12 Networks of *ex situ* collections of genetic resources

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Introduction

Ex situ collections play a central role in the preservation and research of biodiversity as they store biodiversity in a nutshell. Whereas plant, animal, microbe (from yeasts or bacteria to viruses) collections do not directly contribute to conservation *in situ*, they serve a central function in research and contribute *indirectly* to conservation by (1) substituting the accession *in situ*, (2) securing a double set in case of loss and destruction of single cultures, (3) educating botanists and biology teachers, (4) contributing to scientific research, such as taxonomy, evolution, genetics, botany, chemical and proto-pharmaceutical analysis, (5) providing environmental education to the public, (6) offering recreation to the public in areas which are close to natural environments, thus also contributing to the appreciation of nature. In addition, collections serve a central goal in industrial research and development (R&D) based on biological resources.

Article 9 of the Convention on Biological Diversity (CBD) includes *ex situ* collections within its scope. This is undisputed for accessions subsequent to the CBD coming into force; discussions continue about whether the collections are 'providers' or 'users'. Whereas self-descriptions often refer to their intermediary function, their status in legal terms depends on the service they provide. Whereas collections in provider states are often charged with regulatory provider state duties (e.g. Ethiopian Institute of Biodiversity Conservation[1]), collections located in user countries more often than not provide services to users and/or to user countries' governments. The current chapter focuses exclusively on collections in user states. The Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization (NP) has an even stronger focus on user countries' *ex situ* collections as Article 15 NP stipulates that genetic resources 'utilized' (defined by Article 2 (c) NP as 'research and development') within its jurisdiction have to comply with the rules of the other party (the provider state), which secure its prior informed consent (PIC) and access on mutually agreed terms (MAT).[2] It has also refuelled the long-lasting debate

about the temporal coverage (retro-activity) if continuous possessions and new forms of utilization of pre-CBD material fall under the scope of the CBD.[3] This question, however, is not at the heart of this chapter because it departs from the current practice of collections not to distinguish pre- and post CBD-material.[4]

Article 4 NP stipulates that parties shall not be prevented from developing and implementing more specialized ABS agreements, instruments and practices. According to common understanding, these 'specialized instruments' are *ex situ* collections regimes which have been developed in various sectors (from horticultural to food and agricultural, and from zoological and archaeological to the environment and the health care sector), on various levels of governance, each responding to specific needs. Important *ex situ* collections are 'public' (non-commercial) and pursue various sorts of public access and network policies. Overall, they have been recognized as responding to the market failure of underinvestment in public goods (Dedeurwaerdere 2010; Uhlir 2011). Their various forms of open access policies have been challenged *inter alia* by the CBD rationale. Responding both to CBD compliance claims and the wish to maintain open exchange structures, they devised alternative exchange structures which have been incorporated within the NP. This chapter, however, asks the question: under which conditions do these 'specialized instruments' deserve to be accepted as 'tailor-made ABS solutions' that allow a deviation from the general NP regime?

The chapter concentrates on three 'common pools' (*ex situ* collections) in three sectors: horticulture, microbiology and agriculture.[5] They all claim a model function for their respective sector in that they comply with the CBD rules (facilitate access, contribute to fair and equitable benefit sharing, and continue to share and exchange genetic material). However, they differ distinctly in their governance and their rules. The horticultural common pool is the International Plant Exchange Network (IPEN) of some botanical gardens, mainly a grass-root initiative (as 'self-governance'). The chosen microbial collection is the National German Collection of Microorganisms and Cell Cultures (DSMZ) in Braunschweig,[6] a member of the European Culture Collections' Organisation (ECCO) and the World Federation of Culture Collections (WFCC). DSMZ defines itself as a 'service provider' for scientists, industry and government alike. It is run as a private company limited by shares under German company law (GmbH). Its shares are owned by the federal state Lower Saxony, and since it is acknowledged as an international depositary authority (IDA) under the Budapest Treaty, quality control is also secured by the Research Ministry of the federal government. The flagship common pool in the agricultural sector is the Multilateral Regime under the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA), an international treaty administered by the Food and Agriculture Organization of the United Nations (FAO), under which auspices member states pool their collections. The pool is illustrated

by the example of the German Leibniz Institut für Pflanzengenetik und Kulturpflanzenforschung (IPK) in Gatersleben.

The chapter will first present an overview of *ex situ* collections and a matrix of characteristics, followed by a detailed description of the three selected collections. The analysis that follows will look into their privileged status as 'specialized instruments' by examining their ABS performance, their function to their constituencies, and the 'pool rationale'. The chapter ends with some conclusions.

The landscape of *ex situ* collections and the analytic choice

The global wealth of *ex situ* collections cannot easily be categorized. Superficially, they can be distinguished according to the collected material. Whereas all collections of plants (forests, horticulture, staple crops – including fruits, vegetables and grains)[7], animals (livestock, fish and agents of biological control (Schloen *et al.* 2011: 11) and microbes (including bacteria and viruses) are covered by the CBD ABS regime, collections of human tissue and blood are not (Article 2 CBD). Another important category is their purpose. Some collections serve a purely academic research purpose (universities); others pursue a public education mission, often combined with long-term storage tasks and/or research (museums); others pursue primarily administrative purposes (depositories for safety or patent records); others again are directed towards commercial research and development. Another more or less pertinent category is public versus private. Public collections are engaged in making the collections accessible for the broader public[8] and struggle with the CBD requirements of access and benefit sharing.[9] Although collections often cannot neatly be attributed to a specific industrial sector, they are, for organizational reasons, assigned to various supervising agencies. For example, the Leibniz Institut für Pflanzengenetik und Kulturpflanzenforschung (IPK) in Gatersleben, Germany is supervised by the Agricultural Ministry. Collections of viruses and bacteria are submitted to the Veterinary Department *and* to the Department of Health.[10] Botanical gardens are mostly submitted to environmental administrations. Collections can also be distinguished along the scientific method they pursue. Some collections focus on the biological resource, others on the genetic information. Some collections are interested in genetic resources for their biological or chemical material, some digitalize the genome in data banks.[11] An important distinction, not only for scientific reasons, is if a collection collects propagating (living) or non-propagating (e.g. paleontological) material: collections with living, propagating material depend on access to fresh, natural material. More importantly, with regard to the CBD rationale, the material necessarily changes over time (either via sexual crossing, due to environmental pressures, or by death) with ramifications for traceability[12], and the

'genetic proximity' of the *ex situ* collection to the originally accessed material. A rough distinction qualifies them as either 'public' or 'private'. This distinction can refer to the incorporate form (private ownership vs. state property), or to their primary source of funding (private donations/ foundations, commercial collections or public funding, such as most universities and museums). It can also refer to their tax status as being either 'for profit' (private[13]) or 'non-profit' (public, like the *private* non-profit research organizations CAMBIA, DArT). More important, however, is the question of how access rules are designed: as 'public' or as 'exclusionary'. Most corporate collections are treated as 'treasure boxes' to which no access is granted (an interesting exception is the SNP consortium (Godt 2007: 179)). The meaning of 'public access' is, in principle, access by everyone. That implies neither that all governmental collections grant public access, nor that access can be limited to professionals of the community (most university and national scientific collections) or conditioned to professional skills (DSMZ). Yet, 'common pools' usually advertise themselves as 'public access', referring to the idea that the hosted resources belong to everybody.

This chapter concentrates on three distinct types of 'public access': the multilateral FAO system of the ITPGRFA, IPEN and WFCC/ECCO microbial collections. Other types of public access in terms of 'conditioned access', which range from 'exclusionary' to 'free access to everyone', are not covered. Therefore, not included are collections which aim to restore the 'public domain' (access to everybody on unrestricted terms) by contractual arrangements – projects such as MOSAICS (Desmeth 2007) and research organizations like CAMBIA with its (BiOS)[14] initiative (Biological Open Source), or Diversity Arrays Technology (DArT) Proprietary Ltd (Kilian 2009). These initiatives build on the Open Source Model which requires recipients of material to subscribe to the 'copyleft' clause, allowing for improvements (also patenting) and obliging them to share those on equal terms. It is now well understood that these initiatives do not restore the 'public domain' but create a 'contractual construed commons' (Reichman and Uhlir 2003), or 'club commons' (David 2011: 14), a 'total, conditional openness, the condition not being monetary remuneration but covenanted sharing behaviour' (Van Overwalle 2011: 82).[15]

This book, however, does not focus on access to common pools as such (cf. Uhlir 2011; Dedeurwaerdere 2010; Burk 2009), but on tailor-made regimes which retain public openness while respecting the CBD rationale. Thus the interest is in qualified regimes which allow for a deviation from the narrow bilateral contractual CBD approach. The three chosen regimes have become known for their proactive engagement in complying with the CBD.

A closer look at three common pools

ITPGRFA multilateral system

The ITPGRFA was agreed upon in 2001 and came into force in 2004. It is administered by the FAO.[16] Its goal is to secure access to plant genetic materials for farmers, plant breeders and scientists. It is conceived as sector specific (*lex specialis*) to the general CBD. It covers member states' resources *in situ* as well as national collections *ex situ*. Germany hosts two major collections covered by the Treaty,[17] the Leibniz-Institut für Pflanzengenetik und Kulturpflanzenforschung (IPK) Gatersleben[18] and the Julius-Kühn-Institute,[19] currently with 13 locations.[20] The centrepiece of ITPGRFA is the Multilateral System which submits 64 most important staple crops which account for 80 per cent of all human consumption (including wheat and rice in various collections) to access by everyone.[21] Its goal is expeditious access via Standard Material Transfer Agreements (SMTAs). However, the use of SMTAs is restricted to purposes of research, breeding and training. The standard form is not available for chemical, pharmaceutical and/or other non-food/feed industrial uses (Article 12 sec. 1 ITPGRFA). Benefit sharing in the Multilateral System is conceived of in two forms: (1) the primary avenue is free sharing of new developments at no cost for further research (and under the residuary obligations that the duty to share will be transferred to follow-on breeders); (2) however, if receivers want to keep the developments to themselves, they agree to pay a percentage of any commercial benefits they derive from their research into the common fund for the support of conservation and further agricultural development in the developing world. Thus, the ITPGRFA has transformed what was formerly a 'public domain good' into a novel category, which (1) secures access to breeders, farmers and individuals in a world of practised genetic patenting, (2) perpetuates the traditional breeders' freedom to operate,[22] and (3) provides compliance with the CBD in benefit sharing. Essentially, this scheme 'decouples' benefit sharing from use.

Although the Multilateral System is often referred to as 'public domain', it is not in the classical sense for two reasons. First, industrial users are excluded (chemical, pharmaceutical). If they seek access, they have to enter into an individually negotiated contract. Second, often the non-patentability of material 'as received' (Article 12 sec. 3 [d] ITPGRFA) is referred to as securing the 'public domain'. However, there is no evidence that this rule has broadened the scope of non-patentable subject matter beyond the prior standards of 'novelty' and 'inventive step'.[23] The central question of whether isolations and derivatives are patentable is still unresolved.[24]

IPEN

IPEN is a pool of botanical gardens with 148 member gardens located in 21 countries.[25] Two-thirds of them are university collections.[26] Founded in 2001, IPEN endorsed a club model aimed at complying with the ABS requirements of the CBD.[27] It perceives itself as a pioneering model of a sector-specific, self-regulating pool which has implemented a CBD-compliant, innovative model which keeps the existing exchange structures intact between members.[28] IPEN is exclusively accessible to botanical gardens. On average, 58 per cent of plant material in the collections stem from international seed exchanges *between* collections, and 12 per cent of materials are collected *in situ* (von den Driesch *et al.* 2008: 52). Its ultimate goal is to secure access to material, especially *in situ* in provider states. Its functional core is the easy exchange of material between members, which reduces the paperwork to the indication of the so-called IPEN number. No material transfer agreement (MTA) is required. The system is based on the commitment of members to non-commercial use. If one member brings in a new accession, it 'clears' the material for compliance with the domestic access and benefit-sharing rules of the provider state, documents it and assigns a number to the accession. This applies both to situations in which the gardens accessed the material themselves, and where they acquired it via a third party. The IPEN number encodes (1) the provider state, (2) the conditions of access ('un-conditioned'/'conditioned'), (3) the first accession garden, and (4) the unique (chronological) accession number.[29] An example of 'conditioned access' (signalled by the number '1' instead of the preferential '0') is, for instance, the provider state's insistence on documented/notified transfer between member gardens or the prohibition of providing seeds (i.e. vegetative propagation material only). Thus, the number guarantees that ABS rules have been observed. All material 'within in the system' should be legally accessed. In this sense, the first accession garden acquires a 'checkpoint function' (von den Driesch *et al.* 2008: 55). It also ensures traceability of material for the provider states.

Transfer to third parties requires their disclosure of intentions of either non-commercial or commercial use. Under a commitment of non-commercial use, transfer can happen under an SMTA which transfers all IPEN-agreed MAT to the other party (3.2.3 Code of Conduct). In addition, the SMTA obliges the other party to seek new PIC with the provider state once a use is not covered. Any transfer to commercial undertakings and to users with commercial interests requires that the user negotiates his/her own new and separate agreement with the provider state. Only *after* a document giving evidence about prior informed consent of the provider state has been submitted, and the other party has agreed that it will obey its bilateral duty to share benefits with the provider state, will transfer be executed under an individualized MTA (3.2.4. Code of Conduct).[30] Since

IPEN only covers non-commercial use, the material used for commercial purposes has to 'leave' the system. That means that the material will become 're-individualised'. Material inside the system will continue to circulate under the IPEN regime, while the 'leaving' material again becomes 'individual plant material' for which PIC and MAT have to be negotiated with the provider state as if it were accessed for the first time. Delivery by the garden only substitutes actual access on the territory of the provider state. The same procedure applies when an IPEN member wishes to commercialize its material (or use it in ways not covered by the provider approval): the material will be discarded from the system, as commercial use is only possible 'outside the system' (von den Driesch *et al.* 2008: 54). Sanctions for any breach of these duties, however, are not stipulated by the Code of Conduct. Hence, members depend on other strategies to secure compliance with the rules, e.g. by 'blaming' and 'shaming' in cases of biopiracy. As various sources have confirmed, in practice no transfer to third parties occurs (despite its theoretical and legal possibility).

Scientifically, the biggest treasure is the supplementary documentation. The system distinguishes 'maximal' and 'minimal' documentation. Whereas the minimal documentation is the IPEN number, supplemented eventually by any use restrictions[31] (which follows the plant [so called 'accession'] through descendants and transfers), the maximal documentation has to be produced by the first IPEN accession garden and whoever wants to transfer the material inside the network. The documentation includes all relevant information like taxonomy, the type of material, the source, the provider state, the nature of permits which might be necessary for the propagation of the material, and, if so, special conditions of the provider state.

Whereas the system has been widely adopted in Germany, the IPEN network covers only a small fraction of the global 1,800 botanical gardens.[32] Due to its non-commercial commitment, botanical gardens which engage in commercial research are advised also to sign the 'principles on access and benefit sharing for participating institutions' which have been devised under the lead of the Royal Botanical gardens of Kew that (historically) proactively promote the utilization of their resources by industry. Kew is not a partner of IPEN. Other major members of the 'principles', however, are (apart from Kew) the National Botanic Gardens of Ireland and the Missouri Botanical Garden. Thus, whereas the IPEN system secures smooth exchange between members, the overall effects of the system have remained quite limited. On the one hand, this is due to the limited number of member institutions. On the other hand, the explicit exclusion of any management or reporting on commercial utilization has resulted in very limited influence on the shaping of an equitable regime of benefit sharing. Although IPEN was initially considered to open the system towards use management, the plans were not pursued since gardens feared that provider states would then refrain

from providing material (Winter and Kamau 2009). Thus, in essence, the system secures the continuation of the specific German (scientific) type of botanical gardens.[33]

Moreover, additional interests in the 'scientific and non-commercial commitment' of botanical gardens support the continuity of the IPEN system. Since many IPEN gardens belong to universities (directors of botanical gardens are often, at the same time, professors at the local university), or engage in very close relations with them, botanical gardens grant access to their collections in the interests of academia. However, actual practices vary: some gardens treat universities as non-member institutions, and therefore apply the same transfer conditions to them and differentiate between non-commercial (SMTA transfer) and commercially oriented research (prior PIC submission required). University IPEN member gardens, however, transfer material to their colleagues in botanist faculties under IPEN terms (no SMTA required) – regardless of the actual context of the pursued research project as purely non-commercial or commercial, and transfer under SMTA to colleagues from pharmacology departments.[34]

Many universities hold botanical gardens for educational and research purposes. Some may be unaware of potential conflicts between their modern role, which includes technology transfer to industry,[35] and the IPEN system. Yet collaboration with IPEN members eases pressure on universities to comply with ABS. Modern universities cannot draw a clear line between non-commercial and commercial research, however much some might wish to restore it (von den Driesch *et al.* 2008: 55). The modern university has, for various reasons, strengthened its ties to the corporate sector.[36] Consequently, there are evident holes in the IPEN system when MTA-free transfer of material to academic research labs is possible (including digital IPEN maximal documentation). Whether the IPEN transfer (without MTA) to the university faculty complies with IPEN statutes is a question that has to be clarified with regard to the organisational structures in each single case. However, for reasons of CBD compliance, it is not irrelevant if the link to the garden is lost when the material entered the lab. Once the research results become patented (which will then be transferred to the commercial sector), it is highly probable that even in cases in which the indication of the country of origin is objectively possible although not mandatory (§ 34a German Patent Code), the indication will not be included in the patent description.

WFCC/ECCO microbial collections: DSMZ as an example

Central to academic and industrial research alike are microbial *ex situ* collections (Uhlir 2011a). On a global scale, the most important federation is the World Federation of Culture Collections (WFCC), which is engaged in the collection, authentication, maintenance and

distribution of cultures of microorganisms and cultured cells (ECCO as the respective European organization). Its core activity is the development of an international database on culture resources worldwide which records nearly 476 culture collections from 62 countries. Nr. 17.5 und 17.6 WFCC-Guidelines 2010 (3rd)[37] stipulate that the transfer of organisms must ascertain both intellectual property and PIC. Accessions are expected to comply with CBD requirements (including PIC and MAT). However, there is neither a depository which secures information, nor a mechanism for double checks.

Germany is listed with 13 WFCC collections held either by universities or the government (besides the numerous non-service oriented collections of universities and private corporations).[38] The most important WFCC collection is the German Collection of Microorganisms and Cell Cultures (Deutsche Sammlung von Mikroorganismen und Zellkulturen, DSMZ) in Braunschweig,[39] incorporated as a limited company (GmbH), owned by the state of Lower Saxony,[40] a member of the Leibniz-Gemeinschaft.[41] DSMZ is entrusted with three distinct tasks: (1) running an open collection with published catalogues, (2) being in charge of the deposit duties for biological material for patent purposes under the Budapest Treaty[42], and (3) providing for a safe deposit for duplicates where access is solely controlled by the depositor.

For deposit in the open collection, DSMZ requests disclosure of geographical origin and information about PIC und MAT.[43] In this way, DSMZ complies with the WFCC Guidelines, and with modern publication standards which require that the material, for which results are presented, is deposited and publicly accessible for scientists.[44] In addition, the transfer is conditioned: transferring material to third parties in order to secure retraceability is prohibited.[45] DSMZ informs the recipient that he/she might need to attain PIC and MAT by the country of origin before utilization[46] and excludes liability for any violation thereof.[47] In contrast, for the patent related deposits, no similar documentation about the geographical origin, PIC and MAT is currently requested.[48] Article 5 Budapest Treaty (BT) limits additional requirements to incidents of national security and environmental safety. According to Article 6 sec. 2 subsec. v BT, any material has to be accepted. However, this duty only refers to types of material that have been notified to the secretariat of the Treaty. Thus, the question of whether the collection may request disclosure of geographic origin remains open. One may either argue that additional requirements are not permitted, or that the BT lacks a regulation regarding the source information which can be settled by national legislators. Article 6 sec. 2 vii BT submits the collection to confidentiality. Access is granted via the appropriate patent office, with DSMZ only supplying the strain when they have granted permission. Equally, no information about PIC and MAT is requested for security deposits of duplicates.

Comparison

In contrast to many window-dressing assumptions as to 'public access', the primary goal of all three assessed regimes is to secure access to a specific constituency (IPEN: member gardens; ITPGRFA: everybody except industry; DSMZ: scientists and industry). They serve a respective epistemic community (IPEN: botanists and agricultural biologists and geneticists; ITPGRFA: agricultural breeding; DSMZ: biologists). All collections are interlinked in an international network which harmonizes standards, thus securing speedy, quality controlled global exchange. Quality includes the declaration of geographic origin, not necessarily proof of legal access and a contract about benefit sharing. The regulatory structures of these networks are surprisingly loose and function on a collaborative basis: while the agricultural collections are embedded in the international vertical state hierarchy of organisation, they enjoy a great amount of self-governing freedom. The WFCC is a private organization with national member collections, but standards seem to be strict. The Budapest Treaty has some regulatory impact. The network with the weakest organizational scheme is IPEN.

All three collections apply basic rules for CBD compliance with 'incoming material'. As a matter of principle (notwithstanding the two exceptions in DSMZ), none of the collections accept material of uncertain origin/providence (NP). However, while IPEN-numbered material has a 'cleared ABS status' (understood as material accessed according to national rules about access and benefit sharing as far as those exist), ITPGRFA and microbial collections do not even ask for a PIC certificate, or a declaration that MAT have been concluded (neither is a declaration that PIC and MAT were not required). What they do, however, is to provide a 'unique identifier' to the incoming resource.

For material transfer, minimal formalities are required between IPEN members: just the IPEN number suffices. For the transfer to 'other institutions', all collections make use of SMTA in order to lower transaction costs. For that reason, they use them for both CBD and non-CBD material (material acquired before 1992, and material not covered by the scope of the CBD), which has caused some fuss about the legal status of the material (for CBD material: expansion of public domain resources; for non-CBD material: restriction of public domain to the SMTA form). However, important differences exist about CBD requirements for the transfer to third parties. DSMZ gives only a hint to the recipient that he/she is responsible for obtaining PIC and MAT if required. For safety reasons, it prohibits any transfer to third parties (not for CBD-enshrined reasons like the dilution or loss of negotiated restrictions). IPEN members, at the other end of the scale, do not provide material to non-members in practice. However, statutes require that if they do, third parties must produce certificates which document PIC and MAT with the provider state. The

multilateral system of the ITPGRFA lies 'in the middle'. It generously provides access to the material to everybody – with two requisites: (1) an MTA was signed either with a copyleft obligation, or a royalty duty to the fund – both to be transferred downstream, (2) the 'everybody' are researchers, breeders and farmers, not 'big industry' (chemical, pharmaceutical, food).

Their own duty to share benefits with provider states has only pale contours. A limited number of IPEN gardens have engaged in attempts to transfer non-monetary benefits like training, repatriation and information sharing (as advised by the Bonn Guidelines, now Annex, No. 2 NP).[49] The ITPGRFA's approach is benefit sharing by 'share alike' (royalties come second). Microbial collections, like DSMZ, put all responsibility on the recipient. As a matter of principle, they reject their own qualification as 'users', therefore denying their own duties in benefit sharing. Overall, the collections' aim is to avoid benefit sharing.

'Specialized instruments' under Article 4 NP?

The question must be raised whether the three examined regimes can claim preferential status as a 'specialized instrument' under Article 4 NP, which justifies deviations from the general ABS rules. The direct applicability of the NP to *ex situ* collections *in general* is not quite clear. Yet it is undisputed that Article 4 NP (especially the exemption of Article 4 sec. 4 NP) is meant to cover the Multilateral System under the ITPGRFA. For all others, legal uncertainty persists. It should be clear, however, that states which host *ex situ* collections are responsible for making sure that rules governing accessions and the exchange of material are consistent with the ABS principles under Article 15 CBD. The bold proposition that collections are 'not users' and are therefore not subject to the NP, is certainly not substantiated. Considering the restorative intention of the discussed *ex situ* regimes, the following section examines if they 'are supportive to and do not run counter to the objectives of the CBD' (Article 4 sec. 2–4 NP), and conceptually reconsiders the function of collections as both 'providers' and 'users'.

Access

The CBD's goal is to make access to resources subject to the prior informed consent of provider states. The primary goal of the examined collections, however, is to restore prior exchange structures unhampered by exclusionary rights of states. Do collections thereby *undermine* the PIC requirement? What must be considered is that IPEN requires PIC clearance before it accepts material, ITPGRFA deems PIC clearance impossible for acknowledged reasons,[50] and DSMZ puts the duty on recipients. Thus the picture is not homogenous. It appears that the

practical effect of the collections' regulations run counter to the CBD rationale. This is not to say that the regulations as such are not CBD-compliant. But the collections' primary motive not to get involved in benefit sharing in any way undermines their intermediary, preparatory function to enable benefit sharing once commercial gains are realized.

In order to substantiate this proposition, the collections' motives have to be analysed. First, all three examined collections perceive themselves not to be primary addressees of the CBD. They interpret their own activities under the ABS rules to mean that they are incidental third parties. According to their perspective, it is 'big business' which owes benefit sharing to provider countries. They themselves can, and most are willing to, share the non-commercial benefits which they generate (scientific information). However, they need to respond to the rising pressure, to avoid accusations of 'biopiracy', and their own professional need to defend unhampered exchange against exclusionary practices of provider states and industry. Furthermore, in the case of IPEN, member gardens felt the need to respond regarding the denial of permits for bio-prospecting, which threatens the quality of collections in the long term. Their primary motive was to secure *in situ* access to member gardens and to restore the trust of provider states, which had been lost because of growing suspicion as a result of ever increasing public–private collaboration and scandals. The functional core of the IPEN regulations serves to shield their exchange structures (which they perceive as part of non-commercial research) from the corporate world. Finally, the ITPGRFA response has several dimensions. The Multilateral System reacted to the (for their sector impractical) bilateral CBD scheme *and* to the patent enclosures which have restricted the free exchange of agricultural seeds since the 1990s. Various conflicts between FAO collections and the chemical industry over patent protection have disrupted the ideal of public collections as embedded service institutions committed to open exchange.[51] The Multilateral System of the ITPGRFA is not only directed against the bilateral CBD approach, but also against the increasingly exclusionary structure of corporate agricultural business.

Taking this background into account, the attempt to evade the CBD access rules reveals itself as an attempt to shield pre-market scientific research from pressures which first emerged between provider states and industry. As specialized regimes, their primary intention is not to circumvent CBD access rules, but to uphold the operative rules of the subsystem. Thus, the regulations are not *preventing* adherence to ABS rules *in situ*; however, they are also not supportive to provider states either.

The central question, therefore, shifts to the *effects* of these regimes, and to the scope of responsibility of public collections to support the ABS rationale. When are sectoral agreements 'supportive to and do not run counter to the objectives of the CBD' (Article 4 NP)? From a legal standpoint, one may argue that the collections do not impede those who

seek access in provider states and comply with provider states' rules, and they are therefore compliant with Article 4 NP. Is this, however, enough to satisfy the requirement for 'support'? Does the NP require a more proactive stance? Does it require collections to counsel industry on access regulations in provider countries? Do they owe active support to industry in order to acquire PIC for access and commercial use of material stored in their collections (serving users by reducing transaction costs, and serving the environment by avoiding *in situ* bio-prospection)? The quality of the duty will depend on the definition of what 'support' under Article 4 NP means. I argue, since the NP has shifted the focus of ABS from product marketing towards R&D by defining 'utilization' as 'research and development' (Article 2 lit. c NP). All institutions engaged in R&D, not only industry, bear a responsibility for ensuring that the ABS mechanism, as such, functions. In the face of global exchange structures, CBD duties cannot be confined in terms of territory in the sense that provider states have duties under Article 15 sec. 2 CBD ('facilitation of access'), while user states bear duties under Article 15 sec. 7 CBD ('benefit sharing'). I argue that provider and user states (including networks of *ex situ* collections and industry) have a shared responsibility for the CBD mechanism to function. Due to the negotiation process, these duties are reported as reciprocal duties of convention parties. However, the final legal text does not divide into duties confined to providers ('access'), or user states ('benefit sharing'). The mechanism was installed to achieve a joint goal, namely to bring the depletion of biodiversity to a halt. Therefore, each party bears a duty for the whole mechanism. Since *ex situ* collections serve, from a functional perspective, both provider and user functions, a simple assignment of access referring duties to provider states (no duties for user states) cannot be upheld. The 'package of duties' has to be inferred from a more comprehensive analysis which also takes the whole mechanism of 'access and benefit sharing' into account.

Benefit sharing

As much as collections aim to reinstall free access and exchange, they are interested in avoiding benefit sharing. This is the very background for the disputed classification of collections as 'users' or 'providers'. They do not want to be classified as 'users' as they fear being obliged to share benefits in the sense that they are expected to pay.[52] Nor do they want to be classified as 'providers' as they do not want to be held responsible by provider states for ensuring that PIC and MAT are to their benefit. Most collections describe themselves as 'intermediaries'[53] or 'mediators' (Gröger 2007: 123) between providers and users, between science (non-commercial use) and corporations (commercial use) (von den Driesch *et al.* 2008: 52).[54] Some lean towards supporting the interests of provider states (IPEN);[55] others perceive themselves primarily as service institutions for users (DSZM). Their

refusal to engage in benefit sharing is consistent with their position as non-commercial entities: they generate non-commercial benefits and only those can be shared. The most important benefit is the 'coding' (identification and individualization) of genetic resources. In addition, IPEN and biological collections stress that providers benefit from the conservation of material and their access to biological data.[56] They initiate training of botanists (von den Driesch *et al.* 2008: 55), conservation and repatriation. IPEN aims at the bilateral inclusion of the provider institutions in the botanical gardens community.[57] The ITPGRFA system conceives the share-alike mechanism as sharing.

The point of departure is the self-description as 'non-commercial', generating non-commercial benefits, resulting in the duty to share non-commercial benefits. This line of argument, however, is the 'user duty rationale', which is not consistent with the *intermediary* rationale. This self-description makes all examined collections blind to the weaknesses in their regimes – namely, the fuzziness of today's commercial and non-commercial research divide – which, in the long run, will undermine their credibility. The biggest weakness in the way IPEN operates is the exchange, under IPEN conditions, with universities (regardless of their contractual links to industry). In the ITPGRFA system it is the still missing funding (which undermines trust). The largest problem with microbial collections is accessions which are not cleared for ABS conformity. All three weaknesses impair the possibility that future benefits will be shared with provider states.

These considerations shed light on what user states and collections owe under the NP. First, since the ABS mechanism *cannot be split* between the duties of provider and user states, user states bear a responsibility for regulating collections in the sense that they support, and not counteract, the access and benefit sharing mechanism (by deleting information). Second, collections owe benefit sharing once utilization results in benefits, whatever they may be. However, it is well understood that collections cannot be equated to 'the' (profit generating) 'user'. Third, the collections' most important activity is not covered by describing them as 'users'. The identification of resources is clearly in the interests of both, users *and* providers. This double function is consistent with their own self-description as standing between providers and users, being 'intermediaries'. As mediators, it is their task to provide transparency for partners to engage in informed negotiations.

Decoupling and linking of access and benefit sharing

Winter qualifies common pools as instruments which 'decouple access and benefit sharing':[58] the duty to share benefits is decoupled from the provider state (and redefined as benefit to everybody, including provider state), and decoupled from the bilateral CBD rationale.

The analysis of the three collection examples unearthed the functional element which enables decoupling of access and benefit sharing without discharging collections from ABS duties (thus upholding the connection). It is the intermediary function of *ex situ* collections. Economic theory defines intermediaries as 'the creation of a separate market in between two other distinct markets'; in economic terms, their function is the reduction of transaction costs for other markets (Spulber 1999: xiv). Economists distinguish intermediaries embedded in the value chain (producing something new), and brokers in the supply chain (trading the same thing). This reflection is useful for distinguishing different collections in their function. If the focus is identification, typology, making the resource available to the broader public by publishing, storage, display, transfer, etc., a collection could be qualified as an 'intermediary in the supply chain'. They typically do not transform resources, and generate no profits. But they still add value to the resource by the generation of information. Therefore, even if they generate non-commercial benefits, their duty is not reduced to share those. As long as the activity primarily serves 'users', intermediaries are submitted to a *derived* duty *to assure* benefit sharing. The image would be that they side with users (without being users themselves).[59] In similar terms, the systems theory qualifies intermediaries as translators between autonomous rationalities (Willke 1992: 319). Their task is at the same time connection *and* keeping systems apart. This double duty, however, raises questions of incentives and funding. Modern literature on 'trusted intermediaries' (recently discussed in the context of drug discovery (Rai *et al.* 2009: 280) openly explores these questions and should be the subject of future research.

Conclusion with regard to Article 4 NP compliance

The analysis showed that collections under Article 4 NP have to do more than be passive regarding the ABS compliance of those from whom they get material and those to whom they deliver. However, this chapter will not stop short with an inversely legalistic conclusion that the current regulations of the examined *ex situ* collections do not comply with Article 4 NP, based on the argument that they do not actively support it. The 'non-compliance' conclusion would, under the current discussion, quickly be misunderstood as an argument for further commercialization of public research. The conclusion must be more careful for two reasons: first, it needs to protect public, non-commercial research, as it serves a central function to uphold the complexity of the private–public divide. Second, duties need to be differentiated according to the collections' position along the abstract continuum between providers and users. However, I argue that *ex situ* collections fall short when either they resort to the old- fashioned saga of 'non-commercial research' or to the definition of being 'non-users'. This simplistic reasoning accounts for the loss of trust in the public research of

provider states. The trust can only be re-established by an open discussion and with differentiated rules, which sensitively respond to the conflicts at the rim of public and private research. The consequence is that collections must be submitted to the control of national ABS authorities: information is secured not only in the interests of science, but also for NP compliance. Therefore, the generation and transmission of information has to be non-discriminatory to countries of origin and not at the discretion of either the collection or the depositor. In the interest of global resource conservation, the avoidance of *in situ* bioprospecting can legitimately be organized by informing the provider state. National legislation may regulate the collections' activities, install supportive international reporting structures, and may legitimately use the legal techniques of defining them as users or by clarifying that user rules are applied to them [*mutatis mutandis*].

Conclusion

The analysis of three specialized pool regimes for *ex situ* networks reveals that they primarily restore prior exchange structures, and serve their own constituencies. However, they do not undermine the ABS rationale of the CBD, nor do actual arrangements actively support it. An important result of the analysis is the identification of wide loopholes due to regimes' ideology as non-commercial. This carries the risk that the specialized instruments will in the long run lose the trust of provider states. A more nuanced reflection about legitimate interests of provider states relating to specialized instruments is needed. A conceptual result of a brief interdisciplinary, informed legal reflection is to conceptualize *ex situ* collections as intermediaries. The consequence is to submit them to ABS duties *derived from* users' duty to share benefits, and to differentiate duties accordingly. Overall, the chapter concludes that these specialized regimes deserve support. However, they are in need of improvement. Regulation *and* institutional support should be installed to secure, at the same time, scientific quality and NP compliance. Speedy and functional diplomatic support needs to be provided for conflicts arising from access and benefit sharing. Financial support must be granted to intermediaries for providing support services to users. Under these conditions, the benefit-sharing mechanism as a whole (the general bilateral mechanism *and* specialized regimes) can be developed into a transnational redistributional instrument (a 'tax') earmarked for the preservation of biological diversity.

Notes

1 For an example of a provider state's *ex-situ* collections, see the analysis in the TEFF case (Godt 2009: 71–90, 2012).

2 Whereas plant collections have been working on CBD compliance regimes for years, the broader public became aware of the transnational dimension of

'access and benefit sharing' with regard to *ex-situ* collections in 2007 when Indonesia announced that it would deny access to its avian flu virus unless benefits (future developed vaccines) were shared (discussed at the WHO meeting on 25 November 2007); in the meantime a special regime on influenza viruses (the Pandemic Influenza Preparedness Framework administered by the WHO) has been negotiated (see Chapter 16).

3 These two forms might be covered as argued by Winter and Kamau (2011), and Frein and Meier (2012: 13); an alternative view is presented by Buck and Hamilton (2011: 57) who reject the applicability of the CBD to pre-CBD material.

4 Godt *et al.* (2012: 35) argue that whereas simple ongoing possession of pre-CBD material is not covered (due to 'true retroactivity'), new forms of utilization are covered, requiring users to seek PIC and MAT from providers.

5 Cf. Dedeurwaerdere (2010) who undertakes a similar exercise, focusing, however, on pressures to research commons by restrictive intellectual property rights instead of pressures of the ABS regime.

6 DSMZ holds microorganisms, as well as human and animal cell lines, and serves as an International Depositary Authority (IDA) under the Budapest Treaty on the International Recognition of the Deposit of Microorganisms. Its collections contain over 15,000 cultures, representing some 6,900 species and 1,400 genera (archaea, bacteria, plasmids, phages, yeasts, fungi), http://www.dsmz.de, viewed 23 January 2013.

7 E.g. Leibniz-Institut für Pflanzengenetik und Kulturpflanzenforschung (IPK) in Gatersleben (http://www.ipk-gatersleben.de/Internet, viewed 23 January 2013), adjacent to the national genbank for fruits (http://www.deutsche-genbank-obst.de, viewed 23 January 2013); the UR Wageningen (Netherlands) holds both an animal genetic genbank (http://www.cgn.wur.nl/UK/CGN+Animal+Genetic+Resources/Genebank, viewed 23 January 2013) and a plant genetic genbank (http://www.cgn.wur.nl/UK/CGN+Plant+Genetic+Resources, viewed 23 January 2013).

8 Be it for improving the scientific quality of the collection, or for financial reasons, e.g. the OECD 'Scientific Collections International' (http://scicoll.org, viewed 23 January 2013) initiative, a network of global national collections (like the British Museum, Museum für Naturkunde Berlin, Staatliche Museum für Naturkunde Stuttgart (the German collections constitute the DNFS.de)) currently headed by the Smithonian Instititution (Washington DC), (with some associated communal collections), which pool their collections digitally, provide connected information, repatriate knowledge, assist in building up collections in provider countries and engage in capacity building.

9 See the prominent 'Buffon Declaration' of 19 October 2007, adopted by 93 natural history institutions at a symposium held at the Museum of Natural History in Paris, http://www.bfn.de/fileadmin/ABS/documents/BuffonDeclarationFinal%5B1%5D.pdf, viewed 23 January 2013.

10 For example, the Friedrich-Löffler-Institut für Tiergesundheit (with 11 sub-institutes of which one is hosted in isolation on the isle of Riem), http://www.fli.bund.de, viewed 23 January 2013.

11 Not only do microbial collections digitalize their material (e.g. Uhlir 2011a: 86); also other large material collections (Botanical Garden Berlin, IPK-Gatersleben, Consortium of Natural Science History Museums) engage in building up digital databanks (Reinhold Leinfelder, until 2010 General Director of the Berlin Museum for Natural History, personal communication 23 June 2011).

12 'Traceability' vs 'tracking' was discussed by K Davis (2007) for the horticulture sector, advocating 'ex-post-traceability' as opposed to 'ex-ante-tracking'

(certificate). For a similar debate regarding microbiological resources, see Ph. Desmeth (2007) who advocates MASAICS as a system which allows both.

13 Many microbiological collections work on a for-profit basis.

14 Centre for Applications of Molecular Biology in International Agriculture (CAMBIA), having devised the Biological Open Source (BiOS) License. As a private non-profit research institute in Canberra, it launched the initiative in 2004, see http://www.cambia.org/daisy/cambia/home.html, viewed 28 January 2013, described by Berthels (2009).

15 For a critical account on contractual commons with regard to the impact on the overall 'freedom to operate' in the agricultural sector, see Wright (2010: 363 et seq.).

16 For an in-depth analysis of the multilateral system, see Chapter 17; also Henson-Apollonio (2009, pp. 289–293) or Gerstetter *et al.* (2007).

17 http://www.planttreaty.org/sites/default/files/inclu_Germany.pdf, viewed 21 February 2012.

18 A public foundation, http://www.ipk-gatersleben.de/ viewed 28 January 2013, and member of the Leibniz Society (an association), http://www.wgl.de/?nid=str&nidap=&print=0, viewed 23 January 2013.

19 A federal government institution, http://www.jki.bund.de, viewed 23 January 2013.

20 The Julius-Kühn-Institute is a higher federal agency, spread over 13 locations across Germany, http://www.jki.bund.de/de/startseite/ueber-das-jki.html, viewed 23 January 2013.

21 The number indicates how many collections a signatory has included in the Multilateral System: Brazil (5), Canada (4), Czech Republic (14), Scandinavia (inclusion by species listed in the annex), Estonia (inclusion by species listed in the annex), Germany (17), Jordan (1), Syria (1), Lebanon (1), Netherlands (4), Namibia (1), Madagascar (10), Malawi (2), Portugal (inclusion by species listed in the annex), Romania (1), Spain (1), Sudan (1), Switzerland (included the national genebank and private ones), UK (inclusion by species listed in the annex), Zambia (1).

22 Historically secured by (1) governments administering collections, and (2) an open access policy (see Kloppenburg (1988); Winter (1992)).

23 As evidenced by No. 6.10 of the SMTA.

24 On the fierce debate of the early days when negotiating the agreement (Godt 2007: 300 ff.).

25 Status on 12 May 2011 (the number in brackets indicates the number of member's gardens): Argentina (1), Austria (7), Belgium (3) Croatia (1), Czech Republic (1), Finland (3), France (6), Germany (47), Greece (3), Hungary (2), Israel (2) Italy (9), Luxemburg (1), Netherlands (21), Portugal (8), Romania (2), Spain (7), Sweden (3), Switzerland (14), United Kingdom (5).

26 A rate higher than for botanical gardens in general (here 50 per cent), https://www.cbd.int/doc/world/de/de-ex-bg-en.doc, viewed 23 January 2013.

27 IPEN Code of Conduct of November 2003, http://www.botgart.uni-bonn.de/ipen/conduct.pdf or http://www.bgci.org/resources/Description_of_IPEN, viewed 23 January 2013.

28 Regarding the 'checkpoints' model, see von den Driesch *et al.* (2008: 55); on 'unique identifiers' and 'sector specific regulation', see Gröger (2007: 121).

29 An example is 'DE-0-BONN-02348' (von den Driesch *et al.* 2008: 54): (1) DE encodes the provider state Germany, (2) '0' stands for 'unconditioned', (3) the first accession garden was 'BONN', (4) and 02348 indicates that it was the 2,348th accession.

30 Presumably, few commercial actors would pursue the costly ABS procedure for bio-prospection in the provider-state *before* being sure that their lead might produce financial returns.

31 Annex 5 of the IPEN Code of Conduct.
32 Some collections chose to be deleted from the list, like the Botanic Gardens of Wageningen University (Arboretum). It was deleted from the IPEN list in October 2009 after deciding (for financial reasons) to discontinue its management of the two arboretums as scientific collections (personal information by Bert Visser, 1 September 2011).
33 Royal Kew Botanic Gardens and the US collections have a different tradition, which is historically oriented to serving the commercial sector (ten Kate 1999: 168 ff.).
34 Andreas Gröger for the Munich Botanic Garden, personal communication, 13 September 2011.
35 A uniform development worldwide: for Germany § 2 Abs. 7 Hochschulrahmengesetz (revised 12 April 2007); for the US: BayhDole Act (Godt 2007: 167); for developing countries: So *et al.* (2008).
36 Structurally, the turn towards a 'knowledge and information society' has rendered basic research immediately relevant for application. Financial restraints in the public sector pressure scientists to turn to third stream money (Godt 2007: 172 ff.).
37 http://www.wfcc.info/guidelines, viewed 23 January 2013.
38 http://www.wfcc.info/ccinfo/index.php/collection/col_by_country/a/49, viewed 21 February 2012.
39 Concentrating on (1) naturally occurring prokaryotes (bacteria and archaea), yeast, fungi and viruses/phages, (2) genetically manipulated organisms, but also animal and plant cell lines, all of which have been created by human intervention, and (3) the supply of antisera raised against viruses.
40 http://www.mf.niedersachsen.de/portal/live.php?navigation_id=986&article_id=1517&_psmand=5, viewed 21 February 2012.
41 http://www.wgl.de/?nid=ers&nidap=&print=0#anchor_C, viewed 21 February 2012.
42 The Budapest Treaty was signed in 1977 and is administered by the World Intellectual Property Organization. It allows deposits of microorganisms at an international depositary authority to be recognized as sufficient disclosure as a patentability requirement.
43 http://www.dsmz.de/uploads/media/DSMZ_Accession_Form_Microorganisms_01.pdf, viewed 21 February 2012.
44 http://www.dsmz.de/deposit/deposit-in-the-open-collection.html, viewed 21 February 2012.
45 http://www.dsmz.de/bacterial-diversity/convention-on-biological-diversity.html, viewed 21 February 2012.
46 Ibid.
47 Ibid.
48 For example, for bacteria and fungi, http://www.dsmz.de/uploads/media/bacfun_engl_01.pdf, viewed 21 February 2012.
49 M Kiehn, Director of the Vienna Botanical Garden, and Austrian IPEN appointee, interview, 19 September 2011.
50 And therefore, the preamble, recital 15, and Article 8c NP give multilateral ITPGRFA priority over the bilateral CBD approach.
51 For a discussion on 'defensive patenting' as a response by public collections to corporate patenting strategies, see Godt (2007: 300); with regard to the International Maize and Wheat Improvement Center (CIMMYT) example (the Mexican FAO collection on maize), see Feindt (2010: 22).
52 Similar to the scientific community, which has feared the CBD for blocking access. For the acceptance of giving and taking: R. Leinfelder, 'Forschung für

das Gedächtnis des Lebens', *Süddeutsche Zeitung*, Sonderbeilage Artenvielfalt, 15 May 2008.

53 For microbial collections: Dagmar Fritze, Managing Director of DSMZ, interview with F Wolff, 29 February 2012.

54 Von den Driesch *et al.* (2008) speak about botanical gardens as 'user and provider of plant material [...] on the interface of non-commercial use and commercial use interests'.

55 'We are advocates of the provider states', A Gröger (IPEN appointee, Germany, Botanical Garden Munich–Nymphenburg), personal communication, 26 June 2012.

56 R Leinfelder, personal communication, 23 June 2011: the current state of the art is a three- level dataset: basic data/meta data/sequences, each level is interconnected.

57 See the example of the Katse Alpengarten Lesotho (von den Driesch *et al.* 2008: 55).

58 See Chapter 14.

59 A similar position is to be assigned to research funding organizations and academic scientists. Both groups 'enable' R&D on genetic resources similar to *ex situ* collections. Under the NP, academic researchers are classified as 'users'. Collections are, in most cases, not 'users'. However, the negative qualification does not exempt collections from ABS duties. All three groups may 'side with' users, in which case they have a 'derived duty' to ensure that benefit sharing is possible.

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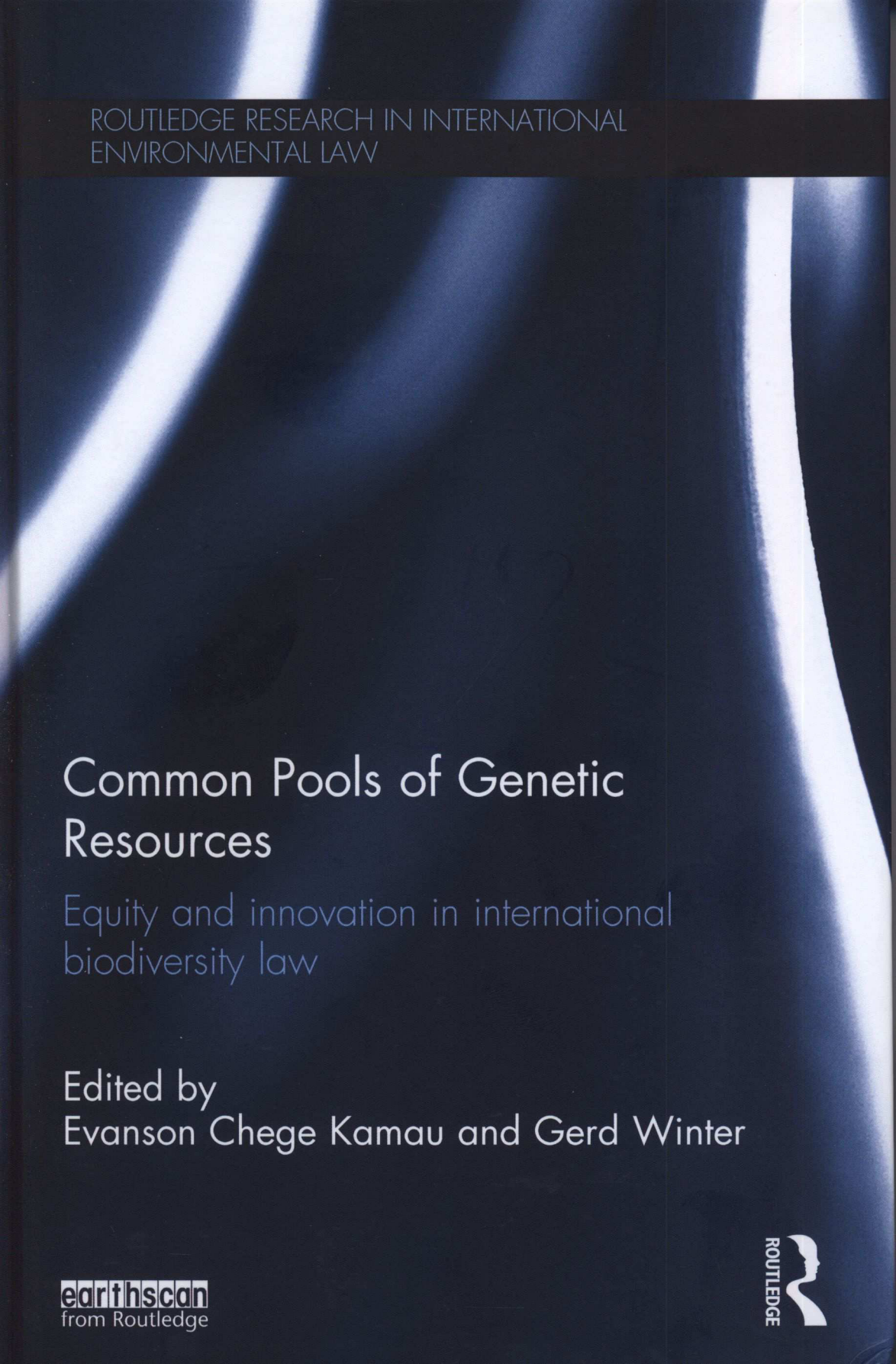
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