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Intellectual Property and Related Rights in Climate Data

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19. Intellectual property and related rights in climate data

Michael W. Carroll

INTRODUCTION

Climate scientists require vast amounts of data to do their work. Viewing the Earth as an integrated system with multiple interdependencies, climate scientists engage in longitudinal analysis of data from sensors monitoring land, sea, and sky around the globe to differentiate climate change from mere weather. Using ever more powerful computing resources, climate scientists seek to integrate all of these data into complex models that can explain, and perhaps predict, the causes and effects of climate change. No single scientific team by itself can gather such data; instead climate scientists must share data among themselves and persuade numerous public and private data gatherers and managers to share data with them.

As a general matter, many public policies support or enable data sharing among climate scientists. However, the challenges for effective data sharing in climate research are many-fold. Some arise simply from resource constraints: researchers are willing to share their data but lack the time, funds or infrastructure necessary to annotate or otherwise present their data to allow for meaningful reuse by other researchers. Others arise from competitive or cultural norms in some disciplines that treat data hoarding as acceptable scientific practice. Still other constraints on data sharing arise from policy concerns outside the scope of this chapter, such as privacy or national security concerns over sharing geospatial data, for example.

Setting these challenges to the side, this chapter focuses on the ways in which intellectual property law can act as a barrier to data sharing. Intellectual property laws supply exclusive rights that can enable a researcher, employer or funder to 'own' data; they can then bring legal claims against persons who access or reuse data without permission. Some of these rights attach automatically to data, data sets, or databases, and thus must be managed properly to enable robust data sharing in climate science. Other rights are created by contract, and the policies around such privately created rights must be understood and analyzed. This chapter briefly describes the variety of climate data needed by researchers and the role of intellectual property and related rights in governing access to and use of such data.

DATA COLLECTION AND DATA SHARING IN CLIMATE CHANGE RESEARCH

Intergovernmental organizations or national governments supply the largest share of climate data either directly or through research support agreements with private researchers. Summary data is available through the United Nations (UN) Intergovernmental Panel on Climate Change, including supporting materials for the Panel's Assessment Reports.¹ The Global Climate Observing System (GCOS) – a joint undertaking of four intergovernmental organizations (the World Meteorological Organization (WMO), the Intergovernmental Oceanographic Commission (IOC) of the UN Educational Scientific and Cultural Organization (UNESCO), the UN Environment Programme (UNEP) and the International Council for Science (ICSU) – seeks to provide comprehensive information on the total climate system, involving a multi-disciplinary range of physical, chemical and biological properties, and atmospheric, oceanic, hydrological, cryospheric and terrestrial processes. Along similar lines, the Group on Earth Observations (GEO) is a voluntary association of numerous governments and intergovernmental organizations working to create a Global Earth Observation System of Systems (GEOSS), which would enable integration of observational data for scientists in multiple disciplines, including those who study climate change. The WMO is a global intergovernmental organization that plays a key role in the free exchange of weather and climate data. Among its activities are to recognize regional climate centers, such as the European Climate Assessment and Dataset,² which offer daily observational data for reuse. At the national level, meteorological ministries and research councils provide or fund substantial weather and climate data. For those in search of individual data sources, the Goddard Space Flight Center of the United States (US) National Aeronautics and Space Administration (NASA) maintains a Global Change Master Directory, identifying tens of thousands of public and private data centers around the world.³

THE GENERAL LEGAL FRAMEWORK GOVERNING RIGHTS IN DATA

The number of intergovernmental initiatives and organizations just listed demonstrate that, at the policy level, there is considerable support for scientific cooperation among climate scientists. Data sharing is an important aspect of this cooperation. The final section of this chapter will identify some particular initiatives aimed at improving data sharing by encouraging data deposit in internet-accessible repositories and, in part, by clarifying that scientists have the right to reuse data. The need for this clarification arises because other public policies that grant exclusive rights or enable control over information resources could impede data sharing unless these rights are addressed directly.

Having acknowledged that the majority of researchers and institutions involved in climate science have expressed some level of commitment to data sharing, this section discusses the legal tools that could be used by a researcher or institution less enthused

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by the prospect of data sharing for whatever reason. Looked at through this lens, two forms of control over climate data must be addressed in order to enable effective data sharing among client scientists: access and use. Control over access may or may not implicate intellectual property law. In some cases, data may be protected as a trade secret or may be covered, in whole or in part, by copyright. In other cases, parties with exclusive control over the places, devices or media on which data are stored can use such control as the basis for limiting or bargaining over terms of use once access has been granted. Because the law is more specific concerning the applicable terms of use that apply to climate data than it is to the terms of access to such data, this chapter begins with the sources of law that supply the terms of use for climate data.

1. Copyright

A significant amount of raw climate data is not subject to copyright and can therefore be copied or reused without fear of liability under this source of law. However, copyright attaches much more readily to the structure, selection and arrangement of data in data sets and databases. As a result, copyright issues are likely to arise in connection with any large-scale data reuse or recombination.

Copyright law (discussed further in Chapter 4 by Daniel Gervais and Chapter 18 by Estelle Derclaye) is national in scope, and varies to some extent by country, but the minimum standards for exclusive rights have been harmonized through a range of international agreements to which nearly 200 nations have agreed. In general a copyright owner may prevent the reproduction, distribution, adaptation, public performance, public display or communication to the public of the copyrighted work subject to a range of limitations and exceptions.

Standards for obtaining copyright

In the context of research data, it is important to stress the limits of what qualifies for copyright protection. In the very large majority of countries, copyright attaches to an original work of authorship that has been embodied in a fixed form.⁴ Copyright does not extend to any underlying ideas or facts.⁵ Most climate data are facts for purposes of copyright law since they describe or represent, often numerically, information about the state of the world rather than an original expression of an author's idea or personality.

However, a database owner may have a copyright in the database structure or in the user interface with the database, whether as a report form or as an electronic display of field names associated with data. The key question is whether the judgments made by the person(s) selecting and arranging the data require the exercise of sufficient discretion to make the selection or arrangement 'original'. For example the US Supreme Court has held that a white pages telephone directory could not be copyrighted.⁶ The data – the telephone numbers and addresses – were 'facts' which were not original because they had no 'author'. Also, the selection and arrangement of the facts did not meet the originality requirement because the decision to order the entries alphabetically by name did not reflect the small degree of creativity needed.⁷

As a practical matter, this originality standard prevents copyright from applying to complete databases – such as those listing all instances of a particular phenomenon – that are arranged in an unoriginal manner, such as alphabetically or by numeric value.

However, courts have held that incomplete databases that reflect original selection and arrangement of data, such as a guide to the 'best' restaurants in a city, are copyrightable in their selection and arrangement.⁸ Such a copyright would prohibit another from copying and posting such a guide on the Internet without permission, unless a limitation or exception on copyright applied. However, because the copyright would be limited to that particular selection and arrangement of restaurants, a user could use such a database as a reference for creating a different selection and arrangement of restaurants without violating the copyright owner's copyright. Further, under the so-called 'merger' doctrine, copyright protection does not extend to original expressions when only a small set of practical choices for expressing an idea exist; that is, the idea and the expression are merged and the lack of protection for the idea governs.⁹

From these principles, it follows that data that represent facts about the world are outside the scope of copyright but that the 'work' to which copyright attaches can either be the structure of the database or a relatively small part of a database, including an individual data element, such as a photograph taken by a person. Software used as part of, or in relation to, the database also is copyrightable. It is therefore possible for a database to contain multiple overlapping copyrighted works or elements. To the extent that a database owner has a copyright or multiple copyrights in elements of a database, the rights apply only to these copyrighted elements.

In the climate context, sensor readings measuring atmospheric, aquatic or geologic conditions are uncopyrightable facts, and the organization of at least the raw data is likely to either be considered unoriginal or, if considered original, is likely to be subject to the merger doctrine. However, visualization techniques or technologies for these data may well require sufficient discretion to give rise to copyrightable works. The data, or visualization of data, about which copyrightability is most likely to be an important question is satellite imagery.

Satellite images are produced through a series of steps, beginning with remote sensing of different wavelengths of the electromagnetic spectrum by the satellite, which represents the sensed characteristics in raw digital data that are then transmitted to an earth station, where the data are minimally processed by an algorithm that assigns false color values for the image and possibly correlates the raw data with other geospatial data in storage. Additional processing by automatic or manual processes occurs frequently as well. Under the principles explained above, a satellite image is copyrightable only if it reflects sufficient human creativity in the form of expression. The issue of whether satellite images are copyrightable has been litigated in Germany and France, with the German court holding no copyright and the French courts holding that images were copyrightable, although on questionable grounds.¹⁰ In general, minimally processed images would appear to fall below the threshold of originality required for copyright-protected status, notwithstanding claims to the contrary made by some governmental and commercial satellite operators.

The duration of copyright

Climate change research often requires access to historical or longitudinal data. The prescribed terms of copyright means that to the extent that copyright law poses a potential barrier to sharing or reuse of some data, the copyright issues are likely to linger for a very long time. Under international treaties, copyright must last for at least

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the life of the author plus 50 years.¹¹ Some countries, including the US, have extended the length to the life of the author plus 70 years. Under US law, if a work were made as a 'work made for hire', such as a work created by an employee within the scope of employment, the copyright lasts for 120 years from creation if the work is unpublished or 95 years from the date of publication.¹²

Uncertainty about whether a set of climate data has any copyrights attached to its structure or arrangement may chill data sharing. This problem is likely to get worse over time, because if some form of permission or license is required for a desired reuse, identifying the owner(s) of the copyright(s) will be far more difficult 50 or 75 years hence.

Ownership and transfer of copyright

Copyright is owned initially by the author of the work. If the work is jointly produced by two or more authors, such as a copyrightable database compiled by two or more scientists, each has a legal interest in the copyright.¹³ The concept of authorship in copyright is quite distinct from authorship in science. Authorship norms for scientific papers or data sets require that credit be distributed across the team; whereas, copyright law limits authorship, and distributes the exclusive rights only to the writer or to those who design the data model or database structure.¹⁴ When a work is produced by an employee, ownership differs by country. In the US the employer is treated as the author under the 'work made for hire' doctrine and the employee has no rights in the resulting work.¹⁵ Elsewhere, the employee is treated as the author and retains certain moral rights in the work while the employer receives the economic rights in the work.

Copyrights may be licensed or transferred. A non-exclusive license, or permission, may be granted orally or even by implication. A transfer or an exclusive license must be done in writing and signed by the copyright owner.¹⁶ Outside of the US, some or all of the author's moral rights cannot be transferred or terminated by agreement. The law on this issue varies by jurisdiction.¹⁷

The copyright owner's rights

Copyright is automatic. Once a work of authorship has been fixed in a tangible form, the author receives the exclusive rights granted by law. The rights of a copyright owner are similar throughout the world, although the terminology differs as do the limitations and exceptions to these rights. As the word 'copyright' implies, the owner controls the right to reproduce the work in copies. In most countries, the reproduction right covers both exact duplicates of a work and works that are 'substantially similar' to the copyrighted work when it can be shown that the alleged copyist had access to the copyrighted work. One issue of uncertainty for data reuse is whether downloading a database with a copyrightable structure is an act of reproduction if the copy of the structure is made temporarily for purposes of data extraction. If a copy is so evanescent that it remains in computer memory for only one or two seconds while factual data is extracted, then the copy is not even a 'reproduction' under US law.¹⁸ Alternatively, if more durable reference copies of the copyrightable material are made, they are likely to be considered fair uses so long as they are not publicly shared and are necessary for the indexing or searching of the underlying factual data.¹⁹ With respect to sharing the copyrightable elements of data, the US divides the rights to express the work to the

public into rights to distribute a copy, to display a copy and to publicly perform the work. In other parts of the world, these three aspects are subsumed within a single right to communicate the work to the public. A separate copyright arises with respect to modifications or adaptations of a copyrighted work – the creation of a so-called ‘derivative work’ – so long as these modifications or adaptations are themselves original. This separate copyright applies only to these changes. The copyright owner has the right to control such adaptations unless a statutory provision, such as fair use, applies.

Limitations and exceptions

Recognizing that the broad grant of exclusive rights may in some cases cause more harm than good, the law limits copyrights or recognizes certain exceptions to their application, and these limitations and exceptions vary by country. In the US, the broad and flexible ‘fair use’ provision is a fact-specific balancing test that permits certain uses of copyrighted works without permission.²⁰ Fair use is accompanied by some specific statutory limitations that cover, for example, certain uses in the classroom and certain uses by libraries. The factors to consider for fair use are: (1) the purpose and character of the use, including whether such use is of a commercial nature or is for nonprofit educational purposes; (2) the nature of the copyrighted work; (3) the amount and substantiality of the portion used in relation to the copyrighted work as a whole; and (4) the effect of the use upon the potential market for or value of the copyrighted work. The fact that a work is unpublished shall not itself bar a finding of fair use if such finding is made upon consideration of all the above factors.²¹

In countries whose copyright law follows that of the United Kingdom, a more limited ‘fair dealing’ provision enumerates specific exceptions to copyright.²² In Europe, Japan and elsewhere, the limitations and exceptions are specified legislatively and cover some private copying and some research or educational uses.²³

The consequence for this global diversity of limitations and exceptions is significant for data sharing among climate scientists. The US fair use doctrine would likely permit a fairly wide range of data reuse, annotation or adaptation without permission from the owner of any copyrights attached to a data set when the reuse is done for research purposes. This is because the nature and purpose of the use would likely favor the user and the likely effect on the ‘market’ for the data set in many cases would be negligible. Elsewhere, the effects of reuse without a license could be treated quite differently. In some countries, limitations or exceptions that permit use of a copyrighted work for ‘personal use’ or ‘private study’ could potentially grant the user an even broader range of reuse than does fair use.²⁴ In other countries, the limitations or exceptions may be interpreted quite narrowly, requiring that data reuse would require a license to be lawful.²⁵

Remedies and penalties

In general, a copyright owner can seek an injunction against one who is either a direct or secondary infringer of copyright.²⁶ The monetary consequences of infringement differ by jurisdiction. In the US, the copyright owner may choose between actual or statutory damages. Actual damages cover the copyright owner’s lost profits as well as a right to the infringer’s profits derived from infringement. The range for statutory

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damages is \$750 to \$30,000 per copyrighted work infringed.²⁷ If infringement is found to have been wilful, the range increases to \$150,000.²⁸ The amount of statutory damages in a specific case is determined by the jury. There is a safe harbor from statutory damages for non-profit educational institutions if an employee reproduces a copyrighted work with a good faith belief that such reproduction is a fair use.²⁹

A separate safe harbor scheme applies to online service providers when their database is comprised of information stored at the direction of their users.³⁰ The service provider is immune from monetary liability unless the provider has knowledge of infringement or has control over the infringer and receives a direct financial benefit from infringement. The safe harbor is contingent on a number of requirements, including that the provider have a copyright policy under which repeat infringers will have their access terminated, that the provider comply with a notice-and-takedown procedure, and that the provider have an agent designated to receive notices of copyright infringement. However, this provision of US law, which also is reflected in the European Commission's so-called E-Commerce Directive,³¹ could provide significant protection to online data aggregators who rely on deposit of datasets from scientists or their supporting institutions.

2. European Database Rights

Climate researchers in the European Union (EU) and some of its trading partners must also take care to address a separate *sui generis* right that applies to certain databases that do not qualify for copyright protection. This right derives from Directive 96/9/EC of the European Parliament and of the Council on the Legal Protection of Databases (Database Directive).³² The Database Directive required Member States to limit copyright to only aspects of a database that are original, as is the case in the US, but then to further enact national legislation providing database owners with a new stand-alone legal right to control certain copying of factual or other non-copyrightable information in databases. All 27 countries subject to the Database Directive have complied with this requirement, and this right has been exported to some of the EC's trading partners, such as South Korea, through free trade agreements. However, repeated attempts to introduce such a right into US law have failed.

The database right

Article 7 of the Database Directive requires that: 'Member States shall provide for a right for the maker of a database which shows that there has been qualitatively and/or quantitatively a substantial investment in either the obtaining, verification or presentation of the contents to prevent extraction and/or re-utilization of the whole or of a substantial part, evaluated qualitatively and/or quantitatively, of the contents of that database.'³³ This provision can be broken down into (1) the eligibility criteria; and (2) the scope of the rights granted to those deemed eligible.

Under the Database Directive, a database is 'a collection of independent works, data or other materials arranged in a systematic or methodical way and individually accessible by electronic or other means'.³⁴ To qualify for this database right, the creator – which unlike in European copyright law can be a corporation³⁵ – must have made

qualitatively or quantitatively a substantial investment in either the obtaining, verification or presentation of the contents.

The eligibility criteria allow for multiple rights-holders in the same data. For example, researchers at University A may make a substantial investment in collecting data. The researchers at University A may then transfer or license the data to researchers at University B, who make a substantial investment in verifying the data. The University B team may then transfer the data to a team at University C, who then make substantial investments in presenting or visualizing the data.

This database right is initially held by the person or corporation which made the substantial investment, so long as (1) the person is a national or domiciliary of a Member State; or (2) the corporation is formed according to the laws of a Member State and has its registered office or principal place of business within the EU.³⁶ The database right lasts for 15 years from the date of publication or, in the case of unpublished databases, from the year of creation.³⁷

Data sharing among climate researchers potentially could implicate the database right. Under the Database Directive, a rights-holder may bring a claim for unauthorized 'extraction' or 'reutilization' of a 'substantial part' of a database. Extraction is defined broadly to mean 'the permanent or temporary transfer of all or a substantial part of the contents of a database to another medium by any means or in any form'. Reutilization is also defined broadly to mean 'any form of making available to the public all or a substantial part of the contents of a database by the distribution of copies, by renting, by on-line or other forms of transmission'.³⁸

A substantial part of the database is to be evaluated quantitatively or qualitatively, which means that even extraction or reuse of a small amount of data may infringe the right if that data has economic value to the right-holder. However, somewhat in conflict with the express language defining the right as covering only substantial parts of the database,³⁹ Article 7(5) of the Database Directive also provides that 'repeated and systematic extraction and/or re-utilization of insubstantial parts of the contents of the database implying acts which conflict with a normal exploitation of that database or which unreasonably prejudice the legitimate interests of the maker of the database shall not be permitted'.

Exceptions and limitations

The broad rights granted under the Directive are subject to specific exceptions and limitations. The Directive provides three specific exceptions under which a substantial part of a database may be extracted or reutilized without permission:

- (a) in the case of extraction for private purposes of the contents of a non-electronic database;
- (b) in the case of extraction for the purposes of illustration for teaching or scientific research, as long as the source is indicated and to the extent justified by the non-commercial purpose to be achieved; and
- (c) in the case of extraction and/or re-utilization for the purposes of public security or an administrative or judicial procedure.⁴⁰

Importantly, under the Database Directive, the rights-holder may not supplement the protection of the database right with a contractual license that restricts the user's right to use insubstantial parts of the database without authorization.

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An analysis of the effect of the Database Directive conducted by the European Commission in 2005 concluded that '[w]ith respect to "non-original" databases, the assumption that more and more layers of IP protection means more innovation and growth appears not to hold up'.⁴¹ The report offered policymakers four options: (1) repeal the whole Database Directive; (2) withdraw the *sui generis* right while leaving protection for creative databases unchanged; (3) amend the *sui generis* provisions in order to clarify their scope; (4) maintain the status quo. Comments were solicited from specific stakeholders. There was support for each option, but as of March 2012 no legislation was pending.

While scientific databases were not the animating case for database legislation, the broad definitions of databases that are covered and of the types of extraction and reuse that would infringe this right would almost certainly apply to a significant percentage of climate data. Fortunately for climate scientists, the law recognizes the potential harm that such broad application of the database right could cause, and thus provides an exception for reuse of unoriginal databases for scientific research that is 'non-commercial'.⁴² Unfortunately, some climate data have commercial value and the scope of the exception may not be broad enough to exempt all scientific reuse of climate data.⁴³

3. Contractual Rights

In general, even if no intellectual property rights attach to data or to a dataset, the person or entity that controls access to data may use this control as a means of requiring that potential users agree to a contract governing the terms of use of the data in exchange for the grant of access. The types of use controls expressed in these contracts often resemble the exclusive rights granted by copyright or the EU database right, and so they may be viewed as a type of privately created intellectual property. However, the law places some important limits on the ability of a person or entity with control over access to data to unilaterally decree what the applicable terms of use can be.

Intellectual property law itself may directly or indirectly limit the permissible scope of contractual restrictions on data reuse. A direct limitation is the provision of the EU Database Directive described above, which prohibits the right-holder from extending rights by contract to prevent reuse of an insubstantial portion of a protected database. Implicit in this prohibition is the idea that public intellectual property laws strike a balance between the rights of owners and users, and unlimited freedom of contract could be used by a right-holder to upset this balance. This same idea informs the doctrines of implied pre-emption and copyright misuse in the US, under which use of contracts to assert control over information in a way that conflicts with public policy will render the contract provision unenforceable.⁴⁴

A number of scholars have argued that courts should use this doctrine to nullify mass market licenses attached to factual or otherwise uncopyrightable databases which upset the balance between copyright and the public domain.⁴⁵ In the few cases to consider the issue, however, the courts have not found contractual restrictions on databases to be in conflict with the balance between owners and users in copyright law.⁴⁶ Their finding of no significant conflict has usually been grounded in a different limit on contractual

control over data, a limit grounded in the differences between contractual rights and property rights. A property right is one that can be asserted against any person who is not also an owner of the property. A contract, in contrast, requires consent and the contract is enforceable only against one who has assented to its terms.

In the case of data or a dataset that has no copyrights or database rights associated with it, the person who controls access can set the terms of use for any person who gets access from the person in control. But, if another user copies the data or dataset from the person bound by the contract, the copier is free to do so without restriction because he or she has not agreed to the terms of the contract and is therefore free to exercise all of the rights associated with work in the public domain. For this reason, the courts have found no conflict between these contractual restrictions on data and intellectual property law.⁴⁷ Only those who agree to restrict their use are so restricted.

In the case of climate data, contracts can legally be used to restrict some forms of data sharing among those researchers who agree, unless some law or public policy limits this use of contracts. However, the scope of control granted to the person who demands acceptance of contractual restrictions on data is less than that granted to the owner of a copyright or a database right in the data or dataset.

It should also be noted that the legal consequences of breaching such contractual restrictions are notably different from those that follow from copyright infringement. A breach of a copyright license usually exposes the breaching party to liability for copyright infringement, which can include remedies such as injunctions, statutory damages, attorneys' fees and disgorgement of profits. In contrast, a breach of contract usually does not entitle the other party to enjoin further reuse, and the breach exposes the breaching party only to liability for the database owner's actual damages, which must be proven with reasonable certainty. In many cases, it would be difficult to prove that unauthorized reuse of scientific data resulted in economic harm that could be shown with the requisite degree of certainty.

4. Public Licensing and the Public Domain

Those with rights to control access or use of data under copyright or the EU Database Directive can also choose to adopt a public license that encourages reuse, or even to waive these rights altogether, effectively placing data in the public domain. For data or datasets to which copyright attaches, owners may choose a Creative Commons license that authorizes members of the public to make a range of uses of the copyrighted aspect of the data or databases, subject to certain conditions. In all cases, the license requires the user to give the owner attribution as directed by the owner. The owner may also choose to authorize only non-commercial uses or to require that derivative works be licensed under the same license, or to prohibit derivative works not already permitted by the limitations and exceptions provided under copyright law. These licenses are marked in machine-readable language as well.

Creative Commons also offers two other tools of particular use for data: CC0 and the Public Domain Mark.⁴⁸ CC0 is a waiver of all rights under copyright and the EU Database Directive. Use of this tool encourages reuse without the user needing to identify which aspects of a dataset are copyrightable and which uses require a license or require compliance with the conditions imposed by a Creative Commons license. In

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particular, use of CC0 avoids the problem of incompatible licensing terms or ‘attribution stacking’, both of which can occur in cases of use of multiple copyrightable datasets licensed under different Creative Commons licenses.

Unlike CC0, which serves as a relinquishment of rights, the Public Domain Mark is simply a label that declares that the marked object is in the public domain for copyright purposes. Significant amounts of climate data are in the public domain because of the limits on copyright discussed above.⁴⁹ Clear labeling of the public domain can encourage reuse of the marked information by alleviating uncertainty.

THE EVOLVING ROLE OF DATA MANAGEMENT POLICIES

The discussion above describes the background information laws that apply to all data. Policymakers, however, have also adopted specific policies directed toward scientific data or even climate science data in particular. These policies differentiate among the primary types of data generators – governments, publicly funded researchers and private entities.⁵⁰ Data generated by public sector entities or by publicly funded researchers are subject to additional policies. In contrast, private entities generally are not subject to any data sharing requirements unless as part of a regulatory approval process.

1. Public Sector Information

Globally, the policies that apply to data generated or collected by public sector entities vary, but there are two principal approaches. The first treats these data as public goods that serve as inputs to speed the pace of scientific research. Under this approach, data are made freely available without restrictions on reuse. The US federal government is the leading proponent of this approach. With respect to usage control rights, even if copyright would otherwise attach to data generated by federal employees, the US has tailored copyright law to place such data generated by the government in the public domain immediately.⁵¹ With respect to access, unclassified government data is presumptively to be freely shared. This presumption was updated with the launch of the Data.gov initiative in 2009 designed ‘to increase public access to high value, machine readable datasets generated by the Executive Branch of the Federal Government’.⁵² Even when the government does not publish its data on the Internet or otherwise, members of the public may obtain copies under the Freedom of Information Act, unless one of the disclosure exceptions applies. Some governments that do not generally adopt this policy approach have made an exception for certain kinds of climate data.

The second policy approach to distributing public sector data is the licensing and cost recovery approach prevalent in the member states of the EU.⁵³ With respect to control, the majority of countries around the world grant full copyright, or a tailored version, to the government in works created by public sector employees. The government can license publication and reuse of these works in the same way that any other copyright owner may. With respect to access, the EU adopted a 2003 Directive on Public Sector Information (PSI Directive) to improve access by limiting the ability for governments to grant exclusive licenses and to cap fees charged for access to those

necessary to recover the costs of producing and disseminating public sector information.⁵⁴ Although the PSI Directive limited some of the more restrictive practices on data sharing among some member states, some commentators continue to criticize this policy approach for limiting reuse through licensing and price barriers, thereby reducing the value of public sector information and undermining the goals of collecting or generating the data in the first place.⁵⁵ The US also allows for some cost recovery for dissemination of public sector data, but the costs recovered are the incremental costs of information management, not the costs of production.⁵⁶

There is a third approach to data sharing that is the least common and most restrictive. While nearly all governments restrict access on national security grounds to some forms of climate relevant data, such as some geospatial data,⁵⁷ the general presumption is that such data should be made public. Authoritarian governments, however, tend to reverse this presumption, sharing data only when necessary or politically convenient or under the terms of data exchange agreements with other governments.

In general, in the fields of climate science, some recent intergovernmental initiatives show promise for improved data sharing even when the background policies would otherwise inhibit such sharing. Of particular note is the Polar Information Commons (PIC).⁵⁸ Launched in connection with the International Polar Year (March 2007 to March 2009), PIC is an initiative to provide for long-term stewardship of data about the polar regions, which is critical to the study of climate change. A range of data collectors voluntarily submits data to the PIC Cloud. Data submitters may choose between the CC0 waiver of rights or a Creative Commons Attribution Only license, meaning that the most that a user of data stored in the PIC Cloud would need do is give credit to the party designated by a data submitter.

Another recent initiative aimed at increasing data sharing to address detrimental environmental change is the Belmont Forum. Formed in 2009, The Belmont Forum is an ambitious global effort to organize effective international partnerships between funders, researchers, operational service providers, and users.⁵⁹ It aims to address the challenges of coordinating disciplinary, institutional, and financial resources via a single integrating conceptual framework, the Earth System Analysis and Prediction System (ESAPS).

2. Publicly Funded Research Data

In addition to public sector information, a significant amount of climate data is produced or collected by publicly funded researchers, usually based in universities. In general, under the background rules, any intellectual property rights in such data are owned by the researchers or their universities. However, governments can mandate or influence how access and control rights in publicly funded data are used to ensure data sharing among researchers. These policies should address what, how and when data sharing should occur, as well as who should bear the cost of making data available to other researchers.

As with the policies that govern public sector information, the policies that govern data sharing terms in public funding agreements also vary widely. These policies are evolving in response to the challenges of data preservation and the opportunities for

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collaborative research afforded by new digital technologies. For example, in the US, as of 18 January 2011, applicants for support from the National Science Foundation are required to submit a data management plan as part of their proposals to indicate how data generated with public support will be preserved or shared.⁶⁰ With respect to data sharing requirements among agencies that fund climate research, the Government Accountability Office issued a report in 2007 describing the range of data sharing requirements in the funding agreements of four agencies and concluded that these requirements could be and should be made more robust to ensure a full public return on the public investment in climate research.⁶¹

In 2007, the European Commission issued a communiqué entitled ‘Scientific Information in the Digital Age: Access, Dissemination and Preservation’ that primarily addresses access to scientific journal articles but which also states that ‘[f]ully publicly funded research data should in principle be accessible to all, in line with the 2004 OECD Ministerial Declaration on Access to Research Data from Public Funding’.⁶² As of 2011, these principles had not been fully translated into data sharing requirements in public funding agreements at the national level in the 27 members of the EU, but they have been implemented, or have influenced policy, in other OECD countries and those seeking OECD membership.

Elsewhere, data sharing requirements are even less uniform. In April 2011, the US National Academies of Sciences (NAS) hosted an international symposium entitled ‘The case for international sharing of scientific data: a focus on developing countries to facilitate information sharing to inform policy development in this field’.⁶³ It should be expected that these policies will evolve in response to both technological developments and increasing demands for international collaborative research on climate change.

CONCLUSION

The background intellectual property rules that apply to climate data pose potential obstacles to scientific research by empowering researchers or their employing institutions to exercise control over access or use of their data. These rules can be, and to some extent have been, overcome by specific policies that apply to climate data generated by public sector entities or publicly funded researchers, but there is considerable room for improvement on these fronts. In addition, without additional policy attention, private entities that gather climate relevant data, such as satellite images, will continue to use the rights of control and access granted by law to limit the sharing of their data.

NOTES

1. See United Nations Intergovernmental Panel on Climate Change, available 24 November 2015 at <http://www.ipcc.ch/>.
2. The European Climate Assessment and Dataset, ‘Home’, available 24 November 2015 at <http://eca.knmi.nl/>.
3. See NASA, Goddard Flight Center, ‘Global Change Master Directory’, available 24 November 2015 at <http://gcmd.gsfc.nasa.gov/>.

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4. See 17 U.S.C. § 102(a).
5. See 15 April 1994, Marrakesh Agreement Establishing the World Trade Organization, Annex 1C, Legal Instruments—Results of the Uruguay Round, Vol. 31, Agreement on Trade-Related Aspects of Intellectual Property, art. 9 [hereinafter TRIPS Agreement], 33 I.L.M. 1197.
6. *Feist Publications, Inc. v. Rural Telephone Service, Co.*, 499 U.S. 340 (1991).
7. *Ibid.*, at 362.
8. *Key Publications, Inc. v. Chinatown Today Publishing Enterprises, Inc.*, 945 F.2d 509, 513 (2d Cir. 1991).
9. *New York Mercantile Exchange, Inc. v. IntercontinentalExchange, Inc.*, 497 F.3d 109, 117–18 (2d Cir. 2007).
10. See Mejia-Kaiser, M. (2006), ‘Copyright Claims for Meteosat and Landsat Images Under Court Challenge’, *J. Space Law* 32 (2), 293–317.
11. Berne Convention for the Protection of Literary and Artistic Works, 9 September 1886, as revised and amended, S. Treaty Doc. No. 99-27, 1161 U.N.T.S. 30 (without 1979 amendment) [hereinafter Berne Convention].
12. See 17 U.S.C. § 302.
13. See *ibid.*, § 201.
14. Compare, e.g., American Chemical Society (May 2014), ‘Ethical Guidelines to Publication of Chemical Research’, available 24 November 2015 at <http://pubs.acs.org/userimages/ContentEditor/1218054468605/ethics.pdf>, with *Feist*, 499 U.S. at 347.
15. See 17 U.S.C. § 101.
16. See *ibid.*, § 204.
17. See Hugenholtz, Bernt and Paul Goldstein, (2012), *International Copyright: Principles, Law, and Practice* (3rd edn), New York: Oxford University Press, 357–69.
18. See *Cartoon Network, LP v. CSC Holdings, Inc.*, 536 F.3d 121, 129–30 (2d Cir. 2008).
19. See *Authors Guild, Inc. v. HathiTrust*, 755 F.3d 87, 97–101 (2d Cir. 2014).
20. See 17 U.S.C. § 107.
21. See *ibid.*
22. See e.g., *Pro Sieben Media AG v. Carlton UK Television Ltd.* [2000] ECDR 110, 113.
23. See, e.g., Copyright, Designs and Patents Act 1988, sections 29–30 (Eng.); Copyright Act, R.S.C., c. C-42, §§ 29–30 (1985) (Can.); and Copyright Act 1968, c.63 as amended, §§ 40–42 (Austl.).
24. See, e.g., *CCH v. Law Society of Upper Canada*, [2004] SCC 13, [2004] 1 SCR 339 (Can).
25. See Reichman, J. and R. Okediji (2012), ‘When Copyright Law and Science Collide: Empowering Digitally Integrated Research Methods on a Global Scale’, *Minn. L. Rev.*, 96, 1364, 1421.
26. See 17 U.S.C. § 502.
27. *Ibid.*, § 504(c)(1).
28. § 504(c)(2).
29. *Ibid.*
30. *Ibid.*, § 512(a).
31. See EU (2000), Directive 2000/31/EC of the European Parliament and of the Council of 8 June 2000 on certain legal aspects of information society services, in particular electronic commerce, in the Internal Market, [2000] OJ L178/6–7 [hereinafter Directive on Electronic Commerce].
32. EU (1996), Directive 96/9/EC of the European Parliament and of the Council of 11 March 1996 on the legal protection of databases, [1996] OJ L077/20–28 [hereinafter Database Directive].
33. *Ibid.*
34. *Ibid.*, Art. 1, § 2.
35. *Ibid.*, Art. 11, § 2.
36. *Ibid.*, Art. 11, §§ 1–2.
37. *Ibid.*, Art. 10, §§ 1–2.
38. *Ibid.*, Art. 7, § 2(b).
39. *Ibid.*, Art. 7, §§ 1, 5.
40. *Ibid.*, Art. 9.
41. NautaDulith (2005), *Study on the implementation and application of Directive 96/9/EC on the legal protection of databases*, available 24 November 2015 at http://ec.europa.eu/internal_market/copyright/docs/databases/etd2001b53001e72_en.pdf.
42. Database Directive, Art. 9(b).
43. Reichman, J. and P. Uhlir (1999), ‘Database Protection at the Crossroads: Recent Developments and Their Impact on Science and Technology’, *Berkeley Tech. Law J.*, 14, 793.

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44. *See, e.g.*, Lemley, M. (1999), 'Beyond Preemption: The Law and Policy of Intellectual Property Licensing', *California Law R.*, **87** (1), 111.
45. *See, e.g.*, Samuelson, P. and K. Opsahl (1999), 'Licensing Information in the Global Information Market: Freedom of Contract Meets Public Policy', *Eur. Intell. Prop. Rev.*, **21**, 386.
46. *See, e.g.*, *ProCD, Inc. v. Zeidenberg*, 86 F.3d 1447, 1449–52 (7th Cir. 1996).
47. *Ibid*, at 1454–5.
48. Creative Commons, 'CC0 FAQ', available 24 November 2015 at http://wiki.creativecommons.org/CC0_FAQ.
49. US National Research Council (2003), *The Role of Scientific and Technical Data and Information in the Public Domain*, Washington, DC: National Academies Press.
50. *See* Reichman J.H and P.F. Uhlir (2003), 'A Contractually Reconstructed Research Commons for Scientific Data in a Highly Protectionist Intellectual Property Environment', *Law & Contemporary Problems*, **66**, 315.
51. *See* 17 U.S.C. § 105.
52. 'About', available 24 November 2015 at <http://www.data.gov/about>.
53. *See* Uhlir, P. (2009), *The Socioeconomic Effects Of Public Sector Information On Digital Networks: Toward A Better Understanding Of Different Access And Reuse Policies*, Washington, DC: National Academies Press pp. 31–2.
54. European Commission (2003), 'Directive 2003/98/EC of the European Parliament and of the Council of 17 November 2003 on the Re-use of Public Sector Information', available 24 November 2015 at http://ec.europa.eu/information_society/policy/psi/docs/pdfs/directive/psi_directive_en.pdf; *see also*, OECD (2008), 'OECD Recommendation of the Council for Enhanced Access and More Effective Use of Public Sector Information', available 24 November 2015 at <http://www.oecd.org/sti/44384673.pdf>.
55. *See* Uhlir, at 12–13; OECD (30 March 2006), 'Digital Broadband Content: Public Sector Information And Content', DSTI/ICCP/IE(2005)2/FINAL, available 24 November 2015 at <http://www.ifap.ru/library/book066.pdf>.
56. *See, e.g.*, US Office of Management and Budget (2000), No. Circular A-130 (Revised), Management of Federal Information Resources, § 8a(7)(c), available 24 November 2015 at http://www.whitehouse.gov/omb/circulars_a130_a130trans4.
57. *See, e.g.*, US Geological Survey, Federal Geographic Data Committee (June 2005), 'Guidelines for providing appropriate access to geospatial data in response to security concerns', available 24 November 2015 at <http://www.fgdc.gov/policyandplanning/Access%20Guidelines.pdf>.
58. *See* 'Polar Information Commons: overview of PIC', available 24 November 2015 at <http://www.polarcommons.org/overview-of-pic.php>.
59. *See* International Group of Funding Agencies for Global Change Research (March 2011), 'The Belmontchallenge: a global environmental research mission for sustainability', available 24 November 2015 at <http://igfagcr.org/sites/default/files/documents/belmont-challenge-white-paper.pdf>.
60. *See* National Science Foundation (January 2013), 'Award and administration guide', ch.VI (D) (4), available 24 November 2015 at <http://www.nsf.gov/pubs/policydocs/pappguide/nsf13001/aagprint.pdf>.
61. *See* Government Accountability Office (Sept. 2007), 'Climate change research: agencies have data-sharing policies but could do more to enhance the availability of data from federally funded research', GAO-07-1172.
62. Communication from the Commission to the European Parliament (2007), The Council and the European Economic and Social Committee, 'Scientific information in the digital age: access, dissemination and preservation', Brussels, 14.2.2007 COM(2007) 56 final, available 24 November 2015 at http://ec.europa.eu/research/science-society/document_library/pdf_06/communication-022007_en.pdf; *see also* Organization for Economic Co-operation and Development (2007), 'OECD principles and guidelines for access to research data from public funding', available 24 November 2015 at <http://www.oecd.org/science/sci-tech/38500813.pdf>.
63. US NAS (2011), 'The case for international scientific data sharing: a focus on developing countries', organized jointly by the Board on International Scientific Organizations, Board on Research Data and Information, in collaboration with Committee on Freedom and Responsibility in Science, available 24 November 2015 at http://sites.nationalacademies.org/PGA/biso/PGA_061353.