁰² *Id.* § 77.

³⁰³ Act No. 7, The Water Act, Mar. 5, 2003 (Swaz.) (on file with the Harvard Environmental Law Review).

³⁰⁴ SWAZILAND, NATIONAL ACTION PROGRAM, arts. 4.2, 5.3, 5.5, 5.6, and 5.7 (2000), available at <http://www.unccd.int/actionprogrammes/africa/national/2000/swaziland-eng.pdf>.

³⁰⁵ For an analysis of the perils of generality and insufficient specificity in environmental legislation, see generally Dorit Talitman et al., *The Devil Is in the Details: Increasing International Law’s Influence on Domestic Environmental Performance—The Case of Israel and the Mediterranean Sea*, 11 N.Y.U. ENVTL. L.J. 414 (2003).

tions also have not linked water management regulations with desertification prevention. For example, neither desertification nor the UNCCD is referred to in the following legal instruments: Eritrea's Proclamation to Establish the National Drought Relief Coordinating Committee;³⁰⁶ the Ethiopian Water Resources Management Proclamation;³⁰⁷ and Zimbabwe's Water Act.³⁰⁸

Like Namibia, Kenya has enacted legislation to manage, conserve, and regulate water rights through its 2002 Water Act.³⁰⁹ Kenya's National Action Plan, prepared a few months before enactment of the Act, expresses concerns regarding the more than thirty organizations working on water issues: "These institutions lack policy guidelines, elaborate legal framework [sic], [and the] human and fiscal capacity to effectively undertake their respective responsibilities. This situation has [the] potential to manifest in duplication of efforts, conflicts, and non-accountability."³¹⁰ The Water Act, which is quite lengthy and comprehensive, "provides for water resources management, pollution control, conservation of water catchments and water allocation through permits. It also provides for water resources assessment, which is the continuous measurement and recording of water resources data"³¹¹

The ultimate objective of the Kenyan Water Act is to separate the general management of water resources from the mechanics of municipal water supply and sewage services,³¹² which would presumably be better-run through autonomous (probably private) providers.³¹³ The Act also emphasizes the need to involve community participation in the management of land and water resources, and to emphasize appropriate levels of government oversight.³¹⁴ The Act, like the laws of Namibia and Swaziland, has plenty of

³⁰⁶ Proclamation No. 129/2003, A Proclamation To Establish the National Drought Relief Coordinating Committee (2003), 12 GAZETTE OF ERITREAN LAWS No. 1 (on file with the Harvard Environmental Law Review).

³⁰⁷ Proclamation No. 197, Ethiopian Water Resources Management Proclamation (2000), FEDERAL NEGARIT GAZETA OF THE FEDERAL DEMOCRATIC REP. OF ETH. No. 25, at 1250 (on file with the Harvard Environmental Law Review).

³⁰⁸ Act No. 31, Water Act (1998) Cap. 20:24 (Zimb.) (as amended 2003) (on file with the Harvard Environmental Law Review).

³⁰⁹ Act No. 8, Water Act (2002), 2002 KENYA GAZETTE 935 (on file with the Harvard Environmental Law Review).

³¹⁰ KENYA'S NATIONAL ACTION PROGRAM, *supra* note 115, § 5.7.1.

³¹¹ KENYA'S THIRD NATIONAL REPORT, *supra* note 115, § 1.1.3.

³¹² Act No. 8, Water Act (2002), 2002 KENYA GAZETTE 935, 946–47 (on file with the Harvard Environmental Law Review).

³¹³ As in all cases of privatization of water resources, concerns have been expressed about the implications of the law in terms of social justice: "Whereas the Kenya government seeks to move away from direct provision of water services in favour of ceding control to autonomous water service providers, this policy shift is fraught with ambiguities that may not augur well for the consumers, especially the poor." SAMMY WAMBUA, HEINRICH BOELL FOUND., WATER PRIVATIZATION IN KENYA I (2004), available at <http://www.boell.de/downloads/global/Water%20Privatisation%20in%20Kenya.pdf>.

³¹⁴ Albert Mumma, Kenya's New Water Law: An Analysis of the Implications for the Rural Poor, International Workshop on African Water Laws: Plural Legislative Frameworks for Rural Water Management in Africa (January 26–28, 2005), at 4, available at <http://www.nri.org/waterlaw/AWLworkshop/MUMMA-A.pdf>.

top-down trappings including the establishment of a Water Resources Management Authority, a Water Services Trust Fund and a Water Appeal Board; it also addresses water pollution and provides for emergency powers in case of a water shortage.³¹⁵

In Israel, the central element of the nation's broad strategy to upgrade the productivity of degraded drylands is an aggressive policy of water management.³¹⁶ This includes the transportation of water from dry sub-humid to water-scarce regions, the wide dissemination of drip-irrigation technologies, the harvesting of rainfall in reservoirs, and the reuse of wastewater.³¹⁷ Legislation has been part of the process.³¹⁸ The first provision of Israel's 1959 Water Law eliminates private rights to water.³¹⁹ Ostensibly, complete government ownership enables water managers to pursue a public policy that makes long-term sustainability (rather than short-term profits) its paramount objective. Conservation is integral, from mandatory standards for flush toilets to regulations on car washing. There is a ban on the use of non-drip irrigation during the rainy months; during the hot summer periods, irrigation is only allowed at night, to avoid unnecessary evapotranspiration.³²⁰

Since the 1960s, overpumping has been largely controlled by the establishment of "red lines." These are water levels beneath which Israel's Water Commissioner may not pump, for fear of salinization due to saltwater intrusion.³²¹ In the worst drought years of the 1970s and 1980s, these levels were on occasion exceeded because of support for the agricultural sector, leading to the depletion of aquifers. More recently, however, overpumping has been kept in check and a chronic drawdown of water resources has been alleviated.³²² A recent phase-out of most water subsidies to agriculture ensures that efficient drip irrigation is ubiquitous in farms throughout the country and particularly in the country's arid and semi-arid regions.³²³ In

³¹⁵ Act No. 8, Water Act (2002), 2002 KENYA GAZETTE 935, 946-49, 1008-11, 1026-27 (on file with the Harvard Environmental Law Review).

³¹⁶ For a detailed review of Israel's policies, see Alon Tal, *Seeking Sustainability: Israel's Evolving Water Management Strategy*, 313 SCIENCE 1081 (2006) [hereinafter Tal, *Seeking Sustainability*].

³¹⁷ Alon Tal et al., *Sustainable Water Management in the Drylands: Recent Israeli Experience*, Israel Ministry of Foreign Affairs, Oct. 2005, at 2, 5, 8, 14 (on file with the Harvard Environmental Law Review).

³¹⁸ Israel's 1959 Water Law has been updated several times. For a description of the country's basic water legislation, see Richard Laster, *Legal Aspects of Water Quality*, in WATER QUALITY MANAGEMENT UNDER CONDITIONS OF SCARCITY: ISRAEL AS A CASE STUDY 263 (Hillel Shuval ed., 1980). For a recent update, see Alon Tal, *Natural Flow*, MECHARAI MISPHAT-BAR ILAN U. L. REV. (forthcoming 2006). For a critical review of the Israeli implementation of water pollution laws, see generally Rachelle Adam, *Government Failure and Public Indifference: A Portrait of Water Pollution in Israel*, 11 COLO. J. INT'L ENVTL. L. & POL'Y 257 (2000).

³¹⁹ The Water Law, 5719-1959, 13 L.S.I. 173 (Isr.).

³²⁰ Tal, *Seeking Sustainability*, *supra* note 316, at 1084.

³²¹ TAL, POLLUTION IN A PROMISED LAND, *supra* note 191, at 224-25.

³²² *Id.* at 239-42.

³²³ Alon Tal, Hawke Lecture at the University of South Australia, Water Wise: Learning

fact, there is no legislation that directly mandates technology diffusion for irrigation. Farmers, who face tight allocations imposed by the central government, simply seek the most efficient way to utilize the water they have. While the decision about irrigation technology is made at the individual level, the policy that drives the dynamics is completely top-down.³²⁴

Furthermore, no country has embraced wastewater reuse as a water management strategy in the drylands and mandated its utilization more avidly than Israel, where sewage water has played a key role in local efforts to reverse desertification.³²⁵ By 1953, Israel had issued the first set of wastewater reuse guidelines, which later became binding legislation.³²⁶ The required secondary level of wastewater treatment allowed irrigation for only a limited range of crops. Vegetables, for example, were prohibited due to concerns about bacterial contamination and the underlying soils and groundwater being negatively affected.³²⁷ Moreover, it quickly became clear that in the ephemeral streams that characterize many dryland regions, wastewater discharges must be of higher quality than in temperate zones where dilution in the streams allows for less advanced treatment levels. Recently, the Israeli government adopted a new set of standards for wastewater which will address these problems.³²⁸

Australia has also introduced many laws to address water issues and water management, although they do not directly mention desertification. Some territories have comprehensive water plans, such as Queensland's Water Regulation 2002;³²⁹ New South Wales' Water Management Act 2000;³³⁰ and the Northern Territory's Water Act.³³¹ In addition, several territories have entered into the Intergovernmental Agreement on a National Water Ini-

from the Israeli Experience 9–11 (Oct. 30, 2003) (transcript on file with the Harvard Environmental Law Review).

³²⁴ Personal Communication with Yaakov Lev, Dir. of Water Conservation Dep't, Isr. Water Comm'n, Tel Aviv (June 6, 2006).

³²⁵ For instance, eighty million cubic meters of wastewater each year is pumped to the desiccated southlands and utilized by the agricultural sector. TAL, POLLUTION IN A PROMISED LAND, *supra* note 191, at 221. In all, some seventy-three percent of Israel's wastewater is recycled, with much of it used to support desert agriculture. Tal, *Seeking Sustainability*, *supra* note 316, at 1082. For a discussion of Israel's wastewater recycling policies, see generally Marcelo Juanico & Eran Friedler, *Wastewater Reuse for River Recovery in Semi-Arid Israel*, 40 WATER SCI. & TECH. 43, 43–50 (1999).

³²⁶ TAL, POLLUTION IN A PROMISED LAND, *supra* note 191, at 222–23.

³²⁷ Phoenix Lawhon, *The Politics of Wastewater Standards: Technocracy, Cost-Benefit Analysis and the Decline of Farmer Power* (Jan. 19, 2006) (unpublished thesis, Ben Gurion Univ.) (on file with the Harvard Environmental Law Review).

³²⁸ Israel, Ministry of Environmental Protection, *Upgraded Effluent Quality Standards*, http://sviva.gov.il/bin/en.jsp?enPage=e_BlankPage&enDisplay=view&enDisp-What=Object&enDispWho=Articals^I2092&enZone=Wastewater_Treatment (last visited Nov. 4, 2006) (on file with the Harvard Environmental Law Review).

³²⁹ Water Regulation 2002, *reprinted* Sept. 1, 2006 (Queensl.) (on file with the Harvard Environmental Law Review).

³³⁰ Water Management Act 2000, *reprinted* Aug. 1, 2005 (N.S.W.) (on file with the Harvard Environmental Law Review).

³³¹ Water Act, Apr. 30, 1992, *reprinted* Jan. 14, 2004 (N. Terr.) (on file with the Harvard Environmental Law Review).

tiative.³³² Furthermore, Australia's National Report mentions its National Space Action Plan for Salinity and Water Quality, which is implemented at the State and Territory levels and executed through agreements between the governments and communities.³³³ But these laws have not ensured utilization of sustainable water technologies. For instance, although cotton is among the thirstiest of crops, a recent survey suggests that only two percent of Australian cotton is grown using drip irrigation.³³⁴ The diffusion of environmentally sound technologies often requires a jump-start from the legislature. A combination of top-down subsidies or strategic water allocation programs could optimize the use of basic water management techniques and serve as technology-forcing measures for such practices as drip irrigation. The primary difference in this regard between the methods in Israel and Australia appears to be the tighter water quotas allocated to the Israeli agricultural and urban sectors.

Certainly centralization and statutory control do not constitute a panacea nor a guarantee of coherent water management programs. Top-down regulation will only be as efficacious as the policy decisions and the political commitments of those implementing the laws. Moreover, water legislation must make sense hydrologically. China's present management along the Yellow River is a case in point. From a regulatory standpoint, China's administrative framework for water resources in general and the Yellow River's extended watershed in particular could not be more organized—with policies designed and enforced by a monolithic Yellow River Conservation Commission.³³⁵ Yet the policies of the Commission are patently inefficient, transporting copious quantities of water to the fringes of the Gobi Desert where the evapotranspiration of the hyper-arid climates makes for low yields per water unit. As a result, precious little water remains for the traditionally fertile, semi-arid lower basins, where agricultural potential is far greater.³³⁶

All the nations discussed above are excellent examples of places where cognizance of the long-term dangers of desertification and a higher profile for sustainable water management issues in the legislative realm might prevent future hydrological bankruptcy and allow for sustainable agricultural development. Yet ultimately, even beyond the problem of legislative specifi-

³³² Council of Australian Governments, Intergovernmental Agreement on a National Water Initiative Between the Commonwealth of Australia and the Governments of New South Wales, Victoria, Queensland, South Australia, the Australian Capital Territory and the Northern Territory (June 25, 2004), available at http://coag.gov.au/meetings/250604/iga_national_water_initiative.pdf (outlining broad plan of action for steps to be taken over next decade to promote efficient water use and maintain healthy river and groundwater systems).

³³³ AUSTRALIA'S NATIONAL REPORT, *supra* note 128, at 8–9.

³³⁴ S.R. RAINE ET AL., NAT'L CTR. FOR ENG'G IN AGRIC., UNIV. OF S. QUEENSL., DRIP IRRIGATION IN THE AUSTRALIAN COTTON INDUSTRY: A SCOPING STUDY 2 (2000).

³³⁵ Patricia Wouters et al., *The New Development of Water Law in China*, 7 U. DENV. WATER L. REV. 243, 283–300 (2004).

³³⁶ PEARCE, *supra* note 289, at 109–10.

city,³³⁷ development of water resources in the drylands is costly, often involving the digging of new wells that go hundreds of meters into the ground, and adoption of water-saving practices, such as drip irrigation. Without adequate international assistance, most countries will not be able to take advantage of technological advances. At the same time, without an appropriate legal framework and constraints, such assistance cannot be effectively utilized.

V. UNCCD IMPLEMENTATION STRATEGIES—CONCLUSIONS

Among the distinguishing characteristics of the UNCCD is its emphasis on a bottom-up approach in which communities are engaged in defining the solutions to their specific desertification problems. The UNCCD places considerable emphasis on tapping local knowledge and experience. Unfortunately, this bias has brought with it an implicit suspicion of centralized, top-down policies. Although parties to the Convention are encouraged to enact legislation, the expectation is that this should be done in a consensual context as part of an overall strategy that does not try to impose solutions from above but works to craft them in conjunction with the affected communities. Presumably, this approach promises practical benefits in terms of actual participation and adoption of responsible land management practices. Undoubtedly, such policies will be more popular among the very people that programs to combat desertification are supposed to help.

The problem is that there are many critical and cost-effective land management practices that will not be adopted for a variety of cultural, political, economic and practical reasons. Human history clearly teaches that the tragedy of the commons will often not be solved by consultation or by galvanizing the collective wisdom and goodwill of affected communities.³³⁸ If sustainable practices are not imposed or strongly encouraged, ecological collapse is often inevitable. It is also clear that in the imperfect world in which we live, funds to facilitate a bottom-up approach have not materialized, and probably will not in the foreseeable future, despite a decade of momentum in establishing a multilateral global framework for combating desertification.³³⁹

The review of legislation presented here suggests that a different approach may lead to more meaningful results. Comprehensible and sensible

³³⁷ For example, one critique of Kenya's water legislation explains: "The Water Act 2000 broadly sets out the legal implementation framework for implementing this policy but is weak on clearly elaborating and outlining government policy on privatisation in the water section." WAMBUA, *supra* note 313, at 3.

³³⁸ See generally DIAMOND, COLLAPSE, *supra* note 9. Diamond documents civilizations stretching over thousands of years that were wiped out due to their insouciant disregard for the ecological constraints and carrying capacities of their environments.

³³⁹ See discussion of funding issues *supra* at note 24.

laws and regulatory systems need to be part of the overall national strategy to address desertification. The Convention itself acknowledges this, but the parties and the Secretariat have never prioritized the implementation of Article 5(e)'s commitment to "strengthening, as appropriate, relevant existing legislation and, where they do not exist, enacting new laws."³⁴⁰

The plethora of statutes addressing drivers of desertification that conform to a conventional command-and-control model of regulation suggest that some countries have recognized the utility of such an approach on their own. Top-down statutes, of course, offer a menu of options: legislative programs can provide incentives, price supports, and other economic mechanisms for fueling stewardship, in addition to traditional regulator prescriptions. Many successful soil conservation programs frequently utilize a combination of carrot and stick. Many of these policies were not drafted as a result of a conciliatory bottom-up approach but rather based on hard-nosed realism and knowledge of the conciliatory approach's limitations if not balanced with centralized prescriptions.

As is the case with any environmental challenge, it is far easier to pass legislation than to implement it. And in the poorest of nations, where destitution is the rule rather than the exception, it will take considerable aid to bring populations to a point where regulation is a realistic alternative. Surely, a more serious commitment in affected countries to establishing statutory infrastructure to combat desertification is no substitute for the international funding that for the foreseeable future will be desperately needed to provide many of the necessary solutions.

This dynamic, however, should not be perceived as a point of conflict between "north" and "south" but an opportunity for more meaningful enhanced partnerships. One of the potential benefits of a top-down approach is the chance for developing countries to show donors that they are indeed serious about land stewardship and that they will make the necessary societal and legislative commitment to address the problem of desertification. Donors may appreciate a greater demonstration of seriousness before funding initiatives to abate land degradation. The UNCCD's bottom-up approach is, of course, to some extent tactical. The emphasis on community involvement for many of the drafters of the convention was more a matter of pragmatism than ideology, due to the considerable experience suggesting that many communities lack the resources, training, and inclination to implement specific practices to reduce land degradation. In many countries, where land use restrictions evoke bitter memories of colonial domination, it is argued that public policy must be more inclusive.³⁴¹

³⁴⁰ UNCCD, *supra* note 11, art. 5(e).

³⁴¹ See, e.g., A. WARREN & C. AGNEW, INT'L INST. FOR ENV'T & DEV., AN ASSESSMENT OF DESERTIFICATION AND LAND DEGRADATION IN ARID AND SEMI-ARID AREAS 46 (1988):

Colonialism and imperialism intensified the peripheral nature of the dry lands,

Yet in practice this position perpetuates a defeatist position. For most of Africa, some forty years have transpired since the last of the colonial regimes departed. Progress will not be made through blaming past exploitation or avoiding proven legal measures because they smack of colonial culture and the past.

Legislation has shown time and again that it can shape public opinion.³⁴² Racial tolerance improved once segregation laws were passed. The importance of species preservation became apparent largely after biodiversity preservation laws were enacted.³⁴³ Anti-desertification laws, especially when supplemented with educational campaigns, may forge a new public awareness and commitment to protecting land resources.

There is little doubt that the reform of land use practices, which implicate the everyday behavior of an entire populace, requires a level of involvement by the public far greater than for other environmental media such as water and air, where pollution is caused by a smaller, and more readily regulated, number of point sources.³⁴⁴ Nonetheless, top-down legislation offers an important supplemental mechanism for fighting desertification, a mechanism whose time may have come.

It is time that the UNCCD's call for legislative action on the part of affected countries receives the attention that it deserves. After ten years of bottom-up efforts, success in combating desertification has not been so remarkable that nations should not consider new approaches. This Article demonstrates that many countries have imposed centralized policies and enforced a myriad of laws whose provisions can not only prevent desertification but can also contribute meaningfully to the restoration of degraded drylands. It would be advisable for affected nations to consider these examples and for the UNCCD to provide greater outreach to make such statutory models and solutions accessible to its signatories.

and introduced other pernicious effects. In many imperial situations, cash-cropping was forcibly introduced to provide taxes to meet, among other things, imperial costs. Opium was grown in India, cotton in the Punjab and the Sudan, groundnuts and cotton in west Africa. These new crops forced out food crops, and when prices fell, encouraged farmers to plough up and plant increased acreages in order to meet their own costs, the new demands for cash, and the national demand for foreign currency.

³⁴² See, e.g., Paul Finkelman, *Civil Rights in Historical Context: In Defense of Brown*, 118 HARV. L. REV. 973, 997 (2005) (noting how the Supreme Court has molded public opinion); see also Don Colburn, *Seat Belts, Survival and the Law*, WASH. POST, Feb. 13, 1985, at Z7 (noting that before seatbelt laws were passed, seatbelt usage was below fifteen percent).

³⁴³ See, e.g., David R. Given, *Forging a Biodiversity Ethic in a Multicultural Context*, 4 BIODIVERSITY & CONSERVATION 877 (1995) (discussing an evolution of local ethics in New Zealand regarding biological diversity, with an emphasis on the impact of the passage of the 1991 Resource Management Act on local attitudes).

³⁴⁴ "Nonpoint source pollution is so difficult to control because of the diversity of sources and the complexities inherent in interactions between land use and hydrology. No single sector of society, land use or medium is totally responsible." *Congress on Control of Nonpoint Source Water Pollution*, 20 RENEWABLE RESOURCES J. 6, 6 (2003).

