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Property Rights for Forest Carbon: A Conceptual Perspective

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Abstract: This study delves into the intricate concept of "carbon rights" and their legal standing, particularly within publicly owned forests, utilizing the "bundle of rights theory" as a framework. The research analyzes Turkish Forest Law, employing the EFLD criterion to evaluate the security of access, extraction, management, exclusion, and alienation rights related to forest carbon. The findings reveal that while Turkish legislation provides robust provisions for access and extraction rights, aspects related to management, exclusion, and alienation exhibit certain limitations. Notably, this study highlights the constrained right of alienation in public forests, impacting the effective utilization of forest carbon rights. The study underscores the need for clear definitions and regulations regarding carbon rights, especially in countries with dominant public forest ownership, to foster sustainable carbon management and equitable participation in international carbon trading mechanisms.

Keywords: property rights; forest carbon; policy; law; sustainability

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1. Introduction

The foundations of climate science were laid in the 1800s with pioneering work by scientists such as John Tyndall, who identified heat-absorbing gasses [1], and Svante Arrhenius, who calculated the warming effect of increased CO_2 concentrations [2]. However, widespread recognition of climate change as a significant issue emerged later, particularly with growing evidence in the mid-20th century. The issue initially came to light in the 1970s during the Stockholm Conference, the inaugural United Nations (UN) Conference on the Human Environment. In 1988, governments established the Intergovernmental Panel on Climate Change (IPCC) on the advice of the United Nations Environment Programme (UNEP) and the World Meteorological Organization (WMO), turning climate research into a crucial component of political decision-making [3].

The 1992 Rio de Janeiro Earth Summit raised global awareness of the threat posed by climate change. The United Nations Framework Convention on Climate Change (UNFCCC)'s creation gave parties a forum to discuss the future course of action [4]. The UNFCCC started annual meetings of the Conference of the Parties (COP), which sparked a long-term negotiating process that finally resulted in the Paris Agreement, via the Kyoto Protocol and the Cancun Agreements, and with other significant agreements [5]. Concerns about the possible repercussions of climate change continue to rise, making the subject a top

priority for legislators, industry, and non-profit groups throughout the world [6]. Climate change poses a long-term threat to the earth's ecosystems and, potentially, the way people live [7]. Climate change issues are causing more countries to focus on accounting for and managing greenhouse gas (GHG) emissions [8]. Nonetheless, as of 2020, the only legally obligatory mechanism for reducing greenhouse gas emissions was the 1997 Kyoto Protocol. A total of 192 UNFCCC Parties, including the EU and its member nations, approved the Protocol. However, because many big polluters did not participate in the Kyoto Protocol, it only accounted for roughly 12% of world emissions [9]. The Protocol included flexibility mechanisms (Emission Trading (ETS)—Article 3; Joint Implementation (JI)—Article 6; and Clean Development Mechanism (CDM)—Article 12) designed to encourage international collaboration in the pursuit of shared goals [10]. The creation of adaptable market mechanisms built on the trade of emission permits was a key component of the Kyoto Protocol. The establishment of and trading in carbon credits pave the way for new debates, especially in the sense of treating "carbon" using a rights-based approach—"carbon rights". Although the concept of carbon rights had already been given legal standing in some nations, such as Australia and New Zealand, in the early 2000s, it only recently came to light in the discussion on Reducing Emissions from Deforestation and Forest Degradation in Developing Countries (REDD+) [11]. While the 2015 Paris Agreement (PA) does not mention "carbon rights", it allows the transfer of mitigation outcomes [12]. Furthermore, since the PA, which contained the REDD+ framework, was created, "carbon rights" has experienced a surge in popularity [13]. Thus, this study starts with an overview of the key concepts related to carbon rights in general and forest carbon specifically. It highlights the links between forest ownership and carbon rights. It also briefly illustrates the role of legislation in supporting a holistic concept of carbon rights as well as the benefits of theoretical approaches to legal analysis.

This study aims to present a comprehensive analysis of the concept of "carbon rights" and their legal standing, especially in the context of forest carbon ownership. The study delves into the intricacies of defining and regulating carbon rights, particularly in countries where forest ownership is predominantly public. The analysis is anchored in the theoretical framework of the "bundle of rights theory"—a foundational concept in property rights analysis that provides a structured framework for understanding the complexities of ownership and the use of resources. Introduced by Schlager and Ostrom [14], the theory categorizes rights into "access", "extraction", "management", "exclusion", and "alienation". These rights define the scope and security of ownership and are particularly relevant to forest management and carbon rights. Integrating this theory into the study of carbon rights helps clarify the intricate relationship between forest ownership and the regulation of carbon as a resource. A key objective of this study is to offer guidance to both national and international legislators on how to effectively integrate carbon rights into their legal frameworks, ensuring clarity, security, and equitable access to these rights for all stakeholders. This study also seeks to address potential obstacles to the recognition and enforcement of carbon rights, contributing to the development of robust and sustainable carbon management policies.

2. Materials and Methods

The analysis of carbon rights or carbon ownership in forests in Türkiye is based on the bundle of rights theory and the criteria derived from the rights outlined in Table 1, which provides definitions of access, extraction, management, exclusion, and alienation rights. As can be seen in the international carbon rights definitions explained in the literature, carbon ownership is mentioned in relation to forest ownership. It is hardly possible to separate the ownership of carbon held in trees and forest soil from the land in any case. For this reason,

the concept expressed with "the right to use" and "ownership of forests" also expresses the right to use and ownership of carbon.

Table 1. Bundles of rights theory and definitions (adapted from Schlager and Ostrom [12–14]).

Access	The right to enter a defined physical area and enjoy non-subtractive benefits
Extraction (withdrawal)	The right to obtain resource units or products of a resource system
Management	The right to regulate internal use patterns and transform the resource by making improvements
Exclusion	The right to determine who will have access rights and withdrawal rights, and how those rights may be transferred
Alienation	The right to sell or lease management and exclusion rights

Additionally, the security of rights associated with different ownership types (Table 2) has been examined. The criteria outlined below were used to evaluate ownership security, and each right was assessed individually based on these criteria.

Table 2. Security criteria of property rights for forest carbon.

Well Established	An approach involving all legislative levels, starting from constitution toward regulation (top to bottom), and hierarchy among legal sources
Clearly Defined	Who has the right to use the resource and who does not, and clearly defined boundaries of the resource
Well Implemented	Government authorities recognize users' rights to devise their own management institutions, plans are well understood, perceived, and implemented

In this study, each bundle of rights criterion was examined in terms of Turkish Forest Law, and each criterion related to property right security was questioned. We used a five-point scoring chart which will later be referred to as the EFLD (Environmental and Forestry Law Department) criterion (Table 3), previously used by Aydin Coşkun and Gençay [15], Elvan [16], Elvan and Turker [17], Elvan et al. [18], Elvan and Birben [19], and Türker and Aydin [20]. The criterion was assessed by scoring on a scale from 0 to 4: 0 = no provision; 1 = includes a general provision and is insufficient; 2 = includes a close provision but is not sufficient; 3 = includes an indirect provision and is sufficient; and 4 = includes a direct provision and is sufficient.

Table 3. EFLD scoring chart.

0	No provision
1	Includes a general provision and is insufficient
2	Includes a close provision but is not sufficient
3	Includes an indirect provision and is sufficient
4	Includes a direct provision and is sufficient

Access, withdrawal, management, exclusion, and alienation rights were considered in the evaluation of carbon in terms of bundles of rights, considering the security criteria of ownership in Turkish Forestry Law. For the security criteria, an evaluation was made based on "well established", "clearly defined", and "well implemented" criteria. The

evaluation made using all security criteria of each right definition is also graphed with EFLD scoring. In the graphic in Figure 1, an analysis of the "property rights for forest carbon" of Turkish forestry legislation in terms of bundles of rights is shown according to the security criteria, and in Figure 2, the bundles of rights are shown in terms of each security criterion. However, the equivalents of bundles of rights in Turkish forest legislation are shown in Table 4.

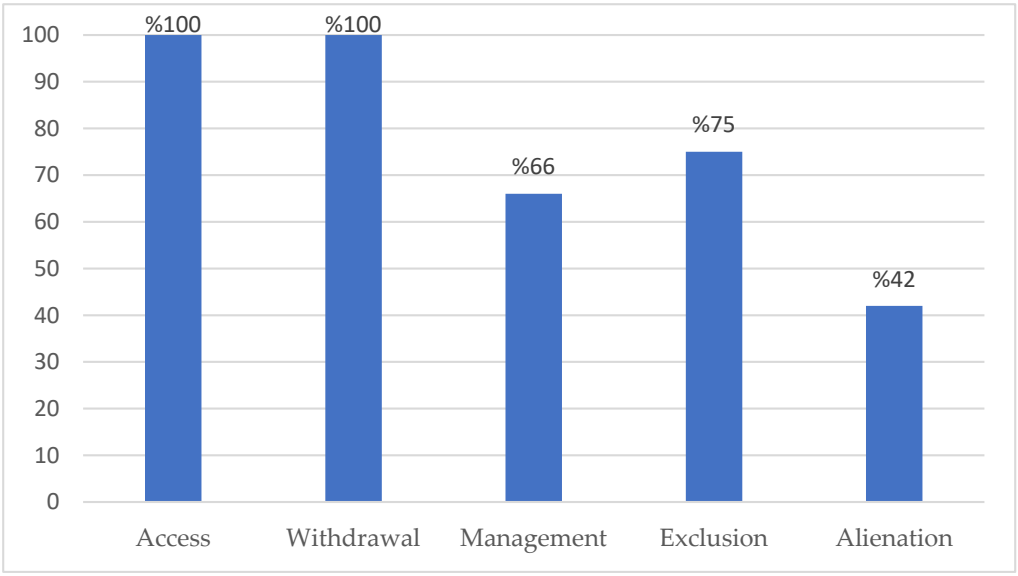


Figure 1. Bundles of rights in Turkish forestry legislation (in this graphic, an analysis of the "property rights for forest carbon" of Turkish forestry legislation in terms of bundles of rights is shown according to the security criteria (compiled by authors)).

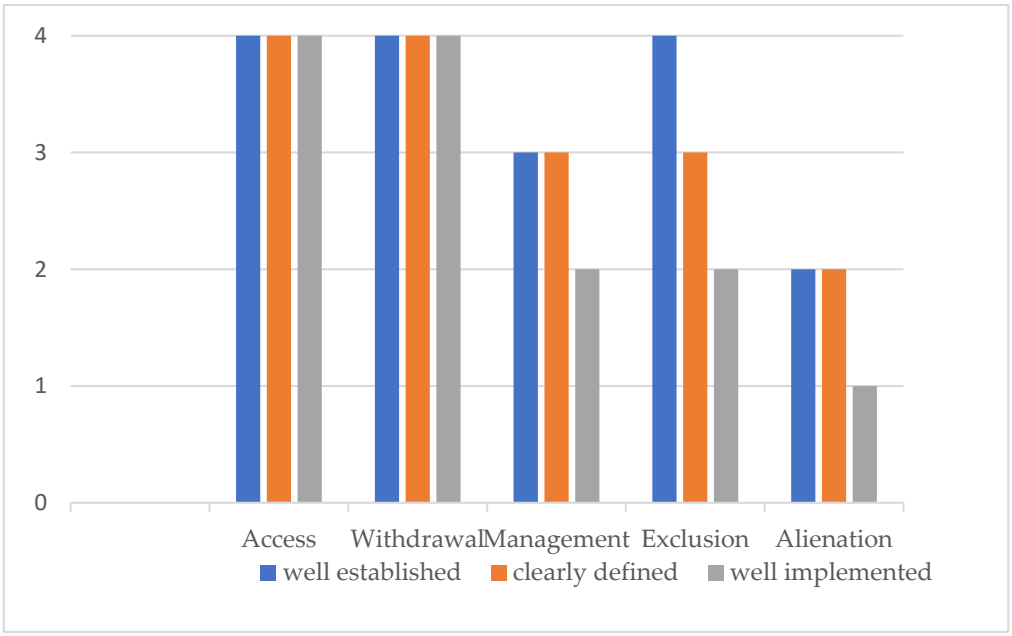


Figure 2. Bundles of rights in the Turkish forestry legislation security criteria evaluation using the EFLD scoring chart. (In this study, each bundle of rights criterion was examined in terms of Turkish Forest Law, and each criterion related to property right security was questioned. In Figure 2, the bundles of rights are shown in terms of each security criterion (compiled by authors).

Table 4. Definitions of carbon rights.

Definition Category	Definition
Carbon Rights	"Comprises the property rights to sequester and store carbon, contained in land, trees, soil, etc. and to benefits that arise from the transfer of these property rights." [21–24]
Carbon Sequestration Right	"In relation to land means a right conferred on a person by agreement or otherwise to the legal, commercial or other benefit (whether present or future) of carbon sequestration by any existing or future tree or forest on the land after 1990." [22–25]
Carbon Rights	"Refer to a justified claim that there is a benefit from reduced GHG emissions and/or sequestered carbon. The justification can be based on an activity that leads to forest conservation or an asset, such as the title or management right to land that enables forest conservation." [12,23–25]
Carbon Rights	"A shorthand term for a plethora of different tradable greenhouse gas (GHG) rights." [12,24–26]
Carbon Rights	"Define which parties have the right to the benefits generated from carbon emission reductions, e.g., by selling a carbon credit in voluntary and compliance carbon markets, or through a government-sponsored PES scheme. They can be-but are not necessarily-tied to the ownership of forest land. Carbon revenue can also be shared among stakeholders, e.g., different levels of government." [12,25–27]
Carbon Rights	"Carbon rights refer to the claims on the benefit streams from carbon pools, for example, the benefit from a specific parcel of forest. Where a market exists for GHG emissions reductions carbon rights may have a financial value. Carbon rights may also define the management responsibilities associated with a specific area of forest. Issues concerning carbon rights include how the rights are defined, how they work in places where land ownership is unclear, and whether legal institutions are strong enough to protect the rights." [12,26–28]
Carbon Right	"Means an interest in land referred to in section 6(1)(a); When a carbon right form is registered—(a) the carbon right that is the subject of the form is created and becomes a separate interest in the land in respect of which the form is registered." [26–29]
A Forest Property (Carbon Rights)	"Agreement separates ownership of carbon rights from ownership of the vegetation to which the carbon rights relate by transferring ownership of the carbon rights from the owner of the vegetation (the transferor) to another (the transferee)." [27–30]
Carbon Sequestration Property Right	"Means the exclusive and distinct legal right to carbon sequestration and carbon stocks." [28–31]
Carbon Sequestration Right	"In relation to a leased land or custom land means a right conferred by agreement to the legal, commercial or other benefit (whether present or future) of carbon sequestration by any existing or future tree, from a planted forest." [29–32]
Carbon Rights	"Means any carbon sequestration credits or offsets, renewable energy credits or similar method of attribution of a value, right or privilege for carbon sequestration that may be used to satisfy limits on carbon dioxide emissions or to reduce taxes, assessments or penalties on carbon dioxide emissions." [30–33]
Carbon Rights	"Owner shall own all carbon rights associated with timber growing on the Timberlands, including, but not limited to, long-term carbon sequestration credits, renewable energy credits, and renewable portfolio standards." [31–34]
Carbon Rights	"Means the right to any benefit or interest which arises or may arise in relation to the act of or the carrying out of carbon sequestration on or in the Designated Area including but not limited to any vegetation or biomass on or in the Designated Area including in its soil and includes any Carbon Right that is already registered." [32–35]
Carbon Rights	"The ownership of any carbon rights associated with Products sold to MeadWestvaco under this Agreement shall transfer to MeadWestvaco at the same time that title to such Products passes to MeadWestvaco." [33–36]
Carbon Rights	"Means any carbon sequestration credits or offsets, renewable energy credits or similar method of attribution of a value, right or privilege for carbon sequestration that may be used to satisfy limits on carbon dioxide emissions or to reduce taxes, assessments or penalties on carbon dioxide emissions." [34–37]
Carbon Sequestration Right	"if a person holds the applicable carbon sequestration right in relation to a project area of a sequestration offsets project, the applicable carbon sequestration right is an eligible interest held by the person in the project area." [35–38]
Forest Carbon Trading	"Refers to the payment by legal entities and organizations to those who manage, develop and protect the forest from destruction in order to allow the sequestration of forest carbon at agreed levels that are certified by the international organization concerned." [36–39]
Forest Carbon Trade	"Means a carbon market system in which payment made for carbon emission reduction by reducing deforestation and forest degradation or carbon stored by increasing forest coverage." [37–40]
Carbon Credit	"Means a saleable verified emission reduction or removal credit, or other carbon mitigation measure recognized under the standards of the Paris Agreement, which is equivalent to one tonne of carbon dioxide (or carbon dioxide equivalent), which can be counted towards an individual, company, country or organization's greenhouse gas mitigation targets; "Carbon trading" means the process of buying or selling certified emission reduction credits" [38–41]
Carbon Credit	"means any tradable certificate representing the right to emit one tonne of carbon dioxide (CO_2) or one tonne of carbon dioxide (CO2) equivalent." [39–42]

Table 4. *Cont.*

Definition Category	Definition
Sink Rights	"The Lieutenant Governor in Council may make regulations respecting emission offsets, credits and **sink rights** for the purpose of achieving reductions in specified gas emissions consistent with specified gas emission targets established under section 3 and the regulations may include, without limitation, provisions (a) respecting the description and nature of emission offsets, credits and **sink rights**; (b) respecting the manner in which and the terms and conditions subject to which emission offsets, credits and **sink rights** may be created, obtained, distributed, exchanged, traded, sold, used, varied and cancelled." [40–43]

3. Results

3.1. Carbon Rights Analysis of the Present Literature

3.1.1. Carbon Rights

Without a definition of a carbon right, it is not possible to reveal the limitations, scope, and forms of use of this right [44]. However, since there are different legal systems and different approaches related to it, it is not easy to construct, design, and frame this system [45]. While there are systems based on the prevention of climate change, there is also the concept of a carbon right, which is defined depending on the transformation of carbon trade into certain market systems and the placing of it on a certain basis [46,47]. This situation naturally led to the emergence of systems that provide different definitions and interpretations of the subject in different countries [48]. Therefore, it is very difficult to deal with carbon rights and the related benefits arising from them in a single system. When the subject is forest carbon, the situation becomes more complicated, and the carbon rights related to forest ownership come to the fore [49]. In other words, it is not possible to consider carbon ownership and the right to benefit from it separately from forest ownership [50,51]. In this case, the method of utilizing forests, which are public goods in most countries around the world, will be determinative of carbon ownership and the utilization rights that will arise in this context. Therefore, a different approach will be required regarding the ownership of the carbon right to be obtained by private individuals and institutions in the face of carbon ownership, which is a public good and has usage restrictions [52–54]. Therefore, thinking of carbon as a "commodity" that depends solely on the acquisition and sale of carbon credits should not be accepted as a correct approach. Linking forest carbon completely to forest ownership and adopting a strict public good approach will also increase restrictions on the use of the right and may adversely affect the international carbon trade that is being tested for operation. Therefore, it would be more correct to define the concept of "carbon ownership" and "carbon rights" as a product of the forest and, moreover, as a positive externality and to define the nationally determined contributions (NDC) of countries more strongly. Under these conditions, the debate over carbon rights frequently becomes a proxy debate about the equitable acknowledgement of ancestry and present claims. This also implies that carbon rights may be defined only when the underlying land issue has been recognized and addressed [55].

This issue will be discussed more broadly in the coming years and will be the main topic of international platforms. The increasing number of forest carbon ownership definitions and differences in the determination of carbon rights will complicate a uniform structure. Given the need to fully integrate the sociological and ecological aspects of carbon and climate change, the terminology of carbon rights also conflicts with the idea of a carbon property right, which the market and current legal system are yet to completely embrace [56]. Carbon rights must be understood, defined, and allocated. Only a very small number of nations have established carbon rights in accordance with their legal frameworks, and even then, meanings depend on the context [57]. For example, the carbon footprint of major sports events, such as the EuroLeague Final Four in Kaunas, demonstrates the significant environmental impact of transportation, energy consumption, and

waste generation [58]. The management of carbon rights must take into account the significant environmental impact of energy-intensive activities, such as transportation in sports, as well. For example, the carbon footprint of ice hockey leagues in Türkiye and Lithuania demonstrates the direct relationship between transportation choices and carbon emissions, highlighting the importance of integrating sustainability into event planning [21]. It is also stated in the literature that the relationship between carbon rights and sustainable tourism is particularly evident in the management of urban green areas [22]. A thematic review conducted by Beriozovas et al. [23] highlights how policies related to livelihoods and agroforestry are central to influencing land tenure and forest conservation practices, directly impacting carbon rights management. Below are various definitions of forest carbon rights available in the international literature. The definitions presented below are direct quotations from the relevant literature. It is possible to see the perspectives of countries on the subject.

The diverse definitions of forest carbon rights found in the international literature (in Table 4) can be categorized into several overlapping perspectives. Some emphasize **property rights**, focusing on ownership and transferability, often linking these rights directly to land or trees themselves (see References [24,30,31,36]). Others adopt a **Benefit-Based Approach**, highlighting who is entitled to the financial or ecosystem service benefits arising from carbon sequestration (see References [12,25,27,32,38]). A third group focuses on **market mechanisms**, emphasizing the tradable nature of carbon rights within carbon markets and compliance schemes (see References [42,49,53,57,58]). From a **legal and regulatory standpoint**, definitions may concentrate on the creation, registration, and protection of these rights within a legal framework (see References [28,29,43]). Finally, some definitions take a broader perspective of **forest carbon management**, encompassing activities like conservation, sustainable forestry practices, and the roles of various stakeholders in managing carbon sequestration (see References [34,35,39,40]). These diverse perspectives reflect the complexity and evolving nature of forest carbon rights in international discourse. Yet disagreements might become more controversial as a result of how various governments define ownership rights over carbon. Guaranteeing universal ownership rights over carbon is crucial to the cap-and-trade system's effective operation [25]. Weak recognition of ownership will fail in achieving what is desired in the sense of sustainability and climate mitigation. It is important to emphasize that even when legal explanations exist, proving carbon rights can be difficult, particularly if land titles are weak, challenged, or lacking [59]. At this point, it might be beneficial to re-examine property rights in general in order to better comprehend carbon rights [60]. The conventional and commonsense view sees ownership as a relationship between a person and a thing, while the contemporary and sophisticated perspective sees ownership as a bundle of rights [61]. Property rights are often explained by the bundle of rights theory, which is based on comparative law. Property law and legal education are increasingly dominated by the notion of a bundle of rights [62]. Legal data, combined with social and economic indicators, provide a more holistic framework for ensuring sustainable forest management and optimizing the benefits of carbon rights [63]. Monitoring the socio-economic indicators of private forest owners can provide critical insights into the effectiveness of carbon rights management and sustainable development strategies [64].

In the end, all environmental issues are also property rights issues [65]. Property rights and natural resource management are now a subject of research in environmental economics and policy-making as a result [66–68]. This is because managing natural resources is fundamental to economic growth [69]. Thus, the concept of the bundle of rights theory is vital for the sustainability of natural resource management and climate mitigation via carbon rights.

3.1.2. Bundle of Rights Theory

In order to understand forest carbon ownership and identify its constraints, it is important to be able to place it in a basic ownership rights framework. For this reason, in this part of the study, the "bundle of rights" theory will be explained first.

At present, the unfair distribution and allocation of resources are seen as dilemmas facing modern societies and as requiring legislation to address them [70]. These same problems afflict the distribution of natural resources in general and forest resources. Because forest resource systems have characteristics in common with many other resource systems, it is challenging to regulate and manage them in a way that is sustainable, effective, and fair [71]. Therefore, forest policies in a particular country must be made in an efficient and equitable manner to overcome difficulties, to sustain forest resources, and to enhance public welfare [72,73]. The level reached when making and planning forests is parallel to the development observed at a global level. Thus, in recent times, environmentally friendly and sustainable resource-use-oriented economic development strategies have become attractive worldwide [74,75].

One of the most efficient methods of achieving efficient and equitable resource use and sustainable economic development is to define and allocate property rights [76]. Because the successful and efficient management of natural resources is directly related to the concept of property due to its role in creating economic value, it is necessary to carefully consider property rights in all aspects. In addition to the criticisms that property structures encourage the unlimited use of resources and that these rights are mostly focused on maximizing short-term economic gains, which leads to the depletion of natural resources [77], it has also been frequently emphasized that property rights are either privately owned or state-owned. It has been emphasized that while private ownership can increase the economic efficiency of resources by encouraging individual entrepreneurship and market mechanisms on the one hand, it can also create the risk of the overconsumption of resources on the other hand; while state ownership ensures that resources are protected in the public interest, bureaucratic obstacles and management difficulties can reduce efficiency. The general tendency is to combine these two models in a hybrid system, i.e., to support market mechanisms with regulatory state policies [78]. At this point, a distinction is made between a property right and the concept of possession, which is not a right in rem like a property right but provides the right to use a natural resource. This is because while the right of property encourages use for individual benefit, possession may provide a limited authority regulated for social or ecological benefits. All these differences arise from the concept of property. Therefore, property rights are considered an important policy tool for governments, and legally defined, clearly delineated, and well-secured property rights are a prerequisite for economic development and investment [79]. Improperly designated, unfairly distributed, poorly allocated, and non-attenuated property rights raise questions about sustainability principles and political achievement [80]. In several countries, property rights, the subject of many theories and considerable current debate, are recognized and protected by various levels of legislation, from the constitution downward. Starting with constitutional provisions, Civil Code, Forest Code, and other relevant statutes contain several provisions dealing with property rights issues. Property rights are considered a concept in between law and economy and are constructed on the basis of such essential elements as rationality and economic scarcity. Since Roman times, the most important word in political and legal philosophy for expressing the allocation of society's limited resources has been "property" [81].

The first science discipline to deal with property rights was philosophy, and Plato, Kant, and Hegel, some of the most prominent philosophers, established a connection between property and society. Subsequently, property rights have become a concept quite

frequently used in the economy [82]. Theoretically, in some scientific publications like "Some Economics of Property Rights" by Armen Alchian, "Toward a Theory of Property Rights" by Harold Demsetz, and "The Property Right Paradigm" by both Armen Alchian and Harold Demsetz, the roles of property rights in economic and social life have been investigated and their historical development and structure have been analyzed.

At present, as it has become an essential element of the economy, the term property rights has many definitions. According to Alchian, a prominent defender of property rights theory, the term property rights is defined as the right to use an economic commodity and a right of selection within the social and legal context [83]. To Denman, property rights "is a form of power and authority for decision-making over concerning resources" [84]. Property rights define actions that individuals can take in relation to other individuals regarding some "thing". If one individual has a right, someone else has a commensurate duty to observe that right [85]. According to Bromley, property is not a physical object but a benefit stream, and to have a property is to have control over an object's benefit stream [86]. The above definitions are in line with the definition of property rights put forward by Commons [87]: that a property right is the enforceable authority to undertake particular actions related to a specific domain. Contrary to the commonly used legal definition, which characterizes property as a collection of rights, a common dictionary definition identifies property as an item or collection of things that one possesses [88,89]. On the other hand, in many neoclassical economic models, natural resource tenures are defined as "bundles of characteristics" such as comprehensiveness, duration, transferability, rights to economic benefits, use restrictions, security, operational requirements, and controls [90,91].

In this study, the "bundle of property rights" theory (Table 1), developed by Schlager and Ostrom [14] in respect to the definition and contents of property rights, is followed as a reference, and with reference to the said theory, property rights are classified into five subcategories: access, extraction, management, exclusion, and alienation. Countries where the state fails to specify even the most fundamental property rights to land, building sites, and other arable resources usually experience poor economic growth and persistent poverty [92,93]. Within this context, the relationship between the security of property rights and their development level requires special attention. By the same token, Coase [94] and Ostrom and Schlager [95] believe that well-defined and well-established property rights are crucial to providing the security that individuals and groups require to make reliable commitments toward one another and to making long-term investment decisions.

By following the research method defined above, we initially define the concept of property rights; then, the system established by Schlager and Ostrom [14] is pursued when investigating the rights and responsibilities arising from the property rights system. After explaining the contents of property rights in terms of users and conducting an analysis, we question the security of these rights with regard to property types. In this analysis, the following criteria are used: well established, clearly defined, and well implemented.

3.2. Right to Access Under Forest Carbon Ownership

Turkish forest legislation acknowledges the right to access, outlining provisions for ownership, utilization procedures, and relevant principles. To determine whether these rights are secure or not, Turkish access rights are summarized below.

3.2.1. Well Established

The 1982 Turkish Constitution mandates forest protection and expansion by the State. Ownership of State forests cannot be transferred, and operations remain the State's responsibility. The Forest Law (1956) designates the General Directorate of Forestry as the lawful proprietor and executor of all related operations. This hierarchy of norms establishes a

clear ownership structure. Similarly, issues of utilization and ownership appear at every level of the hierarchy of norms.

3.2.2. Clearly Defined

The Forest Law explicitly details how users may benefit from State forests. Regulations cover areas such as mining permits (Official Gazette Date: 18 April 2014; Number of Official Gazette: 28976; Implementation Regulation of Article 16 of the Forest Law), public interest permits (Official Gazette Date: 30 November 2021; Number of Official Gazette: 31675; Regulation on the Implementation of the Third Paragraph of Article 17 of the Forest Law), forest product processing, fish production facilities, archeological activities (Official Gazette Date: 30 November 2021; Number of Official Gazette: 31675; Regulation on the Implementation of Article 18 of the Forest Law), grazing permits (Official Gazette Date: 11 July 2012; Number of Official Gazettes: 28350; Regulation on the Procedures and Principles Regarding Animal Grazing in the Forests and in the Grassland, Plateau and Winter Barracks), and forest villager utilization rights (Official Gazette Date: 14 August 1987; Number of Official Gazette: 19544; Regulation on the Implementation of Articles 31, 32 and 33 of the Forest Law No. 6831). Corresponding regulations further elaborate on users, procedures, and operational principles.

3.2.3. Well Implemented

By constitutional decree, the State manages and operates its forests. The Forest Law empowers the General Directorate of Forestry to execute these duties. Detailed instructions are laid out for relevant commissions and bodies. Regulations regarding the forest cadastre (Official Gazette Date: 20 November 2012; Number of Official Gazette: 28473; Forest Cadastre and 2/B Implementation Regulation) (for property boundaries), the General Directorate of Forestry's organizational structure (Official Gazette Date: 24 January 2011; Number of Official Gazette: 27825; Regulation on the Establishment and Duties of the Provincial Organization of the General Directorate of Forestry), State-sanctioned forest planning (Official Gazette Date: 5 February 2008; Number of Official Gazette: 26778; Forest Management Regulation), and the independent administration of nature parks and recreational areas underscore this legal framework (Official Gazette Date: 28 May 2022; Number of Official Gazette: 31849; Forest Parks Regulation) for implementation.

3.3. Right to Extraction (Withdrawal) Under Forest Carbon Ownership

The analysis of extraction rights (withdrawing a product from a source) reveals their inclusion within forest carbon property in Turkish forest legislation. The security measures have been evaluated as follows.

3.3.1. Well Established

The 1982 Constitution mandates the State management and operation of forests. Furthermore, the Forest Law regulates production planning through to the transportation of forest products, all based on State forest management plans. Regulations exist concerning the sales (Official Gazette Date: 25 June 2021; Number of Official Gazette: 31522; Regulation on the Sales Procedures and Principles of Forest Products), transport (Official Gazette Date: 4 June 2004; Number of Official Gazette: 25482; Regulation on Transport Documents to be Given to Forest Products), and stamping (Official Gazette Date: 10 April 2004; Number of Official Gazette: 25429; Stamp Regulation) of these products.

3.3.2. Clearly Defined

Ownership and management principles were first stated in the 1982 Constitution and then further formalized in the Forest Law, giving the General Directorate of Forestry

exclusive utilization rights. Separate regulations detail procedures for State forests as well as forests that belong to public legal entities and private owners.

3.3.3. Well Implemented

Special afforestation provisions within the Forest Law grant permit holders conditional benefit rights within designated areas. Users may establish their own administrative bodies. Private forest owners must appoint responsible managers. Furthermore, forest park operators within State forests and the administrators of national parks and nature parks are all vested with operational rights and may create management structures. The relevant regulation (Official Gazette Date: 12 December 1986; Official Gazette Number: 19309; National Parks Regulation) is also in effect.

3.4. Right to Management Under Forest Carbon Ownership

3.4.1. Well Established

As detailed in the 1982 Constitution, State forests remain non-transferable to third parties and must be managed and operated by the State. Interestingly, the constitution enshrines the State's authority to declassify specific forest areas under stipulated conditions, a provision granting transformative power over resource ownership. The Forest Law aims to balance usage regulations with safeguards against detrimental alterations. Forest cadastral commissions play a vital role here; established by law, they define ownership boundaries on behalf of the State and act as resource protectors. While commission membership is defined, there is potential for the strengthening of regulations on the expropriation of private or treasury lands designated for incorporation into forests and, conversely, on removing areas that no longer retain essential forest qualities.

3.4.2. Clearly Defined

From the highest law of the land, the State management of its forests is unambiguously established. The General Directorate of Forestry is legally designated as responsible for implementing improvements and regulating related usage rights. While permits granted by State forests to businesses and private entities offer some benefits, it is crucial to recognize that not all uses lead to enhancing forest resources. Activities like mining, certain public interest developments, and forest product facilities might, over time, degrade forest resources and indirectly diminish carbon values.

3.4.3. Well Implemented

As per the Forest Law, the General Directorate of Forestry serves as the sole executor of activities across State forests and State-administered forest lands. While secondary legislation further clarifies its role, current regulatory gaps appear with permits granted within State forests. Specifically, in managing forest parks and nature parks, there is room for stronger planning and legislative support. Ineffective protocols create conflict between park administrations and permit holders. A prime example involves energy permits—recent evidence suggests increased fire risk with associated transmission lines. Proactive planning, in synergy with energy permit holders, would mitigate potential resource losses.

3.5. Right to Exclusion Under Forest Carbon Ownership

The right to exclusion is defined as the right to determine who will have access rights and who will not, and how these rights can be transferred. The security of the right has been examined according to the criteria determined in terms of Turkish forest legislation.

3.5.1. Well Established

Article 169 of the Constitution clearly states that the right of access lies with the State and that this right will be exercised by the State. However, in the Constitution, the reasons for taking resources out of forest boundaries were counted, and only the transfer of extracted areas to the treasury was allowed. In the Forestry Law, easement rights and allocations are clearly defined in terms of by which authority and to whom rights are given. Academic studies and judicial decisions on the subject also help in understanding the definitions of rights. On the other hand, the utilization rights granted to forest villagers are defined in the relevant articles of the law and in the provisions of the relevant regulation (Official Gazette Date: 31 July 1997; Number of Official Gazette: 23066; Regulation on Supporting the Development of Forest Villagers). Likewise, there are provisions in both the law and in the regulations regarding forest parks and national parks, nature park management, and afforestation permits regulated in the Forestry Law.

3.5.2. Clearly Defined

Article 169 of the Constitution contains a definite provision that the ownership of State forests cannot be transferred and can only be subject to the right of easement. With regard to the utilization of forests, the limits of utilization rights related to easement and allocation are defined in the Forest Law as well, and who can have the right to benefit is clearly regulated. It is also stated that only forest villagers will benefit from certain rights assigned to them. However, it has also been stipulated that only State institutions will be allowed to benefit regarding health, education and sports facilities, and related permits. However, public benefit criteria were used for these permissions, and no special user definitions were made.

3.5.3. Well Implemented

The OGM is the only and most powerful administration/institution in the management of forests in accordance with the mandatory provisions of the Forest Law. The OGM is responsible for implementing and planning forest management plans and programs well. The OGM can grant the right to benefit from forests to individuals and institutions within certain periods, with the permission of the Ministry. However, although the right of access is clearly regulated both in the mentioned articles and in the regulations, there are no explanatory provisions regarding the rights of withdrawal and transfer. In this regard, reference is made to general laws. Therefore, the right of withdrawal and transfer regarding the right to benefit from the forest should be included in forest legislation.

3.6. Right to Alienation Under Forest Carbon Ownership

The right to alienation is defined as the willingness of an owner to sell, lease, or exchange property. This right for carbon ownership in terms of Turkish forest legislation has been evaluated according to the criteria of well established, clearly defined, and well implemented as follows.

3.6.1. Well Established

In accordance with the imperative provision of the Constitution, "State forests are managed and operated by the State", the operation of State forests is a right that is given only to the State. There is an open door in that some works and processes that need to be conducted during forest operation can be carried out by third parties through tenders. For example, free forestry offices can perform management, afforestation, and forest park or nature park planning duties. However, in terms of forest legislation, the sale of State forests or the transfer of ownership is not possible. This is due to the imperative provision

of the 1982 Constitution. Only in accordance with the Forest Law and with management plans can forest products be put on sale at the end of their harvest period. Regarding renting, it is written in the Forest Law that only those who build houses in the highlands can become tenants of the forest administration if they meet the conditions. As for the right to alienation, the forestry administration can remove those who occupy forest areas illegally and can take legal action to impose sanctions. The right to alienation is possible for private forests and forests that belong to public legal entities. Pursuant to the relevant articles of the Forest Law, forests belonging to public legal entities can be transferred without dividing, and private forests can be transferred to third parties without dividing them for forests no less than 500 ha in size.

3.6.2. Clearly Defined

The right to the use of State forests belongs to the GDF, and for forests belonging to public legal entities and private forests, the right to use belongs to the forest owners. Permission rights are transferable, but the recipient cannot acquire ownership of these areas.

3.6.3. Well Implemented

There is good administrative management regarding easement and allocation in the relevant articles of the Forestry Law. In addition, the explaining and planning of legislation on these issues are carried out sufficiently. Moreover, the provisions of the OGM organization regulations also formed the hierarchical structure. On the other hand, the permissions stipulated in the Forest Law are used in a limited manner. Permit holders are required to have the forest administration approve the transfer of their permit rights to a subcontractor. However, there are no effective provisions for the right to alienation of permit holders when utilizing forest areas. In addition, although they have the right to transfer their own properties regarding forests (private forests and forests belonging to public legal entities), they cannot transfer their immovables by dividing them into small parcels. Also, in illegal interventions, legal follow-up occurs under the authority of the GDF. The works and practices of forest owners are also under the control and supervision of the GDF.

Table 5 provides a concise overview of the rights and provisions within Turkish forest legislation, illustrating how constitutional and legal regulations influence forest resource management and utilization. The key findings include the following: ***Multi-layered Structure***—rights are regulated at both constitutional and legal levels, ensuring comprehensive principles and detailed implementation rules. ***Complexity***—numerous legal articles govern these rights, potentially complicating understanding and application. ***Management-Oriented Approach***—the legislation prioritizes sustainable management, balancing economic, social, and ecological benefits. While not exhaustive, Table 5 offers a foundational overview of key legislative principles.

Table 5. Bundle of rights and provisions in Turkish forest legislation.

Bundle of Rights	Constitution	Ordinary Law
Access	Constitution Art.—169	Law No: 6831; Art.: 6, 7, 8, 9, 10, 11, 16, 17, 18, 19, 26, 31, 32, 33, 51, 57
Extraction (withdrawal)	Constitution Art.—169	Law No: 6831; Art.: 6, 25, 26, 27, 28, 29, 45, 46, 47, 48, 49, 50, 51,52, 53, 54, 55, 56, 57
Management	Constitution Art.—169	Law No: 6831; Art.: 2, 6,7, 8. 9, 10, 11, 16, 17, 18, 19, 20, 21; Additional Articles: 16, 25, 45, 46, 47, 48, 49, 50, 51,52, 53, 54, 55, 56, 57
Exclusion	Constitution Art.—169	Law No: 6831; Art.: 2, 16, 17, 18, 19, 20, 21, 25, 26, 30, 31, 32, 33, 34; Additional Articles: 16, 47, 53, 57, 61, 92, 93, 94, 95, 96

Table 5. *Cont.*

Bundle of Rights	Constitution	Ordinary Law
Alienation	Constitution Art.—169	Law No: 6831 Art.: 16, 17, 18, 19, 20, 21, 25, 30, 31, 32, 33, 34, 57

4. Discussion

Forests play a crucial role in combating climate change, serving as both carbon sinks and renewable energy sources. Recognizing the importance of forest protection, this paper highlights the complexities surrounding forest carbon rights, particularly in the context of public ownership, which dominates globally. While private ownership allows for greater flexibility in transferring and selling carbon rights, public ownership often imposes restrictions. This necessitates clear legal definitions of carbon rights and their scope to facilitate effective carbon management and participation in initiatives like carbon offsetting and emission trading schemes (ETSs).

The lack of clear ownership frameworks, particularly for the right of alienation, can hinder the effective utilization of forest carbon rights. This is particularly relevant for countries with significant public forest ownership—*73% of the world's forest resources are under public ownership. Considering the proportional situation of public ownership in the countries with the most forest areas, it is seen that public ownership is represented at very high rates (Russia—100%; Brazil—77%; Canada—93%; America—37.8%; China—45%; Australia—70.9%; Democratic Congo—100%; Indonesia—99.4%; Peru—N/A; India—76.1%.)* [96,97]. *Considering these general distributions in the world, public ownership is seen as dominant. If we add the most GHG-emitting countries (China (32.93%), United States (12.55), India (7.33), and Russia (7.00)* [98]*) to the equation for this assessment, it is much clearer that the necessary regulations related to carbon rights should/would be designed/formulated within the framework of public ownership*—potentially excluding them from carbon markets and contradicting the principle of joint responsibility enshrined in the Paris Agreement. Therefore, establishing common definitions and concepts for carbon rights is crucial to ensuring equitable participation in international climate mitigation efforts.

5. Conclusions

This study examined the concept of "carbon rights" through the lens of the bundle of rights theory, focusing specifically on the context of Turkish forest legislation and the implications for publicly owned forests. Our analysis revealed that while Turkish law provides robust provisions for access and extraction rights related to forest carbon, limitations exist concerning management, exclusion, and alienation rights. Notably, the constrained right of alienation in public forests presents a significant obstacle to the effective utilization of forest carbon rights, especially concerning their tradable potential within international carbon markets. This limitation may hinder Turkey's full participation in market-based mechanisms for climate change mitigation and potentially impact its ability to achieve its nationally determined contributions (NDCs) under the Paris Agreement. Furthermore, the lack of a comprehensive legal framework defining and regulating carbon rights may impede sustainable carbon management practices and discourage investment in carbon sequestration projects.

The findings of this study have broader implications for countries with dominant public forest ownership, highlighting the urgent need for clear definitions and regulations regarding carbon rights. Establishing a legal framework that balances public ownership with the need for flexible and tradable carbon rights is crucial to fostering equitable participation in international carbon trading mechanisms and promoting sustainable forest management practices. This necessitates moving beyond a purely commoditized view

of carbon rights and acknowledging the multifaceted value of forests, including their ecological, social, and economic benefits. Future research should focus on developing comprehensive and context-specific legal frameworks for carbon rights, considering the unique challenges and opportunities presented by different forest ownership structures. Further research should also explore the potential of innovative market mechanisms and policy instruments to incentivize carbon sequestration and sustainable forest management in public forests. By addressing these issues, we can pave the way for a more equitable and effective global response to climate change, ensuring the long-term health and productivity of our planet's vital forest resources.

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References

1. Arrhenius, S. On the influence of carbonic acid in the air upon the temperature of the ground. *Philos. Mag. J. Sci.* **1896**, *41*, 237–276. [CrossRef]
2. Tyndall, J. The Bakerian Lecture: On the Absorption and Radiation of Heat by Gases and Vapours, and on the Physical Connexion of Radiation, Absorption, and Conduction. *Philos. Trans. R. Soc. Lond.* **1861**, *151*, 1–36. [CrossRef]
3. Ivanova, M. Politics, Economics, and Society. In *The Paris Agreement on Climate Change: Analysis and Commentary*; Klein, D., Carazo, M.P., Doelle, M., Bulmer, J., Higham, A., Eds.; Oxford University Press: Oxford, UK, 2017; pp. 17–27.
4. Duruji, M.M.; Olanrewaju, F.O.; Duruji-Moses, F.U. From Kyoto to Paris: An Analysis of the Politics of Multilateralism on Climate Change. In *Promoting Global Environmental Sustainability and Cooperation*; IGI Global: Hershey, PA, USA, 2018; pp. 31–56.
5. Depledge, J. The Legal and Policy Framework of the United Nations Climate Change Regime. In *The Paris Agreement on Climate Change: Analysis and Commentary*; Klein, D., Carazo, M.P., Doelle, M., Bulmer, J., Higham, A., Eds.; Oxford University Press: Oxford, UK, 2017; pp. 27–43.
6. Klass, A.B.; Wilson, E.J. Climate Change, Carbon Sequestration, and Property Rights. *U. Ill. L. Rev.* **2010**, *2010*, 363.
7. Van Kooten, G.C.; Eagle, A.J.; Manley, J.; Smolak, T. How Costly Are Carbon Offsets? A Meta-Analysis of Carbon Forest Sinks. *Environ. Sci. Policy* **2004**, *7*, 239–251. [CrossRef]
8. Heath, L.S.; Smith, J.E. An Assessment of Uncertainty in Forest Carbon Budget Projections. *Environ. Sci. Policy* **2000**, *3*, 73–82. [CrossRef]
9. European Commission. Climate Negotiations. Available online: https://climate.ec.europa.eu/eu-action/international-action-climate-change/climate-negotiations_en#kyoto-protocol (accessed on 9 September 2022).
10. De Gregorio, S. From Kyoto to Paris: Searching the Sustainability. *VITRUVIO-Int. J. Archit. Technol. Sustain.* **2016**, *1*, VII–XI. [CrossRef]
11. Peskett, L.; Brodnig, G. *Carbon Rights in REDD+: Exploring the Implications for Poor and Vulnerable People*; World Bank REDD-Net: Washington, DC, USA, 2011.
12. Streck, C.; Von Unger, M. Creating, Regulating and Allocating Rights to Offset and Pollute: Carbon Rights in Practice. *Carbon Clim. Law Rev.* **2016**, *10*, 178–189. [CrossRef]
13. Dibley, A.; Wilder, A.M.M. Forest Carbon Rights: Lessons Learned from Australia and New Zealand. *Carbon Clim. Law Rev.* **2016**, *10*, 202–214. [CrossRef]
14. Schlager, E.; Ostrom, E. Property-Rights Regimes and Natural Resources: A Conceptual Analysis. *Land Econ.* **1992**, *68*, 249–262. [CrossRef]

15. Aydin Coşkun, A.; Gençay, G. Kyoto Protocol and "Deforestation": A Legal Analysis on Turkish Environment and Forest Legislation. *For. Policy Econ.* **2011**, *13*, 366–377. [CrossRef]
16. Elvan, O.D. The Legal Environmental Risk Analysis (LERA) Sample of Mining and the Environment in Turkish Legislation. *Resour. Policy* **2013**, *38*, 252–257. [CrossRef]
17. Elvan, O.D.; Turker, Y.O. Analysis of Turkish Groundwater Legislation and Policy Regarding International Principles and Conventions. *Water Sci. Technol.* **2014**, *69*, 2155–2165. [CrossRef]
18. Elvan, O.D.; Birben, Ü.; Ünal, H.E. The Effectiveness of the Bern Convention on Wildlife Legislation and Judicial Decisions in Turkey. *Int. Environ. Agreem. Politics Law Econ.* **2020**, *21*, 305–321. [CrossRef]
19. Elvan, O.D.; Birben, Ü. Analysis of the Ramsar Convention's Effectiveness on the Turkish Legislation and Judicial Decisions. *Wetlands* **2021**, *41*, 35. [CrossRef]
20. Türker, Y.Ö.; Aydin, A. How Ready Is the Turkish Legislation for the Green Deal? *Energy Clim. Chang.* **2022**, *3*, 100084. [CrossRef]
21. Saoualih, A.; Safaa, L.; Bouhatous, A.; Bidan, M.; Perkumienė, D.; Aleinikovas, M.; Šilinskas, B.; Perkumas, A. Exploring the Tourist Experience of the Majorelle Garden Using VADER-Based Sentiment Analysis and the Latent Dirichlet Allocation Algorithm: The Case of Tripadvisor Reviews. *Sustainability* **2024**, *16*, 6378. [CrossRef]
22. Beriozovas, O.; Perkumienė, D.; Škėma, M.; Saoualih, A.; Safaa, L.; Aleinikovas, M. Research Advancement in Forest Property Rights: A Thematic Review over Half a Decade Using Natural Language Processing. *Sustainability* **2024**, *16*, 8280. [CrossRef]
23. FAO. Carbon Rights and the Importance of Benefit Sharing. 2022. Available online: https://www.fao.org/redd/news/detail/en/c/1538781/ (accessed on 25 December 2023).
24. Carbon Rights Legislation Amendment Act 1998 No 124-New South Wales. Available online: https://legislation.nsw.gov.au/view/pdf/asmade/act-1998-124 (accessed on 22 December 2023).
25. Streck, C. Who Owns REDD+? Carbon Markets, Carbon Rights and Entitlements to REDD+ Finance. *Forests* **2020**, *11*, 959. [CrossRef]
26. Glossary. Available online: https://www.cifor-icraf.org/publications/pdf_files/books/bangelsen1801f.pdf (accessed on 20 December 2023).
27. Moving Ahead with REDD Issues, Options and Implications. Available online: https://www.cifor-icraf.org/publications/pdf_files/books/bangelsen0801.pdf (accessed on 20 December 2023).
28. Carbon Rights Bill 2002. Available online: https://www.austlii.edu.au/cgi-bin/viewdoc/au/legis/wa/bill/crb2002153/ (accessed on 20 December 2023).
29. Forest Property Act 2000. Available online: https://www.legislation.sa.gov.au/lz?path=/c/a/forest%20property%20act%202000 (accessed on 20 December 2023).
30. Climate Change Act 2021. Available online: https://www.parliament.gov.fj/wp-content/uploads/2021/09/Act-No.-43-Climate-Change.pdf (accessed on 27 December 2023).
31. Planted Forest-Act 2015 Republic of Vanuatu. Available online: https://faolex.fao.org/docs/pdf/van189680.pdf (accessed on 27 December 2023).
32. Pulpwood Supply Agreement by and Between Smurfit-Stone Container Corporation. Available online: https://www.lawinsider.com/contracts/4Q08Af4a2K0#carbon-rights (accessed on 27 December 2023).
33. Master Stumpage Agreement Among Timberlands Ii, Llc, Wells Trs Harvesting Operations, Llc, and Meadwestvaco. Available online: https://www.lawinsider.com/contracts/459it8zGILC#carbon-rights (accessed on 27 December 2023).
34. NCA Sabah Agreement. Available online: https://sarawakreportdocs.s3.eu-west-2.amazonaws.com/NCA-Sabah-agreement.pdf (accessed on 27 December 2023).
35. Fiber Supply Agreement by and Among Wells Trs Harvesting Operations, LLC, Meadwestvaco Corporation and Meadwestvaco Coated Board. Available online: https://www.lawinsider.com/contracts/iQGkEi95pxv#carbon-rights (accessed on 27 December 2023).
36. Fiber Supply Agreement by and Among Wells Trs Harvesting Operations, LLC, Meadwestvaco Corporation and Meadwestvaco Coated Board. Available online: https://www.sec.gov/Archives/edgar/data/1341141/000119312510068609/dex1026.htm (accessed on 27 December 2023).
37. Carbon Credits (Carbon Farming Initiative) Act 2011 Australia. Available online: https://faolex.fao.org/docs/pdf/aus112294.pdf (accessed on 27 December 2023).
38. Law On Forestry (Revised) 2019 Lao People's Democratic Republic. Available online: https://www.laotradeportal.gov.la/en-gb/site/display/1835 (accessed on 27 December 2023).
39. Forest Development, Conservation and Utilization Proclamation 2018. Available online: https://faolex.fao.org/docs/pdf/eth182203.pdf (accessed on 27 December 2023).
40. Climate Change and Carbon Market Initiatives Act. 2022. Available online: https://faolex.fao.org/docs/pdf/bha211771.pdf (accessed on 27 December 2023).
41. Law on Environmental Protection 2020 the Socialist Republic of Vietnam. Available online: https://faolex.fao.org/docs/pdf/vie212027.pdf (accessed on 27 December 2023).

42. Emissions Management and Climate Resilience Act 2020 Province of Alberta. Available online: https://faolex.fao.org/docs/pdf/al77679.pdf (accessed on 27 December 2023).
43. Monterubio, J. Recognition of Property Rights in Carbon Credits Under California's New Greenhouse Gas Cap-and-Trade Program. *Sustain. Dev. Law Policy* **2012**, *12*, 9.
44. MacKenzie, D. Making things the same: Gases, emission rights and the politics of carbon markets. *Account. Organ. Soc.* **2009**, *34*, 440–455. [CrossRef]
45. Brownsword, R.; Yeung, K. (Eds.) *Regulating Technologies: Legal Futures, Regulatory Frames and Technological Fixes*; Bloomsbury Publishing: London, UK, 2008.
46. Tuerk, A.; Mehling, M.; Flachsland, C.; Sterk, W. Linking carbon markets: Concepts, case studies and pathways. *Clim. Policy* **2009**, *9*, 341–357. [CrossRef]
47. Perdan, S.; Azapagic, A. Carbon trading: Current schemes and future developments. *Energy Policy* **2011**, *39*, 6040–6054. [CrossRef]
48. Wallerstein, I. The rise and future demise of the world capitalist system: Concepts for comparative analysis. In *Imperialism*; Routledge: London, UK, 2023; pp. 141–169.
49. Hajdu, F.; Fischer, K. Problems, causes and solutions in the forest carbon discourse: A framework for analysing degradation narratives. *Clim. Dev.* **2017**, *9*, 537–547. [CrossRef]
50. Savaresi, A.; Morgera, E. Ownership of Land, Forest and Carbon. In *Legal Frameworks for REDD: Design and Implementation at the National Level*; Costenbader, J., Ed.; IUCN Environmental Policy and Law Paper; IUCN: Gland, Switzerland, 2009; Volume 77, pp. 15–33.
51. White, A.; Martin, A. *Who Owns the World's Forests*; Forest Trends: Washington, DC, USA, 2002.
52. Richards, K.R.; Alig, R.; Kinsman, J.D.; Palo, M.; Sohngen, B. Consideration of country and forestry/land-use characteristics in choosing forestry instruments to achieve climate mitigation goals. In *Economics of Carbon Sequestration in Forestry*; CRC Press: Boca Raton, FL, USA, 2020; pp. 47–64.
53. Schaich, H.; Plieninger, T. Land ownership drives stand structure and carbon storage of deciduous temperate forests. *For. Ecol. Manag.* **2013**, *305*, 146–157. [CrossRef]
54. Merlo, M.; Briales, E.R. Public goods and externalities linked to Mediterranean forests: Economic nature and policy. *Land Use Policy* **2000**, *17*, 197–208. [CrossRef]
55. Streck, S. *Hades of REDD+ the Right to Carbon, the Right to Land, the Right to Decide*; Ecosystem Marketplace: Washington, DC, USA, 2022.
56. Boydell, S.; Sheehan, J.; Prior, J. COMMENTARY: Carbon Property Rights in Context. *Environ. Pract.* **2009**, *11*, 105–114. [CrossRef]
57. Perkumienė, D.; Atalay, A.; Labanauskas, G. Tackling Carbon Footprints: Sustainability Challenges of Hosting the Final Four in Kaunas, Lithuania. *Urban Sci.* **2024**, *8*, 55. [CrossRef]
58. Perkumienė, D.; Atalay, A.; Švagždienė, B. Carbon Footprint Stemming from Ice Sports on the Turkey and Lithuanian Scale. *Energies* **2023**, *16*, 1476. [CrossRef]
59. Knox, A.; Vhugen, D.; Aguilar, S.; Peskett, L.; Miner, J. *Forest Carbon Rights Guidebook: A Tool for Framing Legal Rights to Carbon Benefits Generated Through REDD+ Programming*; USAID: Washington, DC, USA, 2012.
60. Mccarty, L.T. Ownership: A Case Study in the Representation of Legal Concepts. *Artif. Intell. Law* **2002**, *10*, 135–161. [CrossRef]
61. Nash, J.R.; Stern, S.M. Property Frames Wash. *Univ. Law Rev.* **2010**, *87*, 449–504.
62. Perkumienė, D.; Doftartė, A.; Škėma, M.; Aleinikovas, M.; Elvan, O.D. The Need to Establish a Social and Economic Database of Private Forest Owners: The Case of Lithuania. *Forests* **2023**, *14*, 476. [CrossRef]
63. Škėma, M.; Doftartė, A.; Perkumienė, D.; Aleinikovas, M.; Perkumas, A.; Sousa, H.F.P.E.; Pimenta Dinis, M.A.; Beriozovas, O. Development of a Methodology for the Monitoring of Socio-Economic Indicators of Private Forest Owners Towards Sustainable Forest Management: The Case of Lithuania. *Forests* **2024**, *15*, 1657. [CrossRef]
64. Bromley, D. *Environmental Problems in Southeast Asia: Property Regimes as Cause and Solution*; EEPSEA: Ho Chi Minh City, Vietnam, 1997; p. 18.
65. Gerber, J.-D.; Knoepfel, P.; Nahrath, S.; Varone, F. Institutional Resource Regimes: Towards Sustainability Through the Combination of Property-Rights Theory and Policy Analysis. *Ecol. Econ.* **2009**, *68*, 798–809. [CrossRef]
66. Glück, P. Property Rights and Multipurpose Mountain Forest Management. *For. Policy Econ.* **2002**, *4*, 125–134. [CrossRef]
67. Irimie, D.L.; Essmann, H.F. Forest Property Rights in the Frame of Public Policies and Societal Change. *For. Policy Econ.* **2009**, *11*, 95–101. [CrossRef]
68. Dalton, T.R.; Coats, R.M.; Asrabadi, B.R. Renewable Resources, Property-Rights Regimes and Endogenous Growth. *Ecol. Econ.* **2005**, *52*, 31–41. [CrossRef]
69. Davidson, D.J. Private Property Wrongs: Uncovering the Contradictory Articulations of an Hegemonic Ideology. *Sociol. Inq.* **2007**, *77*, 104–125. [CrossRef]
70. Ostrom, E.; Hess, C. Private and Common Property Rights. *Prop. Law Econ.* **2010**, *5*, 53. [CrossRef]
71. Boadway, R.; Bruce, N. *Welfare Economics*; Basil Blackwell: Cambridge, UK, 1984.

72. Dinwiddy, C.L.; Teal, F.J. *Principles of Cost-Benefit Analysis for Developing Countries*; Cambridge University Press: Cambridge, UK, 1996.
73. Serageldin, I. Sustainable Development: From Theory to Practice. *Financ. Dev.* **1996**, *33*, 3.
74. Vosti, S.A.; Reardon, T.A. *Sustainability, Growth, and Poverty Alleviation: A Policy and Agroecological Perspective*; International Food Policy Research Institute: Washington, DC, USA, 2007.
75. Reardon, T.; Vosti, S.A. Links Between Rural Poverty and the Environment in Developing Countries: Asset Categories and Investment Poverty. *World Dev.* **1995**, *23*, 1495–1506. [CrossRef]
76. Hamilton, K.; Dixon, J.; Xie, J.; Kunte, A. *Five Years After Rio: Innovations in Environmental Policy*; World Bank: New York, NY, USA, 1997.
77. Steppacher, R. Impératifs et limites de la croissance. *J. Urban Res.* **2006**. Available online: http://journals.openedition.org/articulo/884 (accessed on 15 November 2024). [CrossRef]
78. Steiger, O. Property economics versus new institutional economics: Alternative foundations of how to trigger economic development. *J. Econ. Issues* **2006**, *40*, 183–208. [CrossRef]
79. Haley, D.; Luckert, M.K. Tenures as Economic Instruments for Achieving Objectives of Public Forest Policy in British Columbia. In *The Wealth of Forests: Markets, Regulation and Sustainable Forestry*; UBC Press: Vancouver, BC, Canada, 1998; pp. 123–151.
80. Young, M.D. *Sustainable Investment and Resource Use: Equity, Environmental Integrity and Economic Efficiency*; CABI: Wallingford, UK, 1992; p. 192.
81. Donahue, C., Jr. The Future of the Concept of Property Predicted from Its Past. *NOMOS Am. Soc. Political Leg. Philos.* **1980**, *22*, 28.
82. Örücü, E. *Taşınmaz Mülkiyetine Bir Kamu Hukuku Yaklaşımı*; Mülkiyet Hakkının Sınırlanması Istanbul; Istanbul Üniversitesi Hukuk Fakültesi: Istanbul, Türkiye, 1976.
83. Alchian, A.A. Property Rights. In *The Invisible Hand*; Springer: Berlin/Heidelberg, Germany, 1989; pp. 232–238.
84. Denman, D.R. *The Place of Property: A New Recognition of the Function and Form of Property Rights in Land*; Geographical Publications: Berkhamsted, UK, 1978.
85. Agrawal, A.; Ostrom, E. Collective Action, Property Rights, and Devolution of Forest and Protected Area Management. 1999. Available online: https://ethz.ch/content/dam/ethz/special-interest/usys/ites/ecosystem-management-dam/documents/EducationDOC/EM_DOC/Recommended%20readingDOC/Agrawal_devolution2001.pdf (accessed on 16 December 2023).
86. Bromley, D.W. *Environment and Economy: Property Rights and Public Policy*; Basil Blackwell Inc: Cambridge, MA, USA, 1991.
87. Commons, J.R. *Legal Foundations of Capitalism. 1924*; University of Wisconsin-Madison: Madison, WI, USA, 1968.
88. Lee Reed, O. What Is "Property"? *Am. Bus. Law J.* **2004**, *41*, 459–501. [CrossRef]
89. Schlager, E.; Ostrom, E. Property-Rights Regimes and Coastal Fisheries: An Empirical Analysis. In *The Political Economy of Customs and Culture: Informal Solutions to the Commons Problem*; Simmons, R.T.A., Lee, T., Eds.; Rowman & Littlefield Publishers: Lanham, MD, USA, 1993; pp. 13–41.
90. Pearse, P.H. Property Rights and the Development of Natural Resource Policies in Canada. *Can. Public Policy/Anal. Polit.* **1988**, *14*, 307–320. [CrossRef]
91. Scott, A.; Johnson, J. *Property Rights: Developing the Characteristics of Interests in Natural Resources (Resource Paper No. 88)*; Department of Economics, University of British Columbia: Vancouver, BC, Canada, 1983.
92. North, D.C. *Institutions, Institutional Change and Economic Performance*; Cambridge University Press: Cambridge, UK, 1990.
93. De Soto, H. *The Mystery of Capital: Why Capitalism Triumphs in the West and Fails Everywhere Else*; Basic Books: New York, NY, USA, 2000.
94. Coase, R.H. The Problem of Social Cost. *J. Law Econ.* **2013**, *56*, 837–877. [CrossRef]
95. Ostrom, E.; Schlager, E. The Formation of Property Rights. In *Rights to Nature: Ecological, Economic, Cultural, and Political Principles of Institutions for the Environment*; Island Press: Washington, DC, USA, 1996; p. 127156.
96. Ding, H.; Chiabai, A.; Silvestri, S.; Nunes, P.A. Valuing Climate Change Impacts on European Forest Ecosystems. *Ecosyst. Serv.* **2016**, *18*, 141–153. [CrossRef]
97. FAO. *Global Forest Resources Assessment 2020: Main Repor*; FAO: Rome, Italy, 2020.
98. FAO. *The State of the World's Forests 2022. Forest Pathways for Green Recovery and Building Inclusive, Resilient Andsustainable Economies*; FAO: Rome, Italy, 2022.

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