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ARTICLES

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INTERNATIONAL TRANSFER PRICING METHOD

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Avery Douglas

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SOUTH CAROLINA JOURNAL OF INTERNATIONAL LAW & BUSINESS

VOLUME 16

SPRING 2020

CONTENTS

ARTICLES

GAME THEORY FOR INTERNATIONAL ACCORDS

Uri Weiss & Joseph Agassi 1

A COMPARATIVE ANALYSIS OF SINO-AMERICAN CONTRACTUAL
WRITING ATTRIBUTES: UNDERPINNINGS FOR CHINA'S FUTURE
UNIFORM CIVIL CODE TO MANDATE WRITING FOR LAND SALE
CONTRACTS

Dr. Wei Wen 23

STUDENT NOTES

THE BEST OF BOTH METHODS: A PROPOSAL FOR A HYBRID
INTERNATIONAL TRANSFER PRICING METHOD

Annalise Musselman 57

CORAL REEF CASE STUDY: COMPARING CURRENT
INTERNATIONAL AND DOMESTIC CORAL REEF LAWS AND DIVING
INTO THE LEGAL IMPLICATIONS OF COUNTRIES FAILING TO
ADEQUATELY PROTECT AND CONSERVE THESE ECOSYSTEMS AS
CLIMATE CHANGE WORSENS

Avery Douglas 93

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VOLUME 16

2019-2020

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GAME THEORY FOR INTERNATIONAL ACCORDS

Uri Weiss and Joseph Agassi⁺*

I. THE POLITICAL ASPECT OF GAME THEORY	2
II. A COMPARISON BETWEEN OUR APPROACH AND THE RELATED LITERATURE	9
III. ADDITIONAL MORALS TO LEARN FROM AUMANN'S NOBEL LECTURE (2005).....	15
IV. CONCLUSION.....	22

Realpolitik is the claim that agreements in international relations are worthless since there is no institution to enforce them. Game theoretician Robert J. Aumann suggests in his 2006 Nobel lecture that “the fundamental insight is that repetition is like an enforcement mechanism.”¹ The application of this insight to international relations allows for the improvement of their applicability and it, thus, refutes Realpolitik.

Early game theory appeared as an alternative to the social sciences. However, it is better anchored within social science—as a useful tool. This renders game-theoretical recommendations irenic. Aumann argues that there is no a priori reason to expect that the agreement to

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¹ Robert J. Aumann, “War and Peace,” Prix Nobel 2005, the Nobel Foundation, Stockholm (2006).

cooperate should have practical results.² His claim rests on an additional assumption: at times no improvement is observed. Yet, at times significant improvement is observed. This should encourage the search for the conditions that lead to improvement; it goes well with the proposal to consider game theory part-and-parcel of social science: how does playing in a given game depend on the culture within which it takes place.

I. THE POLITICAL ASPECT OF GAME THEORY

A common topic of discussion within game theory is *the prisoner's dilemma* and its relevance to cooperation because its rules lead to conduct that reinforce conflict. When political scientists, jurists, or biologists apply game theory to the analysis of cooperation, they usually refer to this specific game. Of course, many other games pertain to cooperation. It is not easy to find out what game describes a situation sufficiently well in the field. It is easier to find out what game is advantageous to play under what circumstances. Such matters are better open to critical discussion and empirical tests.

Before presenting *the prisoner's dilemma*, let us present another, simpler game, *the movies dilemma*, a variant of *the prisoner's dilemma* often present in film. Here it is:

	Coop	Def
Coop	1, 1	3, 2
Def	2, 3	2, 2

	Cooperate	Defect
--	-----------	--------

² Robert J. Aumann, *Nash Equilibria Are Not Self-Enforcing*, in *ECONOMIC DECISION-MAKING: GAMES, ECONOMETRICS, AND OPTIMIZATION: CONTRIBUTIONS IN HONOUR OF JACQUES H. DRÉZEE*, 201–206 (J.J. Gabszewicz, J.-F. Richard, and L. Wolsey, eds. 1990).

Cooperate	freedom, freedom	penalty, reduced penalty
Defect	reduced penalty, penalty	reduced penalty, reduced penalty

Figure 1. *The Movies Dilemma*

In this game, mutual cooperation is best for both players. To achieve mutual cooperation they have to trust each other sufficiently; if they mistrust one another, then they will come to mutual defection;³ one defection leads to the worst outcome. Thus, if both players expect the other to either cooperate or defect, then their very expectations will make it true.⁴

In *the movies dilemma*, the information that one player has about the decision of the opponent plays a crucial role. Therefore, in variants of this game that allow the police to manipulate players through misinformation, it may lead one player to expect the other to defect. In that case, the expectation is self-fulfilling. Hence, manipulation is unnecessary. It suffices for the police to convince the players that the police will manage to convince one player that the opponent will expect the other player to expect the opponent to lose the trust of the one player.

In contrast, in *the prisoner's dilemma* game, it is worthwhile for each player to defect regardless of what the opponent does. This is the whole of the specification of that game. In the literature, it usually comes with a standard illustration that depicts a situation with four options: no penalty and penalties of three levels: lenient, severe, and medium—lenient penalty for the illegal possession of arms, severe penalty for having used them illegally, and the

³ We use terms such as defection because they are common in the game's theoretical literature, but not because of their moral content. For example, a firm that does not join a cartel defects in the game's theoretical language, although it should not be denounced.

⁴ This game appears in movies in diverse variants. For example, one prisoner may seemingly betray the other, but without losing the other's trust. This variant of the game may end with the trust rewarded, and it may result with the trusting party alone receiving full penalty, thus, leading to a new game of revenge. In all variants of the movies dilemma, the information that one player has about the decision of the other player plays a crucial role.

reduction of the severe penalty that leaves it still harsher than the lenient one.⁵ Consider two persons detained for possession of illegal weapons near a bank in which an armed robbery just took place. The police have strong enough evidence to charge them with the lenient penalty, but not enough evidence to charge them with the severe penalty, so the police try to encourage them to testify against each other. To achieve this, the police isolate them and propose to each of them a plea-bargain. The options that the game offers are these: if they both defect, they will both receive medium penalty; if they cooperate with each other and keep silent then they will both receive the lenient penalty. There are four levels of possible results, from 1 to 4:

	Coop	Def
Coop	2, 2	4, 1
Def	1, 4	3, 3

Figure 2. *The Prisoner's Dilemma*

Thus, the wish to maximize individual payoff imposes on each player in *the prisoner's dilemma* game the betrayal of the other regardless of the strategy of the other.⁶ A strategy like the one

⁵ Stuart Oskamp & Daniel Perlman, Factors Affecting Co-operation in the Prisoner's Dilemma, 9 J. OF CONFLICT RESOL. 29-31 (1965).

⁶ This idea of strategy is as old as game theory. According to the definition of Von Neumann and Morgenstern set forth in 1944, a strategy is a player's plan, which specifies what choices to make in every possible situation, for all possible information available at the moment decision is called for. The strategy conforms to the pattern of information that the rules of the game prescribe. Thus, a strategy is a comprehensive policy, a plan for action in every possible situation that the rules of the game allow. Obviously, then, the project of Von Neumann and Morgenstern is utopian. As Kenneth Arrow has noted, such a strategy is impossible even for chess—a problem-situation much simpler than some real-life ones. Von Neumann and Morgenstern postulated that comprehensive strategies are always parts of games. This limits the applicability of game theory to the very simplest

described here is not the only one available. It is dominant in the sense that in all permissible situations a player will gain from it more than from any alternative strategy; therefore, in this game a player cannot gain anything from the information about the opponent.⁷ Hence, in *the prisoner's dilemma* game, rationality precludes the socially optimal result: it leads to the socially worst result. This is why it is intriguing; the unpleasant aspect of the situation in *the prisoner's dilemma* is that the distrust inherent in it is irreparable, since it imposes a result not improvable by soliciting trust.⁸

In some similar games, raising the level of trust might improve matters. The most common illustration for this is the variant of *the prisoner's dilemma* known as *the stag-hunt game*⁹ (what makes game theory interesting is that it offers many variants of this game with different results; a little change in the game may, at times, lead to a completely different result). In it, cooperation brings the best payoff for each of them; the unilateral betrayal of one meets the defector the second-best payoff and the other the worst payoff, and mutual betrayal gives both the third-best payoff. For this, again, four possible outcomes are required. This is illustrated by two hunters who choose simultaneously whether to hunt a stag or rabbits. They succeed only if they both go for a stag, and each player achieves the best result—the stag. A player who goes for a stag alone is met with absolute failure. A player who goes for a rabbit alone wins all the rabbits, which is the second-best result, while both going for the

games, thus, limiting severely the intellectual challenge of game theory. Sometimes it is surpassingly possible to write some strategies. The standard examples are the always defect in the repeated prisoner's dilemma, as discussed above, and the tit-for-tat in the same game. See JOHN VON NEUMANN & OSKAR MORGENTHAU, *THEORY OF GAMES AND ECONOMIC BEHAVIOR* (1944) (ebook), <https://ebookcentral.proquest.com/lib/lawsc/reader.action?docID=1092486&ppg=2>.

⁷ This is the equivalent to Savage's "sure thing principle." In the early stages of game theory, it was called "the sure thing strategy."

⁸ This may explain the futility in some situations of the good will of peace activists who do not try to act politically, specifically in a way that changes the game.

⁹ Richard H. McAdams, *Beyond the Prisoner's Dilemma: Coordination, Game Theory and the Law*, 82 S. CALIF. L. REV. 13–15 (2008).

rabbits mutually gives every player half of the rabbits—the third-best result. Therefore, it is best for both to go for the stag. For the one who goes for the rabbits, it is better if the other does not, namely, that the opponent goes for the stag (and loses), thus, enabling the one to hunt rabbits unimpeded. Consider then four levels of success, from 1 to 4:

	Coop	Def
Coop	1, 1	4, 2
Def	2, 4	3, 3

Figure 3. *The Stag-Hunt*

Obviously, the absence of trust prevents the achievement of the optimal solution in this game, while if the players trust each other enough, they will achieve it. The important difference between the two games is not in the stories, but in the matrices for it is possible to translate the story of the stag-hunt game to the terms of the prisoner's dilemma game, and it will remain the stag-hunt game. For example, if the two suspects from the prisoner's dilemma game keep silent, they will both walk; if they both sing, they will both receive the usual penalty; and if only one sings, then only that one will receive a lenient penalty, and the other will receive a heavy penalty. Hence, the matrix determines the game, not its illustration.

The most important difference between the unrepeatable prisoner's dilemma and the unrepeatable stag-hunt is that in the former game defection is the dominant strategy—each rational player will defect in any case—whereas in the latter the defection (or its avoidance) depends on the assessment of the interdependent strategies of players. Whereas the one game offers no hope for cooperation, the other offers recognition of the option of raising the incentive for cooperation by raising trust. Hence, it is more important to avoid situations that impose the prisoner's dilemma game rather than the stag-hunt game.¹⁰ Although both games describe conflict situations, the lesson for social science is that in

¹⁰ See Joseph Agassi & Abraham Meidan, *Philosophy from a Skeptical Perspective* 96 (Cambridge Univ. Press, 2008).

some conflict situations action can improve actors' situations all around even without eliminating the conflict.

The difference between variants of a game may, thus, be significant. The decision about which variant describes a given political situation already determines attitudes towards it. Thus, bellicose game theoreticians set the game one way, and the irenic ones set it the other way. This is Mario Bunge's criticism of game theory: it encourages arbitrariness.¹¹ The description of a real-life situation as a game will, thus, be less arbitrary if it includes options—whenever these are possible—for players to choose what game to play, with whom, and with what payoffs. This decision as to what game to play—this super game—describes some situations better than the games prescribed in standard game-theoretical texts.¹² This requires the recognition that at times some players are able to choose what game to play next.

This is also the choice available to scholars who wish to use game theory in order to analyze given situations: they may (and possibly should) ask what games are available to players and what game is better for a player to play. This will prescribe for scholars the decision as to the choice of game to analyze—the most important in the field. They may then help players or social planners improve their lots by offering good advice. For example, in the sphere of litigation, it is more important for students of jurisprudence to analyze the *asymmetric* litigation game than the *symmetric* one, even if the symmetric games are more frequent.¹³ Only the asymmetric

¹¹ See MARIO BUNGE, *SOCIAL SCIENCE UNDER DEBATE: A PHILOSOPHICAL PERSPECTIVE* 180 (Univ. of Toronto Press, 1998) (ebook), <https://ebookcentral.proquest.com/lib/southcarolina/detail.action?docID=4671968>)

¹² See *id.* at 176–80.

¹³ For example, Weiss analyzed the appeal game as an asymmetric one, while Shavell analyzed the appeal game as a symmetric one. See Uri Weiss, *The Regressive Effect of Appealability*, SSRN ELECTRONIC JOURNAL 1 (2011), <http://dx.doi.org/10.2139/ssrn.1688877>. Shavell noted that his model is not valid in a case of heterogeneous litigants, and, nevertheless, derives general policy recommendations from this model. The difference is

game may hide unacceptable consequences for the weaker party. The legal system may allow for situations in which weak litigants cannot realize their rights or at least it is not worthy for them. Legislators, judges, and attorneys for the weak litigants should try to prevent these situations as the initial (super) game. This is a worthy moral for the “law and economics” movement that aims to assess which legal rules are economically efficient. The analysis of the symmetric game—where options are the same for each side—is elegant, easy, natural, and relatively easy to apply, but it is not the most important game in town. Legal theory will benefit more from research that will reduce the number of unavoidable injustices of the system, and these are the asymmetric cases where financially comfortable litigants have many more options, including those who are less risk-averse due to their richness than ones who happen to be financially constrained.¹⁴ This may lead the weak parties to forego the use of all the legal advantages that they have and settle for much less than what the law entitles them. This is also the case when one party is a one-time player, and the other party is a repeat player¹⁵ (ironically, the literature considers this case not a part of “law and economics” but a part of “law and society”; obviously, it is both). Any move intended to compensate the less well-off litigant is a revision that will lead jurists to prevent games that end up in patent injustice. This is not limited to any specific society; the Bible mentions asymmetric litigation: “seek judgment, relieve the oppressed, judge the fatherless, plead for the widow.”¹⁶

Admittedly, asymmetric games are usually mathematically less elegant, but they are socially more important, at least from the humanist perspective. Unlike the prisoner’s dilemma, many situations of war and peace comprise asymmetric games. In many

not only that one analyzes this game and the other analyzes another game: the important question is what game should be analyzed in the theory of litigation. What game should we see when we recommend rules of litigation? See Steven Shavell, *The Appeals Process and Adjudicator Incentives*, 35 THE J. OF LEGAL STUDIES. 1, (2006).

¹⁴ See Uri Weiss, *The Regressive Effect of Legal Uncertainty*, TEL AVIV UNIV. L. FAC. PAPERS, 2005, at 1.

¹⁵ See Marc Galanter, *Why the “Haves” Come out Ahead: Speculations on the Limits of Legal Change*, 9 L. & SOC’Y REV. 95 (1974).

¹⁶ Isaiah 1:17.

cases of violence, the strong party sees the game as asymmetric but presents it as symmetric in efforts to fend off the police, the courts, or public opinion. Even kids who are bullies in school do that when facing school authorities. Under attack, then, it is often useful to change the game by making a credible threat to involve the police, the courts, and public opinion. Making a conflict visible may even render an asymmetric game symmetric and thereby reduce violence dramatically.

II. A COMPARISON BETWEEN OUR APPROACH AND THE RELATED LITERATURE

Aumann (2009) claims:

incentive . . . has to be there, and that is what is represented by the prisoner's dilemma in very stark, obvious language Absolutely, you must create incentives for stopping CO₂. There is one very simple way to do it. Just tax the emissions. You could impose a much higher tax on gasoline. And there are other ways to tax emissions. Do not overtax them, but tax them at the true cost of these emissions. Absolutely, you have to give incentives. Not by fear: that is not going to work. What is going to work is giving people incentives. Precisely game engineering.¹⁷

We assume our readers are familiar with this, especially since incentives can appear in different places and grow at different paces depending on extant social and political conditions. Incentives can be chosen as part of the game, such as in the case that a player chooses a conditional strategy in the prisoner's dilemma, and they can be chosen in order to prevent a particular kind of games. Let us sharpen that in the example Aumann described, the social planner actually supplies an incentive in order to prevent an undesirable game, so it is actually a super-game.

Similarly, Aumann and Shapley show the need for social science in order to explain the stability of the repeated prisoner's

¹⁷ Robert J. Aumann, *Game Engineering*, in DISCUSSION PAPER: CENTER FOR THE STUDY OF RATIONALITY no. 518 (2009).

dilemma—as due to the cooperation between players imposed by the rule that requires penalty for those who do not punish:

it . . . should be noted . . . that not only are defections from the cooperative sequence punished, but also defections from any punishing sequence are punished. A player who ‘should’ punish and does not do so will himself be punished. This is what provides the motivation for the punisher actually to carry out the penalty, and so keeps [the equilibrium].¹⁸

To this we add its converse: the same rules can destabilize the prisoner’s dilemma itself and even eliminate it almost totally.

As to the context of any game, Aumann and Drèzee (2008) observe this:

Formally, a game is defined by its strategy sets and payoff functions. But in real life, many other parameters are relevant; there is a lot more going on. Situations that substantively are vastly different may nevertheless correspond to precisely the same strategic game. For example, in a parliamentary democracy with three parties, the winning coalitions are the same whether the parties each hold a third of the seats in parliament, or, say, 49 percent, 39 percent, and 12 percent, respectively. But the political situations are quite different. The difference lies in the attitudes of the players; in their expectations about each other; in custom; and in history, though the rules of the game do not distinguish between the two situations.¹⁹

Let us comment on this: in Aumann’s example (or even in a more extremist case of seats divided to 49%, 49%, 2%), traditional game theory may deem the three political parties in possession of

¹⁸ Robert J. Aumann & Lloyd S. Shapley, *Long-Term Competition—A Game-Theoretic Analysis*, in *ESSAYS IN GAME THEORY*, 1–15 (Megiddo N. ed., 1994).

¹⁹ Robert J. Aumann & Jacques H. Drèzee, *Rational Expectations in Games*, 98 *AM. ECON. REV.* 1, 72–86 (2008).

equal power, since no party can establish a winning coalition by itself, and each party can establish a winning coalition with every other party.²⁰ Clearly, this is a mistake. Nevertheless, game theory is right in considering the small party in this case as having much more power than the number of its seats suggest and in its explanation of this fact; but, game theory ignores the constraint on the power of the small party that social norms of fairness impose. Game theory also ignores the incentives that this situation provides to change the situation radically. Thus, members of the big parties may defect and establish small parties or the majority may change the voting system. This invites interesting questions. How does the prevalent view of fairness influence the situation? What is the right view of fairness? How should it influence the situation? These questions and their likes pull us out of the mathematical world of game theory and lead us to apply social science. This illustrates the fruitfulness of traditional game theory as well as its limitation. Hence, to be fruitful, game theory should become part and parcel of social science. Otherwise, game theory may generate more mistakes than it can prevent.

In the conclusion of their paper, Aumann and Drèzee add this: “The fundamental object of study in game theory should be the game situation G rather than its underlying game G ,” while in the paper itself they define game situation as “a game played in a specific context.”²¹

As young as game theory is, it already has a tradition. That tradition rests on its initial aim that was tacit. It was, we say, to replace the explanatory model of the social sciences (indeed, one of the early names of game theory was “social physics”). Von Neumann and Morgenstern said of its applications that they are of two kinds: “On the one hand to games in the proper sense, on the other hand to economic and sociological problems as well We hope to establish satisfactorily . . . that the typical problems of economic behavior become strictly identical with the mathematical notions of suitable games of strategy” For economic and social problems, the games fulfill—or should fulfill—the same function,

²⁰ *See id.*

²¹ *Id.* at 72, 82.

which various geometrical-mathematical models have successfully performed in the physical sciences.²²

The 2008 paper of Aumann and Drèzee just cited is possibly a challenge to the tradition of Von Neumann and Morgenstern, a step-in effort to revise it. In line with this we try to anchor the theory—as is or in a revised version—within traditional social science. To that end, we draw attention to the difference between Aumann²³ (1990) and Aumann and Drèzee (2008). Aumann (1990) claimed—quite rightly—that agreement to play the stag-hunt game in mutual cooperation is not self-enforcing.²⁴ He added that the agreement to cooperate while playing the stag-hunt game does not bring about any improvement.²⁵ This we deem somewhat incorrect since it is an oversight of the agreement that may change the mutual expectations of players that the result of the game depends on. Aumann's argument is this: both players will gladly agree to cooperate, whether or not they later keep their word while playing; hence, their explicit agreement conveys no information: “To say that a game is non-cooperative means that there is no external mechanism available for the enforcement of agreements Incentives can be changed by changing either the payoffs or the information of the players.”²⁶

Of course, one may see the custom of keeping promises as irrational in any one-time game. This is a mistake. Expectations regarding cooperation that rest on agreement are too common to dismiss. Also, it will be beneficial for any specific society as well as for the international community to reform the culture in a manner that generates expectations to cooperate. That reform would render the reliance on promises eminently rational. As such, agreements tend to raise expectations; they improve the likelihood of achieving cooperation even in the repeated prisoner's dilemma game. This has a significant effect also for international relations, where institution to enforce contracts are still rather ineffective. This is in agreement with Aumann: “In the international relations literature, the game has

²² VON NEUMANN & MORGENSTERN, *supra* note 6, at 2.

²³ Aumann, *supra* note 2.

²⁴ *Id.*

²⁵ *Id.*

²⁶ *Id.*

been called the ‘security dilemma.’”²⁷ Contrary to Aumann 1990, however, we argue that international agreements in stag-hunt situations improve the disposition to cooperate and that, therefore, game theory rejects *Realpolitik* in international relations (*Realpolitik*, to repeat, is the recommendation to consider all agreements altogether worthless²⁸).

Aumann is quite right in asserting that there is no *a priori* reason to expect agreement to cooperate to lead to cooperation.²⁹ The very need to come to agreement may already signal potential mistrust and, thus, mistrust and doubt as to the expectation that promises lead to cooperation. Thus, Aumann’s assertion that there is no *a priori* reason to expect agreement to lead to cooperation requires completion; at times, but only at times, there is a *posteriori* reason for that.³⁰ This then is an argument for the proposal to consider game theory, part and parcel, of social science. How a given player will behave in a given game, thus, depends on the culture within which the game takes place. Hence, the conclusion from the rules of the game to the conduct of its players depends on tacit suppositions that represent the social conditions under which they play the game. These are better specified explicitly. The rules of the game called game theory should be altered to include this demand. This will lead to the proliferation of variants of many games that have, thus far, already been considered exhaustively.

For example, in the traditional wording of the stag-hunt game, the description of the set of alternatives is too sketchy: the option of agreement is missing without notice. Therefore, when one mentions it, one implicitly indicates that the game is not a closed system; it is, then, not mathematics; at best, it is social science. Considered pure mathematics, it does not have a unique solution: the conclusion that agreement will lead to improvement is questionable and depends on the expectation the agreement creates. In this regard, we agree with Aumann.

²⁷ *Id.*

²⁸ Aumann, *supra* note 2.

²⁹ Aumann, *supra* note 2, at 619–20.

³⁰ *See id.*

We can conclude from the above discussion that it is better to play the variant of stag-hunt with the option of preliminary communication than the stag-hunt without the option, and that these are indeed two different games. In the stag-hunt game with an option of preliminary communication, words are not merely cheap talk, but, they are in the one-time prisoner's dilemma game with an option of preliminary communication. To be precise, we should not ignore the variant of prisoner's dilemma played publicly with unenforceable agreements to cooperate: in this variant of the game, players will respect their agreement to cooperate in cultures in which the refusal to honor one's commitment will damage one's reputation considerably.

In Aumann's Nobel lecture we read, "the fundamental insight is that repetition is like an enforcement mechanism."³¹ This insight of Aumann is a clear refutation of *Realpolitik* that assumes that since there is no institution to enforce agreements in international relations, those agreements are worthless. Aumann's insight explains why covenants without sword waving can serve as much more than mere words: they add significant strength to much needed security. What we said contradicts Watkins assertion,³² which states that game theory endorses the claim of Hobbes: "covenants, without the sword, are but words, and of no strength to secure a man at all." We argue that game theory leads to the contrary conclusion: that covenants may prevent war even without sword waving, more in line with the observation of Hobbes.³³

³¹ Aumann, *supra* note 1, at 354.

³² John Watkins, *Imperfect Rationality*, in EXPLANATION IN THE BEHAVIORAL SCIENCES 202–03 (Robert Borger and Frank Cioffi ed., Cambridge Univ. Press 1970).

³³ THOMAS HOBBS, THE ELEMENTS OF LAW NATURAL AND POLITIC 78 (Ferdinand Tonnies ed., Frank Cass and Company Limited 1969): "In contracts that consist of such mutual trust, as that nothing be by either party performed for the present, when the contract is between such as are not compellable, he that performeth first, considering the disposition of men to take advantage of everything for their benefit, doth but betray himself thereby to the covetousness, or other passion of him with whom he

Game theory conflicts with the *Realpolitik* idea that international agreements are not worth the paper on which they are written.³⁴ Game theory similarly conflicts with the *Realpolitik* idea that the rule of law does not matter since it can do no more than reflect and legitimize extant balances of forces active between the nations with no ability to change them.³⁵ This is the social philosophy of Hegel that is popular today among the legal realist movement.³⁶ Fortunately, this view meets with a very simple refutation: a new enforceable law can prevent, or at least reduce, situations of prisoner's dilemma, which is agreeable to all parties involved, so such a law has a great likelihood of changing an undesirable Nash equilibrium in many games.³⁷

III. ADDITIONAL MORALS TO LEARN FROM AUMANN'S NOBEL LECTURE (2005)

We offer two morals from Aumann's Nobel lecture. The first corresponds with his conclusion of his analysis of a particular repeated game:

contracteth. And therefore such covenants are of none effect. For there is no reason why the one should perform first, if the other be likely not to perform afterward. And whether he be likely or not, he that doubteth, shall be judge himself But when there shall be such power coercive over both the parties, as shall deprive them of their private judgments in this point; then may such covenants be effectual; seeing he that performeth first shall have no reasonable cause to doubt of the performance of the other that may be compelled thereunto.”

³⁴ See Erik Ringmar, *The Relevance of International Law: a Hegelian Interpretation of a Peculiar Seventeenth-Century Preoccupation*, 21 REV. OF INT'L STUDIES 87 n.1 (1995).

³⁵ *Id.* at 91.

³⁶ See *id.* at 101–02.

³⁷ A game is in a Nash equilibrium only if no player has incentive to change strategy unilaterally. See John Nash, *Non-Cooperative Games.*, 54 ANNALS OF MATHEMATICS S2 n.2, 286 (1951).

“What is maintaining the equilibrium in these games is the threat of punishment. If you like, call it ‘MAD’—mutually assured destruction, the motto of the cold war.”³⁸

In the game, he analyzed it is indeed feasible to implement the advice to punish the party that plays the repeated prisoner’s dilemma with a hostile strategy. It may nevertheless be infeasible in international relations, for example, in cases where punishment leads to a response from a third player such as an umpire (it will not be a repeated prisoner’s dilemma, but a mere variant of it). In an effort to achieve a result of cooperation in the game, a player may be ready to punish the opponent severely. Other parties may then block the whole game, even in cases in which mutual cooperation is achievable with relative ease. Even the option of lenient penalty may be politically and scarcely feasible then. Therefore, an umpire may prevent the game and sometimes lead one player to always cooperate and the other to always defect. Let us propose these two games that may be enforced by the umpire: a repeated unilateral stag-hunt and a repeated unilateral prisoner’s dilemma. Therefore, it is a super game; the umpire may force the states to play one of these games; in other situations, the teacher may force the pupils to play one of these games. In these games, one player can choose between cooperation and defection, and the second player has only an option of cooperation. The payoffs of the possible results of these games are such that the payoffs of these results in the prisoners’ dilemma or stag-hunt. Actually, the umpire deletes one of the lines in the matrix of the game and by this makes it a new matrix—a new game.

This will be the matrix of the unilateral prisoner’s dilemma:

	Coop	Def
Coop	1, 2	2, 1

Figure 4. *The Unilateral Prisoner’s Dilemma*

This will be the matrix of the unilateral stag-hunt:

	Coop	Def
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³⁸ Aumann, *supra* note 1, at 354.

Coop	1, 1	2, 2
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Figure 5. *The Unilateral Stag-Hunt*

One of the advantages of the variant of a repeated stag-hunt with an umpire whose task is to force one player to avoid punishing the other player, to enforce the repeated unilateral stag-hunt, on such a variant of a repeated prisoner's dilemma, is this: in the repeated unilateral stag-hunt, the players will reach mutual cooperation, while in the repeated unilateral prisoner's dilemma they will reach the result in which one player will always defect and the other will always cooperate. While mutual cooperation is a possible result (as well as mutual defection) in the repeated prisoner's dilemma, the only possible result in the repeated unilateral prisoner's dilemma is that one player will always defect (this is their dominant strategy) and the other player will always cooperate. Hence, international intervention will be more desirable if it prevents the repeated prisoners' dilemma than if it prevents one side unilaterally from defecting in the repeated prisoner's dilemma. Furthermore, if a state believes that the umpire prevents them from defecting in a repeated prisoner's dilemma, the state should prevent this game when possible.

Notice that although in a prisoner's dilemma game the response to always-defect by always-defecting is reasonable and is possibly the best winning strategy, it still poses a possible penalty. Similarly, raising the reward for mutual cooperation or for being betrayed unilaterally may make tit-for-tat the reasonable strategy even in the prisoner's dilemma. This is so since the risk of the tit-for-tat strategy that incurs is reasonable: a player who adopts it takes a risk of losing in the first round, but he gains the opportunity to achieve the payoff of mutual cooperation, an opportunity that is not achievable by the always-defect strategy. The rational choice between these two options then depends, not only on the expectation that the opponent will play tit-for-tat, but also on the time discount and on the distance between the different payoffs (this fully accords with the complaint of Bunge 1998 that game theoreticians do not consider sufficiently critically the numbers that they write as examples for payoffs).³⁹

³⁹ BUNGE, *supra* note 11, at 178.

The second moral from Aumann's theory is sober. The mutual cooperation in the repeated prisoner's dilemma depends on mutual threat, sometimes a threat to use force or to punish. Therefore, a change of the rules of the game that stabilizes mutual cooperation is beneficial even when its players choose mutual cooperation as the status quo. This is a challenge to the observation of Von Neumann and Morgenstern that any "game is simply the totality of the rules which describes it": they obviously overlooked the possibility of changing the rules of a game.⁴⁰ Constitutions often include some formal rules for change, and every constitution is open to a revolution.⁴¹ This is so since even if the players achieve a Nash equilibrium of cooperation; the equilibrium may not be stable for some changes. Furthermore, there are equilibria of cooperation that rest on mutual threats, and there are those that rest on mutual trust; from a social science point of view, the latter is more stable and, thus, more desirable.

A physical system is in an equilibrium when the net force on each body in it is zero. It is stable if a small temporary deviation from it does not destroy it. It is unstable if it does (the equilibrium is indifferent if this deviation leads to another equilibrium). Moreover, equilibrium is relative to the forces in question: a system can be stable regarding only one set of extant forces. A game is in a Nash equilibrium if, and only if, no player has incentive to change strategy unilaterally. However, not all Nash equilibria are stable. Consider not only strategy change but also changes in the rules. Some equilibria remain stable even after such a change, but not after a change in the mutual expectations. Thus, stability is a relative matter.

One great advantage of the repeated stag-hunt game over the repeated prisoner's dilemma game is that only in the repeated stag-hunt game does each player always mutually cooperate, resulting in a Nash equilibrium. Thus, pacifist players will gain most from preferring to play stag-hunt over playing prisoner's dilemma: a

⁴⁰ VON NEUMANN & MORGENSTERN, *supra* note 6, at 49.

⁴¹ See generally Herbert John Spiro, *Constitution*, ENCYCLOPEDIA BRITANNICA (Feb. 5, 2020), <https://www.britannica.com/topic/constitution-politics-and-law>.

player committed to play “always cooperate” will achieve the best result in all interactions, even where the received norm is mutual defection. And then, remarkably, all parties to the game are better off when they move from an equilibrium of mutual cooperation in the repeated prisoner’s dilemma game to an equilibrium of mutual cooperation in a repeated stag-hunt game.

One may question this observation by noticing that those two equilibria allot the same payoffs to both players: this suggests there is no advantage in the shift from the one game to the other. The preference of more stable equilibria over less stable ones will lead to the rejection of this suggestion. This generally holds true as long as the more stable equilibrium does not impose stagnation; otherwise, the objection to stagnation may change the preference. Game theory is understandably an idealization, and, thus, it is not sufficiently sensitive to account for the difference in degrees of stability of the repeated game; this is no reason to overlook this difference, however. It is generally a political mistake to overlook degrees of stability, and it seems game theory can hardly help here without first inviting some development or change. As it happens, this oversight is common. Politicians systematically propose to end a war by reinstating the *status quo* in hopes of avoiding the repetition of past failed efforts at stability. At times, this hope for better stability rests on better considerations of the balance of powers between warring states. Game theory in its current state is unable to critically examine such considerations, as it is not sensitive enough to compare degrees of stability. It even overlooks the price for the achievement and maintenance of mutual cooperation in games of the prisoner’s dilemma. Parties to this sort of game may make aggressive threats, which are costly even when there is no intention to follow them up. And then, players have to weigh the cost of war against the cost of the equilibrium within which peace depends on the fragile tool of threats to fight back (this resembles the equilibrium of peace in the repeated prisoner’s dilemma). Since the consideration of waging war is expensive, it is wiser, whenever possible, to change the situation to enable players to rely on trust, which is the transition from the prisoner’s dilemma game to the stag-hunt game. This happened in Europe after World War II, it seems. For now, peace is recognized as the best option for every European Union country, even where an attack on a neighbor would lead to an immediate surrender. This situation is obviously the best goal for all international relations, as it achieves the most stable situation. In this

situation, the peace will be stable, even if the two sides assess the outcome of a potential war as advantageous for themselves (even to the degree they are both convinced that they will definitively win the war). This is quite intriguing because in most other sorts of games this optimistic assessment of the results of wars usually leads to wars. Game theory, to repeat, does not succeed in accounting for the stability of the kind of game that leads to a Nash equilibrium of peace since no degree of stability is intentionally built as yet into the system of game theory.

We therefore recommend rendering game theory more sensitive to degrees of stability of its equilibria. This includes stability of the equilibrium when the rules are unstable or when players are misinformed, commit common mistakes, or change their preferences midgame.⁴² It also includes stability of the equilibrium when new players enter the game or when the available set of alternatives for current players change. The development should be more fruitful as a toolbox to achieve stable world peace.⁴³ The ideal

⁴² Howard *et al.* discuss a meta-game for which prospective players may choose their emotions, preferences, and even rationality. Players' self-interest will influence these and make some of their threats and promises credible; they will then rationally promote their chosen preferences. Howard *et al.* say, "often (as a player) one would be better placed strategically if one's preferences (P) were replaced by other preferences (P'). With preferences P', one would be in a stronger position to pursue one's original preferences P. Fundamentally, this happens because players can make use of each other's preferences as a means to obtain their ends." Now, if in the former game the players can adopt such moves, they do not improve their situation in the central game but prevent the central game; they make it another game. This is so since objective rules and options do not suffice to determine the game, as payoff for players signify too. Oddly, Howard *et al.* dismiss this rather obvious consideration. Nigel Howard ET AL., *Manifesto for a Theory of Drama and Irrational Choice*, 44 J. OPERATIONAL RES. SOC'Y, Jan. 1993, at 99, 100. See also, Nigel Howard, *The Present and Future of Metagame Analysis*, EUR. J. OPERATIONAL RES. 32.1, 1987, at 1.

⁴³ There are different sorts of equilibria in game theory, and they may be perceived to present different degrees of stability, but not in a way that will be fruitful for handling the problems we present here. We invite our readers to challenge us and correct our mistakes; we will be grateful for this.

of international relations would naturally be a solution of this kind, whenever possible. The hope, that we suggest will make it more viable, is that this situation is achievable by building widespread expectations for the application in international courts of strict laws against aggressive national leaders. At the very least, we should welcome efforts to minimize all incentives for political leaders to break international law or to ignore its summons or rulings. All this is easier said than done, of course. Our point, however, is that it is common sense and obvious from the viewpoint of game theory, as it should be. The generally received observation is that no one wants game theory to make recommendations that conflict with the public interest. And it is almost a consensus that the public interest is to make peace a top priority in all cases except for intolerable situations like enslavement or destabilization that worsens the situation (as symbolized by the compromise that Britain accepted in Munich in 1938).⁴⁴ If there is a situation in which war is better than peace, this should be subject to critical discussion, together with all possible answers to the question, what compromise is tolerable. Can game theory in its current version help the search for a reasonable answer to such a discussion? The answer, it seems on its face, is present-day game theory is useless for that purpose. We have argued that this is not true: present-day game theory may help rethink how to mitigate situations that threaten peace, admittedly, when degrees of stability signify greatly this is the case. And then, we say, it need not be so since game theory can nevertheless help one rethink the extent of the desirability of raising the degree of stability of peace and, thus, the cost that it is worthwhile to meet that end. And, observe,

⁴⁴ See, *Munich Agreement*, Fr.-Ger.-Gr. Brit.-It., Sept. 29, 1938, The Avalon Project, Lillian Goldman Law Library, Yale Law School.

Abraham Wald has shown the way.⁴⁵ Considering chains of games and sub-games will be a useful extension of current game theory.⁴⁶

We suggest then that the most significant achievement of game theory is not in the design or in the applications of games, but in the suggestions of what games are unwise to play. Here, we follow Popper (Popper 1945), who said, politically, preventing pain or suffering has priority over creating pleasure. Obviously, in game theory, prevention is also much easier than application because every game requires some conditions for its very applicability, and these are never too clear and are seldom part of game theory proper. The games we consider unwise to play are obviously dangerous, as they may lead to war. The paradigm case here is chicken/brinkmanship. To our regret, game theoreticians are often more concerned with the best way to play them. Even if they are right, we prefer not to join them, but to recommend the proposal to avoid playing them when possible. At times, the game theoreticians in question stress that peaceful games fit some utopian situations so that in the meantime war is inevitable. We say, even if some war is inevitable, we should do our best to try to prevent every specific case of impending war, giving the good Lord the benefit of the doubt.

IV. CONCLUSION

Here then is our major corollary to game theory: the tools for achieving cooperation are incentives that generate strong and significant expectations: in brief, hope. The incentives may be

⁴⁵ See Abraham Wald, *Statistical Decision Functions Which Minimize the Maximum Risk*, *Annals of Mathematics*, 46 ANNALS MATHEMATICS, Second Series, Apr. 1945, at 265. See also Abraham Wald, *Statistical Decision Functions* (1950). See also Jacob Wolfowitz, *J* 1952. Abraham Wald, 1902–1950, *The ANNALS OF MATHEMATICAL STATISTICS* 23, 1–13 (1952).

⁴⁶ See Eilon Solan & Nicolas Vieille, *Quitting Games*, 26 MATHEMATICS OPERATIONS RES., May 2001, at 265. Solan and Vieille discuss the system in which players have the choice between quitting and continuing to play. They impose on games limitations that increase their mathematical elegance. Alas, these limitations lose the empirical character of games that gamblers play and of games that are important in social studies.

supplied by the legal system and by the norms and customs of civil society. The expectations may be products of institutions created to raise trust and join the educational or the diplomatic system. Surprisingly, a little success in trust-building may have a huge, dramatic, and positive impact on situations like the repeated prisoner's dilemma. Is this moral from game theory true? This is an empirical question not discussed here. That it deserves such discussions is obvious from the huge success of every educator who tried to reach neglected youths. Still, it is important to notice that the theory suggests that trust is superior to defection as the default option, thus, opening a venue to its empirical tests.

We recommend adding hope to the incentives and expectations of standard economic theory. Of course, appropriate incentives may generate hope, but they may also generate despair—intentionally or not. People can expect the best (that sounds hopeful), and they can expect the worst. Yet the logic of the ascription of expectations to rational agents differs from that of hope, since, unlike expectation theory, the theory of hope requires the will to live as more basic than any expectation, rational or not. As it happens, game theory evolved during the Cold War under the strong influence of economic theory and expectations theory. The theory of hope awaits proper development. We suggest that this step will also promote peace.

**A COMPARATIVE ANALYSIS OF SINO-
AMERICAN CONTRACTUAL WRITING
ATTRIBUTES: UNDERPINNINGS FOR CHINA’S
FUTURE UNIFORM CIVIL CODE TO MANDATE
WRITING FOR LAND SALE CONTRACTS**

*Dr Wei Wen**

I. INTRODUCTION.....	25
II. THE FIRST CORE ATTRIBUTE: THE SINO- CIVILIAN EVIDENTIARY PURPOSE AND THE ANGLO-AMERICAN EVIDENTIARY FUNCTION.....	28
<i>A. ADDITIONAL STRENGTHS OF THE EVIDENTIARY PURPOSE AND FUNCTION</i>	33
<i>B. THE NEED FOR WRITTEN FORM DUE TO LIMITATIONS OF TESTIMONY IN MODERN CHINA</i>	35
III. DERIVATIVES OF THE EVIDENTIARY PURPOSE AND FUNCTION	38
IV. THE SECOND CORE ATTRIBUTE: THE SINO- CIVILIAN WARNING PURPOSE AND THE ANGLO-AMERICAN CAUTIONARY FUNCTION.....	40
V. DERIVATIVES OF THE WARNING PURPOSE AND THE CAUTIONARY FUNCTION.....	43



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VI. THE THIRD CORE ATTRIBUTE: THE ANGLO-AMERICAN CHANNELING FUNCTION 45

VII. DERIVATIVES OF THE CHANNELING FUNCTION..... 50

VIII. THE HIERARCHY OF THE ATTRIBUTES OF WRITING IN SINO-AMERICAN LITERATURE..... 31

IX. CONCLUSION 54

In order to demonstrate the desirability of writing, this article advances, integrates, and synthesizes the theoretical, doctrinal, and practical attributes of writing in Sino-American literature; assesses their importance; and separates the core attributes from their derivatives, leading to a much clearer focus on the three core attributes of writing in Sino-American literature. This article identifies the existing attributes that are relevant to writing in order to provide a more informed understanding of the role of writing. This article also draws experience from England, Germany, and Taiwan.

This research is timely. China’s current Contract Law does not mandate writing for land sale contracts, causing nationwide uncertainty as to whether a writing requirement is a mandatory prerequisite for contractual remedies in land sale contract cases in China. However, parties to land sale contracts should be required to execute their agreements in writing. As a timely opportunity to fill this gap and address this problem, China’s supreme legislature, which is now drafting a uniform civil code that will include the new rules of Contract Law, could utilize the comparative analysis of this article as a solid underpinning to mandate writing for land sale contracts and to maximize the benefits of writing. Therefore, it is recommended that the future civil code mandates writing for land sale contracts. This is desperately necessary to effectively address the uncertainty in land sale contract cases. The reform proposed here also fills in the gaps of

the current Contract Law and the scholarly civil code drafts that do not have solutions to address the uncertainty problems.

Furthermore, the comparative analysis of this article assists to remove the uncertainty in China about the application of the “healing theory,” a remedy given by China’s Contract Law to validate oral contracts, including oral land sale contracts, that would otherwise be invalid for violating the requirement of writing. China’s supreme legislature could also utilize the analysis of this article as a part of its policy-making process, to tighten or loosen the statutory requirement of writing for other types of contracts or agreements (such as lease contracts or building contracts) when drafting the future uniform civil code.

I. INTRODUCTION

The purpose of this article is to demonstrate the desirability of written form and provide Chinese legislators, particularly China’s supreme legislature, with solid theoretical underpinnings to mandate writing for land sale contracts. In Anglo-American jurisdictions, certain types of contracts, including land sale contracts, must be evidenced in writing.¹ This writing requirement in the United States derives from the English Statute of Frauds 1677 (the Statute)² and is still critical in modern times because Anglo-American literature acknowledges that contractual formality has theoretical and

¹ RESTATEMENT (SECOND) OF CONTRACTS CH.5, STATUTORY NOTE (AM. LAW INST. 1981).

² STATUTE OF FRAUDS, 29 Car. 2 c.3 § 4 (1677). There were evidentiary limitations in seventeenth century England, such as lack of adequate control on juries, dysfunctional parol evidence rules, perjury, and frauds. In order to address the evidentiary limitations, the Statute of Frauds was enacted to require certain types of important contracts to be evidenced in writing, including contracts of dispositions of interests in land and contracts of guarantee so that courts had accurate written evidence on which to rely. J.H BAKER, AN INTRODUCTION TO ENGLISH LEGAL HISTORY 290 (2nd ed. 1979); 6 WILLIAM HOLDSWORTH, A HISTORY OF ENGLISH LAW 388 (1966).

practical justifications. Most of the Anglo-American attributes are echoed and further enriched by their Sino-Civilian counterparts. Although some attributes are not specific to land contracts, they are desirable in land sale contract cases. In order to provide a more informed understand of the role of writing, this article advances, synthesizes, and integrates the theoretical, doctrinal, and practical attributes of writing in Sino-American literature and also identifies the attributes that are not relevant to writing.

Although all the attributes are treated as standalone in Sino-American literature, this article assesses their importance, examines their interrelations, and separates the core attributes from their derivatives; leading to a hierarchy that has a much clearer focus and highlights the three core attributes of written form in Sino-American literature: evidentiary, cautionary, and channeling. In particular, the Anglo-American channeling attribute is not found in Sino-Civilian literature, but this attribute can inform China and persuade it that certainty in land sale contract cases is essential and important. This article also draws experience from other jurisdictions: England, Germany, and Taiwan.

This article is timely. China's supreme legislature is now in the process of drafting its first uniform civil code that will include new rules of Contract Law, and the future civil code will be the most important statute to govern all civil cases (including contract cases) in China.³ This could and should be an opportunity to mandate writing for land sale contracts and introduce certainty in land sale contract cases.

³ See Shierjie Quanguo Renda Changweihui Lifa Guihua (十二届全国人大常委会立法规划) [*Legislative Plans of the 12th Standing Committee of National People's Congress*]; Zhongguo Minfazongze Caoan Chushen Minfadian Shijianbiao Mingque (中国民法总则草案初审 民法典时间表明确) [*First Reading of China's General Principles of Civil Code, the Timetable of Enacting Civil Code is Clear*]; Zhongguo Renda Wang (中国人大网) [NAT'L PEOPLE'S CONGRESS WEB] (June 1, 2015), http://www.npc.gov.cn/npc/xinwen/2015-08/03/content_1942908.htm; Zhongxinwang (中新网) [CHINA NEWS SERV. WEB] (June 27, 2016), <http://www.chinanews.com/gn/2016/06-27/7919168.shtml> (the timetable is clarified by the Chair of Sub-Committee of Legislative Affairs of the Standing Committee of the National People's Congress).

China's current Contract Law explicitly mandates a writing for seven types of contracts, including lease contracts exceeding six months⁴, building contracts,⁵ and technology transfer contracts.⁶ This approach is appropriate because it is categorized by the specific types of contracts and each type of contract can be examined on its merits to determine whether it deserves the attention of the writing requirement. However, Contract Law does not expressly mandate writing for land sale contracts and this has caused nationwide uncertainty about whether a writing is mandatory as a prerequisite for contractual remedies in China.⁷ Further, land sale contracts deserve to be mandated in writing. When the law was under the review of the supreme legislature two decades ago, China's supreme legislature acknowledged the strengths of writing and once mandated written form for land sale contracts, although the reasons why the requirement was removed in its later draft remain unknown and undocumented.⁸ Now it is time to resume the requirement of writing for land sale contracts. Furthermore, the seven types of contracts that are mandated in writing by Contract Law, including lease contracts exceeding six months,⁹ arguably encompass less significant implications than land sale contracts. If lease contracts deserve the mandatory requirement of writing, land sale contracts should deserve the same.

As the current Contract Law has missed the opportunity of mandating writing for land sale contracts, this opportunity falls on the future civil code. China's supreme legislature could utilize the comparative analysis of this article as a solid underpinning to clearly

⁴ Hetong Fa (合同法) [CONTRACT LAW] (promulgated by Nat'l People's Cong., Mar. 3, 1999, effective Oct. 1, 1999), at art. 215.

⁵ *Id.* at art. 270.

⁶ *Id.* at art. 342(2).

⁷ This will be further discussed in Part VI.

⁸ See Quanguo Renda Changweihui Fazhi Gongzuo Weiyuanhui Mingfashi (全国人大常委会法制工作委员会民法室) [Civil Law Division of Sub-Committee of Legislative Affairs of the Standing Committee of the National People's Congress], *Zhonghua Renmin Gongheguo Hetongfa Lifa Ziliao* (中华人民共和国合同法立法资料选) [Selected Legis. Materials of Contract Law] (1999), at 10, 13, 18, 22, 29, 44, 45, 121, 141.

⁹ Contract Law, *supra* note 4.

mandate writing for land sale contracts in the future civil code. Accordingly, it is recommended that the future civil code mandates writing for land sale contracts. This would be an effective solution to addressing the nationwide uncertainty problem in land sale contract cases. The core attributes of writing are also conducive to solving the uncertainty relating to an important remedy in land sale contract cases in China.¹⁰ This analysis fills the existing gaps because both the current Contract Law and the civil code drafts proposed by Chinese scholars do not have any section to solve the two identified uncertainty problems. Further, China's supreme legislature could utilize the analysis of this article as a part of its policy-making process to tighten or loosen the statutory requirement of writing for other types of contracts or agreements (such as lease contracts or building contracts) when drafting the future uniform civil code.

The following sections proceed by discussing the desirability of writing—the theoretical, doctrinal, and practical attributes of writing arising from Sino-Civilian literature and Anglo-American literature, in a sequence considering the three core attributes (the evidentiary, the cautionary and the channeling attributes), followed by the derivatives of each core attribute. At the end, this article presents the hierarchy of the attributes in the form of a family tree.

II. THE FIRST CORE ATTRIBUTE: THE SINO-CIVILIAN EVIDENTIARY PURPOSE AND THE ANGLO-AMERICAN EVIDENTIARY FUNCTION

Sino-Civilian and Anglo-American literature widely acknowledge that signed and written contracts are accurate and persuasive evidence of contractual terms and also increase legal certainty and transactional safety. The evidentiary purpose has been discussed extensively in Sino-Civilian literature. It has been argued that written and signed contracts clarify contractual liabilities and

¹⁰ This will be further discussed in Part VI.

assist in preventing disputes about contractual content.¹¹ Formality is also seen as a useful and necessary means to ascertain contractual intention and confirm and assist in interpreting contractual terms.¹² Because written contracts can be documented with identifiable reference,¹³ it is convenient to present evidence and clarify liabilities in case of disputes concerning important and complicated contracts.¹⁴ Further, the evidentiary purpose promotes certainty through clarifying contractual rights and obligations.¹⁵ Due to the certainty, written contracts protect claimants and increase transactional safety, which is particularly important for contracts involving large amounts of money.¹⁶

Notwithstanding this, written form is criticized for increasing the cost of contract formation, because oral form is convenient, low cost, and commonly used in daily life.¹⁷ Written form may also make transactions complicated. Arguably, the more complicated the contractual formality, the more likely claimants will see formality as a burden and abandon it.¹⁸ Hence, claimants may not enjoy the certainty and safety introduced by formality.¹⁹ This may also give dishonest people opportunities to take advantage of bona fide

¹¹ Han Shiyuan (韩世远), *Hetongfa Zonglun* (合同法总论) [CONTRACT LAW] 2011, at art.113; Wang Liming (王利明), *Hetongfa Yanjiu Diyijuan* (合同法研究第一卷) [STUDIES ON CONTRACT LAW] 2011, at 485.

¹² Cui Jianyuan (崔建远), *Hetongfa* (合同法) [LAW OF CONTRACT] 2007, at 90; Liming, *supra* note 11, at 485.

¹³ Cui Jianyuan (崔建远), *Hetongfa Zonglun Shangjuan* (合同法总论上卷) [ON CONTRACT LAW] 2011, at 251.

¹⁴ *Id.*

¹⁵ Sui Pengsheng (隋彭生), *Hetongfa Yaoyi* (合同法要义) [ESSENCE OF CONTRACT LAW] 2011, at 70; Wagatsuma Sakaw, *Zhaiquan Gelun Shangjuan* (债权各论上卷) [ON OBLIGATION] (Xu Hui (徐慧) trans., 2008), at 27.

¹⁶ Pengsheng, *supra* note 15, at 69.

¹⁷ Jianyuan, *supra* note 13, at 248; Cui Jianyuan et al., (崔建远), *Zhaifa* (债法) [LAW OF OBLIGATION] 2010, at 263.

¹⁸ Dieter Medicus, *Deguo Minfa Zonglun* (德国民法总论) [INTRODUCTION TO GERMAN CIVIL CODE] (Shao Jiandong (邵建东) trans., 2013), at 461; Werner Flume, *Falü Xingwei Lun* (法律行为论) [ON JURISTIC ACTS] (Chi Ying (迟颖) trans., 2013), at 287.

¹⁹ Medicus, *supra* note 18, at 461; Flume, *supra* note 18, at 287–88.

claimants who are not familiar with business practice.²⁰ Despite criticisms, the voice for written form is getting stronger in China. In particular, it has been argued that the current Contract Law limits the use of oral form for valid reasons, partly because oral contracts fail to draw a clear line between pre-contractual statements and contractual terms.²¹ Further, the weaknesses of the oral form have been summarized by a Chinese expression: “Words of mouth have no guarantee.”²² Hence, it has been suggested that contracts involving large amounts of money should be in writing.²³

Moreover, the German and Taiwanese legislatures have accepted the evidentiary purpose as a valid reason to tighten up the formality requirement for land sale contracts. The German legislature confirms that compliance with formality permanently evidences the existence and content of legal actions and hence reduces, shortens, and simplifies legal proceedings (“Beweiszwang”).²⁴ Additionally, compliance with formality clarifies the legal nature of the conduct, as if the complete legal meaning were “cast on a coin” to increase certainty.²⁵ Because of high economic value of land, Taiwan’s legislature requires land contracts to be notarized in written form in order to increase legal certainty, protect private rights, and prevent lawsuits.²⁶ This approach is supported by a Taiwanese scholar who agrees that notarized and written documents crystallize contractual content.²⁷

With respect to the United States, Professor Fuller argued formality provides clear, convincing, and reliable evidence of

²⁰ Medicus, *supra* note 18, at 461; Flume, *supra* note 18, at 287–88.

²¹ Pengsheng, *supra* note 15, at 69.

²² *Id.*

²³ Jianyuan, *supra* note 13, at 248.

²⁴ Medicus, *supra* note 18, at 461; Flume, *supra* note 18, at 287–88.

²⁵ Medicus, *supra* note 18, at 461; Flume, *supra* note 18, at 287.

²⁶ Legislative Yuan Gazette 立法院公報, (Chinese only Lifayuan Gongbao), <http://lis.ly.gov.tw/ttscgi/lgimg?@881301;0252;0513>.

²⁷ Wang Tzechien (王澤鑾), Minfa Zongze (民法總則) [GENERAL PRINCIPLES OF CIVIL LAW] 328 (2010).

contractual terms (the “evidentiary function”).²⁸ Professor Posner points out that this function absorbs the value of the fraud-preventing purpose of the statute of frauds.²⁹ This function has a cost-effective advantage. Claimants are incentivized to create accurate written contractual records as they bear the risk of errors caused by incomplete contractual documents.³⁰ The same considerations are manifested in relation to the rules governing the validity of testamentary dispositions. The strengths of the evidentiary function ensure the accuracy and authenticity of testamentary intent through recording the intent in a reliable and permanent way (“probative safeguard”). In holographic will cases, handwriting serves an evidentiary function by replacing attestation and assisting in proving the genuineness of the will.³¹ By comparison, nuncupative wills perform the evidentiary function unsatisfactorily due to the absence of writing and signatures, and more rigorous formality is required to resolve this problem.³²

Despite its positive aspects, the statute of frauds has been criticized for serving the evidentiary function unsatisfactorily due to the loose operation of the statute. The first critique is that agreements which do not evidence all transaction details nevertheless satisfy the requirement of writing imposed by the statute.³³ The second critique is that written contracts can be rescinded in oral form, which is allowed by the statute.³⁴ The third critique is that although the presence of written contractual documents assist in preventing breach of contract, the statute does

²⁸ Lon L. Fuller, *Consideration and Form*, 41 COLUM. L. REV. 799, 800 (1941); Joseph M. Perillo, *The Statute of Frauds in Light of the Functions and Dysfunctions of Form*, 43 FORDHAM L. REV. 39, 64–69 (1974) (exploring the evidentiary function in a historical context).

²⁹ Eric Posner, *Norms, Formalities, and the Statute of Frauds: A Comment*, 144 U. PA. L. REV. 1971, 1984 n. 19 (1996).

³⁰ *Id.* at 1985.

³¹ Ashbel Gulliver & Catherine Tilson, *Classification of Gratuitous Transfers*, 51 YALE L.J. 1, 13 (1941); John H. Langbein, *Substantial Compliance with the Wills Act*, 88 HARV. L. REV. 489, 493 (1975).

³² Langbein, *supra* note 31, at 493.

³³ Michael Braunstein, *Remedy, Reason, and the Statute of Frauds: A Critical Economic Analysis*, 1989 UTAH L. REV. 383, 426–27.

³⁴ *Id.* at 427–28.

not explain why claimants must use written form to achieve this.³⁵ Moreover, written form is criticized for being redundant, as claimants are motivated to use written form to protect themselves in the business world.³⁶ In the United States, an empirical study shows manufacturers preferred using written contracts for operating business smoothly and avoiding uncertainty and risks caused by oral contracts, regardless of what the statute of frauds says.³⁷ The study substantiates the real need for writing, as business people value the evidentiary attributes and choose to use written form voluntarily. The study also confirms that the statutory requirement of writing respects commercial norms and aligns with business practices.

Despite the criticisms of the statute of frauds, similar to the German and Taiwanese legislatures, the English Law Commission and Parliament have accepted the evidentiary function as a valid reason to tighten the statutory writing requirement for land contracts.³⁸ This acceptance has resulted in the adoption of a much stricter requirement that “contracts only be made in writing and only by incorporating all the terms in one document”³⁹ to replace the previous loose approach that merely required contracts to be “evidenced in writing” and allowed the joint reading of several documents.⁴⁰ In the views of the English legislature and Law

³⁵ Posner, *supra* note 29, at 1985.

³⁶ Zhu Qingyu (朱庆育), Yisi Biaoshi Yu Falü Xingwei (意思表示与法律行为) *Expression of Intention and Juristic Acts*, 1 Bijiaofa Yanjiu (比较法研究) COMP. L. J. 15, 25 (2004).

³⁷ The empirical study was conducted in 1957 in Connecticut. *The Statute of Frauds and the Business Community: A Re-appraisal in the Light of Prevailing Practices*, 66 YALE L. J. 1038, 1042 (1957); Zipporah Batshaw Wiseman, *The Limits of Vision: Karl Llewellyn and the Merchant Rules*, 100 HARV. L. REV. 465, 515–19 (1987).

³⁸ Law Commission, *Transfer of Land: Formalities for Contracts for Sale Etc. of Land* P 2.8 (Law Commission No.164, 1987), available at https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/228611/0002.pdf (this document led to the tightening up of the statutory requirement of writing for land contracts in England in 1989).

³⁹ Law of Property (Miscellaneous Provisions) Act 1989, c. 34, § 2(1) (Eng.).

⁴⁰ Several documents can be jointly read to record essential terms to satisfy the statutory requirement of writing. Law of Property Act 1925, 15 & 16 Geo.5 c. 20, § 40 (Eng.); *Pearce v. Gardner* [1897] QB 688 (Eng.).

Reform Commission, the evidentiary strengths of written form are sufficiently attractive to support this major change and to defeat several attempts to repeal the Statute of Frauds.⁴¹ The English legislature's actions should inform China about the desirability of writing for land sale contracts in China.

Likewise, China's supreme legislature acknowledged the evidentiary strengths of writing and once-required written form for land contracts mandatorily in earlier drafts of Contract Law when the law was under review two decades ago, but the requirement was removed from the final enactment for reasons which remain unknown and undocumented.⁴² With the support of the evidentiary attributes, it is now time for China's future uniform civil code to mandate writing for land sale contracts.

A. ADDITIONAL STRENGTHS OF THE EVIDENTIARY PURPOSE AND FUNCTION

In addition to increasing certainty and clarity, the evidentiary purpose and function have other strengths. First, formality increases the likelihood of contractual performance and reduces lawsuits. After claimants sign written contracts, they are bound and protected by every contractual term to which they agree. Written contracts may deter claimants from breaching contracts and strengthen their self-discipline. In this regard, written contracts impose dynamics between claimants. Even critics of the statute of frauds, like Professor Braunstein, recognize that "writing is often necessitated by the need to plan and co-ordinate performance."⁴³ In contrast, oral contracts increase the difficulties of collecting evidence and

⁴¹ In 1937, The Law Revision Committee in England recommended the repeal of section four of the Statute of Frauds. Editorial Committee of the Modern Law Review, *The Law Revision Committee's Sixth Interim Report*, 1 MOD. L. REV. 97 (1937). In 1953, the Committee made another proposal to repeal the Statute. Cyril Grunfeld, *Statutes and Reports of Committees, Law Reform (Enforcement of Contracts) Act 1954*, 17 MOD. L. REV. 451 (1954).

⁴² Civil Law Division of Sub-Committee of Legislative Affairs of the Standing Committee of the National People's Congress, *supra* note 8, at 10, 13, 18, 22, 29, 44, 45, 121, 141.

⁴³ Braunstein, *supra* note 33, at 425.

distinguishing between opposing views in disputes.⁴⁴ Hence, claimants are more likely to pursue lawsuits to their advantage if only bound by oral contracts. Indeed, with written and signed contracts to serve as solid evidence, claimants are less likely to sue. One example is *Chen WenX v. Li XX*, a case in China where one claimant alleged that an oral land sale contract did not exist due to the absence of a written contract.⁴⁵ Had there been a signed written contract in this case, the allegation would have had no standing, thereby reducing the incentive to pursue lawsuits.

Secondly, written and signed contracts reduce the likelihood of errors caused by incomplete contractual record and also increase efficiency by providing certainty and clarity. Professor Braunstein, who argued for the repeal of the statute of frauds, concedes that due to the evidentiary function, “written agreements are more certain and less vulnerable to misinterpretation,”⁴⁶ and that “courts and juries naturally view allegations of an oral contract with skepticism.”⁴⁷ In contrast, oral form increases the difficulties of determining contractual obligations.⁴⁸ This uncertainty increases the courts’ difficulties and burden to deliver fair and accurate judgements. These negative results could be further magnified by the limitations of testimony in modern China, which will be discussed later.

Third, written and signed contracts reduce the cost of resolving contractual disputes. With the presence of solid written contractual evidence, claimants may be incentivized to pursue alternative dispute resolutions that are less costly than lawsuits, such as mediation. This is particularly the case in China, where mediation is

⁴⁴ Pengsheng, *supra* note 15, at 69.

⁴⁵ *Chen WenX Su Li XX* (陈文 X 诉李 XX) [Chen WenX v. Li XX], CHINALAWINFO (Liuzhou Interm. People’s Ct. June 9, 2012). Chen WenX’s partner and Li XX had an oral land sale contract. However, after the death of Chen WenX’s partner, Chen WenX’s family refused to perform the oral contract. Li XX sued.

⁴⁶ Braunstein, *supra* note 33, at 424.

⁴⁷ *Id.* at 425.

⁴⁸ Pengsheng, *supra* note 15, at 69.

free.⁴⁹ Furthermore, as written contracts increase the likelihood of contractual performance, fewer cases end up in court. Hence, courts have more resources to deal with their existing contractual lawsuits. Even if claimants are determined to sue, with the help of the certainty and clarity introduced by signed contracts, courts can still increase judicial accuracy and efficiency by spending less time investigating contractual terms. Therefore, the additional strengths of the evidentiary attributes of writing further demonstrate the desirability of writing.

*B. THE NEED FOR WRITTEN FORM DUE TO LIMITATIONS
OF TESTIMONY IN MODERN CHINA*

The need for written form is strong in China, as the evidentiary attributes of written form address the limitations of testimony in modern China effectively. In the United States, Professor Corbin argued that written form should not be mandatory for sale of goods contracts as the background against which the statute of frauds was enacted has disappeared.⁵⁰ The statute of frauds was originally enacted to address the evidentiary weaknesses in seventeenth century England, which led to widespread perjury and frauds through requiring important contracts such as those relating to land to be evidenced in writing so that courts had accurate written evidence on which to rely.⁵¹ However, the background against which the statute was enacted—"frauds and perjury"—may still persist in modern China. Perjury and baseless claims are chronic

⁴⁹ Renmin Tiaojie Fa (人民调解法) [People's Mediation Law of The People's Republic of China] (promulgated by the Standing Comm. Nat'l People's Cong., Aug. 28, 2010, effective Jan. 1, 2011), at art. 4, CHINALAWINFO.

⁵⁰ Professor Corbin argued that written form should not be mandatory for sale of goods contracts that exceed a certain amount of money, as the modern jury system is more functional than the times when the statute of frauds was enacted and a jury is no longer used in contractual disputes in many jurisdictions. Arthur Corbin, *Uniform Commercial Code – Sales: Should it be Enacted*, 59 YALE L. J. 821 (1950).

⁵¹ Baker, *supra* note 2, at 341–49.

problems in Chinese civil litigation⁵² and are partially caused by the evidentiary rule that anyone who knows the facts of cases is obligated to stand in the witness box.⁵³ The purpose of the rule appears to encourage the discovery of facts. However, claimants can take advantage of this rule by hiring “witnesses” who are willing to make incorrect statements and commit perjury, as the “witnesses” simply need to allege knowing the facts to obtain the “legitimacy” to deliver testimony in court.

As the modern Chinese evidentiary rules reflect the reasons why the statute of frauds was enacted in seventeenth century England, the statute of frauds-related experience, in the United States and England, may inform China by explaining the desirability of written form. Courts in China need to rely on the certainty, clarity, and stability introduced by signed contracts. Written contractual evidence plays a significant role in setting factual boundaries and evidentiary matrix. This is important in contractual disputes such as interpretation, termination, and damages, where ascertaining the precise contractual terms is the fundamental pre-condition of

⁵² Some claimants are prosecuted for committing perjury. Zhejiang Tonglu Renmin Jianchayuan Su Wen Xjia (浙江桐庐县人民检察院诉闻某甲) [Zhejiang Tonglu County People's Procuratorate v. Wen Xjia], CHINALAWINFO (Zhejiang Tonglu County People's Ct. Mar. 22, 2016); Jilin Yitongxian Renmin Jianchayuan Su Gao XX (吉林伊通县人民检察院诉高某某) [Jilin Yitong County People's Procuratorate v. GaoXX], CHINALAWINFO (Jilin Yitong County People's Ct. Nov. 26, 2015); Ningbo Yinzhouqu Renmin Jianchayuan Su Hong Shanxiang (宁波鄞州区人民检察院诉洪善祥) [Ningbo Yinzhou Dist. People's Procuratorate v. Hong Shanxiang], CHINALAWINFO (Ningbo Yinzhou Dist. People's Ct. Oct. 19, 2012). Hou Guoyun & Xu Meng (侯国云,徐梦), Dui Weizhengzui De Xiuding Yu Zhenghe Jianlun Jidai Zengjia De Liangge Zuiming (对伪证罪的修订与整合—兼论亟待增加的两个罪名) [*The Review of Perjury and the Two Crimes that Should be Urgently Added*], 1 Fazhi Yanjiu (法治研究) LAW STUDY JOURNAL (2015).

⁵³ Minshi Susong Fa (民事诉讼法) [Civil Procedure Law] (promulgated by the Standing Comm. Nat'l People's Cong., Apr. 09, 1991, effective Apr. 09, 1991; rev'd by the Standing Comm. Nat'l People's Cong., Aug. 31, 2012), at art. 72, CHINALAWINFO. Perjury and baseless claims may also be caused by inadequate cross-examination and the lack of effective lawyers in China. By contrast, cross-examination may be more adequate and there may be more effective lawyers in the United States.

settling the disputes. Additionally, written contracts increase judicial accuracy, reduce the possibilities of relying on oral testimony, and reduce the risks of perjury and baseless contractual claims. These evidentiary strengths are particularly important in land contract cases due to the significance of contractual remedies in land transactions. Perhaps this is why Professor Corbin questioned the desirability of written form in sale of goods cases but did not question the writing requirement in land contract cases.

In contrast, oral testimony introduces uncertainty and risks. Witnesses may retract their testimony, resulting in compromised findings which may need to be revised or overturned. This prolongs trials and makes them expensive. Further, claimants may exploit the evidentiary rules to make baseless claims and, therefore, commit frauds and perjury. These negative impacts decrease the judicial accuracy and efficiency discussed earlier. It has been radically suggested that witnesses are the second worst source of evidence next to the contracting parties.⁵⁴

After years of experience, China's legislatures and courts have relied more on written contractual evidence and limited the application of testimony. In particular, the Supreme People's Court of China has placed written and signed contracts at the top of the evidentiary hierarchy in terms of persuasiveness.⁵⁵ This is because the same signed contract can be presented to courts as different types of evidence for maximizing the chances of discovering truth. For example, a comprehensive signed contract can prove the authenticity of signatures or handwriting (physical evidence), prove contractual content (documentary evidence), set out contractual terms without referring to other evidence (direct evidence) and record firsthand contractual evidence (original evidence).⁵⁶ Furthermore, the Supreme People's Court has advised its lower courts by stating that the testimony given by certain witnesses

⁵⁴ OTHMAR JAUERNIG, *Minshi Susong Fa* (民事诉讼法) [CIVIL LITIGATION] 295 (Zhou Cui (周翠) trans., 2003).

⁵⁵ *Zuigaoyuan Guangyu Minshi Susong Zhengju De Ruogan Guiding* (最高人民法院关于民事诉讼证据的若干规定) [Provisions of Evidence in Civil Procedures] (promulgated by the Sup. People's Ct., Dec. 21, 2001, effective Apr. 1, 2002), at art. 77.

⁵⁶ *Id.*

cannot be the sole basis for determining the facts.⁵⁷ This guidance also sets out the rule that testimony provided by spouses and relatives is less convincing than testimony given by other witnesses.⁵⁸ The actions taken by the Supreme People's Court demonstrate the desirability of written form.

III. DERIVATIVES OF THE EVIDENTIARY PURPOSE AND FUNCTION

The evidentiary purpose and function have derivatives. Although derivatives are treated as stand-alone in Sino-Civilian and Anglo-American literature, the derivatives depend on the evidentiary nature of writing—written and signed contracts are original and accurate evidence of contractual content. Despite this dependency, the derivatives enrich the evidentiary attributes.

First, from the perspective of enterprises, written contracts record the content that is used for business convenience, such as making written files organized, inserting profitable contractual terms into written contracts, and keeping administrative information consistent in writing (the “managerial function”).⁵⁹

Second, from the perspective of government, written form is an aid for supervising economic activities and regulating contractual content (the “regulatory function”).⁶⁰ Its Chinese counterpart is the “public law purpose” where formality arguably provides a clear and reliable basis for land registration authorities to check and supervise land contracts.⁶¹ The German version is the “public interest purpose” (Öffentliches Interesse) as written contracts facilitate government archival management and supervision in land-related matters.⁶² Further, written contracts can be physically taxed and

⁵⁷ *Id.* at art. 69(1)(2)(5), such as the testimony delivered by witnesses who do not make their appearance at court without legitimate reasons.

⁵⁸ *Id.* at art. 77(5).

⁵⁹ Perillo, *supra* note 28, at 58.

⁶⁰ *Id.* at 62.

⁶¹ Wang Hong (王洪), *Hetong Xingshi Yanjiu* (合同形式研究) [Research on Contractual Formality] 48 (2005).

⁶² Medicus, *supra* note 18, at 462.

stamped (the “taxation function”).⁶³ Indeed, the taxation function is particularly important in land transactions. As land transactions are great sources of revenue, they have gone beyond private law domain and have a public significance in many jurisdictions. Government needs written land sale contracts to better achieve the purposes of management, supervision, and revenue collection.

Third, from the perspective of claimants, written contracts help to protect them by drawing a clear line between contractual formation and pre-contractual negotiations, and avoiding ambiguities that are caused by their own negligence or other parties’ frauds (the “contractual-party-protection purpose” and “Parteien des Rechtsgeschäfts”).⁶⁴ This may be more important to claimants of lower socio-economic status.⁶⁵ However, the contractual-party-protection purpose is contested as the unequal economic status of claimants does not constitute illegitimacy at law; what is of legal concern is whether the economic status advantage is obtained by illegitimate means or exploited for imposing undue influence on the claimants’ will.⁶⁶ Further, written contracts protect third parties’ interests as they are reliable sources of information about existing legal relations (the “third-party-protection purpose” and “Einzelne Dritte”).⁶⁷ Written contracts also arguably serve the “publicity function and purpose,” as they reveal reliable contractual information to protect prospective bona fide purchasers against unknown pre-existing legal relations,⁶⁸ to assist them to better understand contractual terms,⁶⁹ and to increase public transparency of legal relations.⁷⁰ Similarly, where written contracts clearly explain the key issues to prospective consumers, writing serves the “information-providing purpose” (‘Informationszweck’).⁷¹

⁶³ Perillo, *supra* note 28, at 64.

⁶⁴ Medicus, *supra* note 18, at 461–62.

⁶⁵ Sakaw, *supra* note 15, at 28.

⁶⁶ Qingyu, *supra* note 36, at 25.

⁶⁷ Medicus, *supra* note 18, at 462; Li Yongjun (李永军), *Hetongfa* (合同法) [LAW OF CONTRACT] 204 (2010).

⁶⁸ Perillo, *supra* note 28, at 59.

⁶⁹ Pengsheng, *supra* note 15, at 70.

⁷⁰ Tzechien, *supra* note 27, at 328.

⁷¹ Shiyuan, *supra* note 11, at 114.

Fourth, writing serves the “circulation purpose,” as written documents are commonly used in commercial law for circulating negotiable securities such as bills and stocks.⁷² Writing also serves the “transaction safeguard purpose,” as written contracts increase transaction safety through the precise recording of contractual content.⁷³

Lastly, novel derivatives may arise as individuals, enterprises, legislatures, governments, and societies continue to utilize the evidentiary attributes, increasing the desirability of writing in China in the context of land sale contracts.

IV. THE SECOND CORE ATTRIBUTE: THE SINO-CIVILIAN WARNING PURPOSE AND THE ANGLO-AMERICAN CAUTIONARY FUNCTION

The second core attribute of formality is the warning purpose in Sino-Civilian literature and its counterpart, the cautionary function in Anglo-American literature, suggests that the action of signing written contracts urges claimants to be prudent and cautious.

In Sino-Civilian literature, the warning purpose arguably assists claimants to understand the legal meaning and significance of contracts and therefore avoid hasty and rash decisions.⁷⁴ Additionally, written contracts arguably induce claimants to consider contractual content seriously,⁷⁵ to convey intention cautiously,⁷⁶ and to better understand contractual consequences.⁷⁷ However, these arguments may not explain why claimants must use written form to immutably demonstrate caution.⁷⁸

The German and Taiwanese legislatures have accepted the warning purpose as a valid reason to tighten up their formality requirements for land sale contracts. The German legislature

⁷² Sakaw, *supra* note 15, at 27; Tzechien, *supra* note 27, at 328.

⁷³ Liming, *supra* note 11, at 501.

⁷⁴ Tzechien, *supra* note 27, at 328.

⁷⁵ Liming, *supra* note 11, at 485.

⁷⁶ Shiyuan, *supra* note 11, at 114.

⁷⁷ Jianyuan, *supra* note 13, at 67.

⁷⁸ Qingyu, *supra* note 36, at 24.

confirms that compliance with formality gives claimants an intensive awareness of entering into transactions, makes them think twice, and ensures the seriousness of their decisions (“Warnzweck”).⁷⁹ Similarly, the Taiwanese legislature thinks that formality is necessary to encourage claimants to be prudent when forming important contracts such as land contracts.⁸⁰

In the United States, Professor Fuller argued that formality acts as a check against unconsidered actions and prevents claimants from being incautious, inconsiderate, or impulsive (the “cautionary function”).⁸¹ Professor Perillo pointed out that the cautionary function changes the habits of the nation through encouraging the use of written form.⁸² Further, the cautionary function may prevent mistakes caused by the careless use of language.⁸³ In particular, the strengths of the cautionary function have successfully persuaded the English legislature to tighten the statutory writing requirement for land contracts.⁸⁴ It has been further argued that the cautionary function is also important to justify the requirements of writing and signatures in testamentary cases for serving cautionary policies.⁸⁵ Nevertheless, the statute of frauds is criticized for performing the cautionary function unsatisfactorily. For example, written repudiations are created after contract formation and do not manifest the prudence of contract formation, but the repudiations still satisfy the statute through evidencing contractual terms.⁸⁶ Likewise, claimants may not have the idea of entering into contracts when signing or creating some written memoranda that nevertheless satisfy the statute because there are cases in the United States where the sellers have only signed the agency agreements and do not have

⁷⁹ Flume, *supra* note 18, at 287; Medicus, *supra* note 18, at 461.

⁸⁰ <http://lis.ly.gov.tw/ttscgi/lgimg?@980501;0248;0327>;
<http://lis.ly.gov.tw/ttscgi/lgimg?@881301;0252;0513> (Legislative Yuan Gazette 立法院公報, Chinese only (Lifayuan Gongbao)).

⁸¹ Fuller, *supra* note 28, at 800.

⁸² Perillo, *supra* note 28, at 56. Professor Perillo examined the operation of the cautionary function in the context of gratuitous contracts, gifts, guarantee promises, and marriage settlement.

⁸³ Posner, *supra* note 29, at 1985.

⁸⁴ Law Commission, *supra* note 38, at 2.10.

⁸⁵ Langbein, *supra* note 31, at 494–96.

⁸⁶ Perillo, *supra* note 28, at 53–56.

in mind the formation of sale contracts with the buyers when signing the contracts.⁸⁷ Further, as consideration is carefully bargained for between claimants, this cautionary attribute can be manifested by consideration instead of the statute of frauds.⁸⁸

Indeed, formality guides, leads, and directs claimants to become more cautious and prudent. When claimants talk, they are more likely to formulate ideas and communicate as opposed to forming contracts. In contrast, when claimants put words on paper and sign it, they may become more cautious and have mental awareness of entering into transactions. This mental activity can be applied universally. A common phenomenon helps illustrate. When people pay with cash and count the actual banknotes in their hands, they have an intense feeling of spending money. As a result, they may think twice and buy less. In contrast, when people use credit cards, they simply swipe the cards and buy more, as they do not have the actual feeling of spending money. Signing written contracts is similar to paying with cash as it makes claimants think twice about contractual content. In contrast, making oral contracts is similar to swiping credit cards in the sense that it makes claimants care less about contractual content.

Moreover, the cautionary function and the warning purpose increases the chance of successful contractual performance in a similar fashion to the evidentiary function and purpose.⁸⁹ Professor Braunstein acknowledges that “the ceremony of writing encourages the parties to take their undertaking seriously, thus increasing the likelihood of performance.”⁹⁰ Braunstein further concedes that, although written repudiations do not indicate cautiousness of contract formation, the repudiations show the deliberation of contractual termination.⁹¹ These cautionary attributes require claimants to be prudent at different stages of contractual arrangements, such as contract formation, variations, and termination.

⁸⁷ Braunstein, *supra* note 33, at 430.

⁸⁸ Posner, *supra* note 29, at 1985–86.

⁸⁹ Pengsheng, *supra* note 15, at 70.

⁹⁰ Braunstein, *supra* note 33, at 425.

⁹¹ *Id.* at 430–31.

Professor Perillo raises the question of what types of contracts deserve a statutory requirement of writing and its cautionary function.⁹² This question is relevant in Chinese law because land sale contracts in China also deserve the operation of cautionary function. For most Chinese individuals, purchasing land is likely to be one of the most important decisions they make in their lives. In particular, statistics show that the housing prices in Chinese major cities are increasingly unaffordable.⁹³ Written forms help purchasers weigh and consider contractual terms and consequences. This exercise involving the written forms matches the importance and seriousness of land contracts and echoes the idea of intensive awareness of entering into transactions stated by the German legislature.⁹⁴

V. DERIVATIVES OF THE WARNING PURPOSE AND THE CAUTIONARY FUNCTION

The warning purpose and the cautionary function of writing has derivatives. Although these derivatives are seen to be stand-alone by Sino-Civilian and Anglo-American scholars, these derivatives depend on the nature of the cautionary attributes—the action of signing written contracts helps claimants to be prudent and cautious.

One derivative is the educational function. Written form encourages claimants to read and understand the written contractual content, although arguably the statute of frauds is not concerned with the educational function.⁹⁵ Another derivative is the clarity function; claimants may discover more disagreements after reading written transaction details and hence clarify contractual content.⁹⁶

⁹² Perillo, *supra* note 28, at 56.

⁹³ Erlingyijiu Nian Wuyuefen Qishige Dazhong Chengshi Shangpin Zhuzhai Xiaoshou Jiage Biandong Qingkuang, (2019年5月份70个大中城市商品住宅销售价格变动情况) [*Changes in Housing Prices at Seventy Major Cities in May 2019*], Guojia Tongjiju 国家统计局 [NATIONAL BUREAU OF STATISTICS] (June 18, 2019) http://www.stats.gov.cn/Tjsj/zxfb/201906/t20190618_1670960.html.

⁹⁴ Medicus, *supra* note 18.

⁹⁵ Perillo, *supra* note 28, at 60–62.

⁹⁶ *Id.* at 56–57.

The clarity function is a hybrid derivative of both the evidentiary attributes and the cautionary attributes. The evidentiary attributes increase clarity through recording contractual content accurately. The cautionary attributes promote clarity. Through cautious reading, claimants may discover and address ambiguities before signing the contracts. Consequently, wholly written contracts may become more clear, certain, and complete than oral contracts.

Other derivatives include the magical function, the sacramental function, and the psychological function. In ancient times, claimants had to take an oath when forming contracts that parties-in-breach would be cursed and sanctioned by supernatural powers.⁹⁷ The ancient rigorous procedures of contract formation remind claimants of the “rightfulness” of performing their contracts despite changes of subsequent circumstances.⁹⁸

I propose a new function as a derivative of the cautionary attributes—the ceremonial function, because the conduct of burning or tearing signed contracts is a form of celebration or expression of seriousness.

In the late 1940s and early 1950s, farmers in China celebrated their liberation by burning the deeds they signed with landlords. For example, in July 1951, the farmers in Nanping Township, Hechuan County burned land deeds to celebrate the victory of the land reform;⁹⁹ they believed their dream of owning the land was finally achieved. Although the pre-existing land system was not abolished by the conduct of burning the deeds itself, the deeds were considered to be a symbol of the old land system. Burning the deeds was a way by which the farmers expressed their hope of starting a new life and having new social status. This is similar to freedom of speech in the modern sense; Chinese farmers expressed their feelings by burning their deeds in a similar way that Americans express their freedom of

⁹⁷ *Id.* at 44.

⁹⁸ *Id.* at 45.

⁹⁹ Those scenes were captured by photos and one of the photos can be found online. Zhongguo Zhiming Sheyingjia Zuopin Dangan, (中国知名摄影家作品档) [*Gallery of China's Top Photographer*], <http://www.fotocn.org/shipanqi/42599> (last visited July 17, 2019).

speech through flag-burning.¹⁰⁰ Likewise, the conduct of tearing signed contracts nowadays is a ceremony of expressing claimants' determination and seriousness of waiving their contractual rights because, in doing so, the claimants would lose the best evidence to prove the existence and formation of their contracts.

VI. THE THIRD CORE ATTRIBUTE: THE ANGLO-AMERICAN CHANNELING FUNCTION

In the United States, Professor Fuller argued that formality serves as a test of legal intention and enforceability (the channeling function). In the context of the statute of frauds, the absence of writing indicates that claimants do not intend to be bound.¹⁰¹ Similarly, Professor Perillo argued that employing written form in compliance with the statute of frauds manifests contractual intention.¹⁰² Further, the cost-effective advantage of the channeling function extends to testamentary cases; the compliance with formality such as executing wills saves courts the trouble of ascertaining the presence of testamentary intention. Additionally, the standardization of testation lowers the cost of judicial administration in will-related cases.¹⁰³

However, Professor Fuller pointed out that the channeling function does not fully relieve judges from ascertaining the intention of legal transactions; otherwise, the effect of formality would be exaggerated.¹⁰⁴ There are cases in which the written documents satisfy the requirement imposed by the statute of frauds but fail to reveal whether an enforceable relationship is intended or which type of relationship is intended. This is because there are cases in the United States where the signed document that satisfies the statute of

¹⁰⁰ *Texas v. Johnson*, 491 U.S. 397 (1989).

¹⁰¹ Fuller, *supra* note 28, at 801–802.

¹⁰² Perillo, *supra* note 28, at 49.

¹⁰³ Perillo, *supra* note 28, at 49–50; Langbein, *supra* note 31, at 493–94.

¹⁰⁴ Fuller, *supra* note 28, at 801.

frauds records pre-contractual negotiations and thereby does not indicate contractual intention.¹⁰⁵

Indeed, the presence of signed and written contracts may indicate contractual intention and assent. This explains the importance of signatures on written contracts in case law such as the classic rule derived from *L'Estrange v F Graucob Ltd*: claimants' signatures on written contracts are a sign of their intention and assent to be bound by the contracts regardless of whether the claimants have read the contracts.¹⁰⁶ However, the presence of written form and signatures is not the sole test: other factors, such as vitiating factors, are also relevant in ascertaining intention and assent. For example, fraud and misrepresentation are exceptions to the *L'Estrange* rule despite the presence of signed written contracts. Furthermore, the evidentiary attributes play a more important role through recording the content revealing such intention and assent.

Professor Posner interprets the channeling function from the perspective of legal enforcement, arguing that the function gives claimants a way to signal to courts their desire for contractual enforcement; the presence of writing manifests such desire while the absence of writing does the opposite.¹⁰⁷ This argument is partially rebutted as the desire for enforcement could also be expressed orally,¹⁰⁸ and the channeling function justifies written form as a default rule, but not as an immutable rule for signaling enforcement.¹⁰⁹

Indeed, claimants need clear rules to signal their desire for enforcement of contractual rights. In the context of writing, the channeling function requires the law to provide consistent and clear rules with respect to the threshold question of whether written form is mandatory for land sale contracts as a prerequisite for contractual remedies. If claimants have clear rules with which to comply, they can make contractual arrangements and predict contractual consequences accordingly. Complying with the statutory

¹⁰⁵ Braunstein, *supra* note 33, at 428–30.

¹⁰⁶ [1934] 2 KB 394 (Eng.).

¹⁰⁷ Posner, *supra* note 29, at 1984.

¹⁰⁸ *Id.*

¹⁰⁹ *Id.*

requirement of writing enables contracts to be protected by law, while noncompliance does the opposite. Likewise, courts have clear guidelines to apply for delivering consistent cases. This is the role of many laws—to settle disputes by laying clear standards and rules, even in pre-industrial eras.¹¹⁰ In particular, the English legislature confirms that the certainty introduced by this function is attractive and justifies imposing a much stricter statutory requirement of writing for land contracts.¹¹¹

The Anglo-American channeling function informs China as to how to achieve certainty in land sale contract cases. There is nationwide uncertainty in urban and rural China in relation to whether signed contracts are mandatory as a prerequisite for contractual remedies in land sale contract cases.¹¹² Some Chinese urban courts consider signed contracts to be mandatory, but other urban courts have delivered the opposite judgements.¹¹³ The cause of the uncertainty is the conflict of rules between Contract Law and urban real property administration law. Contract Law sets out the general rule that writing is optional and does not mandate writing for land contracts, but urban real property administration law (which has lower authority than Contract Law) mandates writing for urban land sale contracts.¹¹⁴ This uncertainty is even greater in rural areas.¹¹⁵ This overall nationwide uncertainty is particularly

¹¹⁰ Mechanisms other than law may perform the channeling function, even in pre-industrial eras. For example, Professor Karl Llewellyn, together with an anthropologist, conducted an empirical study on an aboriginal Cheyenne tribe in America. He found that even in the absence of a government in the modern sense, disputes were solved and behaviors were regulated without violence in this primitive tribe. William L. Twining, *KARL LLEWELLYN AND THE REALIST MOVEMENT* 153–69 (1985).

¹¹¹ Law Commission, *supra* note 38, at §§ 2.7, 2.11.

¹¹² Wei Wen, *The Need for Certainty and Written Form in Land Sale Contracts in China: A Legal Reform Recommendation*, 3 *INT'L COMP., POL'Y & ETHICS L. REV.*, 383–402 (2020).

¹¹³ *Id.*

¹¹⁴ Chengshi Fangdichan Guanli Fa (城市房地产管理法) [Urban Real Property Administration Law] (promulgated by the Standing Comm. Nat'l People's Cong., Jul. 5, 1994, effective Jan. 1, 1995; rev'd by the Standing Comm. Nat'l People's Cong., Aug. 27, 2009), at art. 41, CHINALAWINFO.

¹¹⁵ Wen, *supra* note 112.

concerning given the importance of land sale contracts and contractual remedies in land related cases. The solution to addressing this uncertainty is to clearly mandate writing for land sale contracts so all courts and claimants have to follow this rule.¹¹⁶ Because China's supreme legislature is now drafting the uniform civil code, the highest nationwide authority in contractual and private law, it is recommended that the civil code mandates writing for land sale contracts. Among other things, the civil code should specifically include a section to articulate that "[l]and sale contracts shall be in written form and signed by claimants" (or the equivalent). This is recommended in order to eradicate the common element of uncertainty and thereby perform the channeling function more satisfactorily. A comparative analysis of the attributes of Sino-Civilian and Anglo-American writing within this article firmly underpins this recommendation.

Furthermore, Chinese courts have inconsistent and contradictory judgements about the application of the "healing theory."¹¹⁷ The healing theory is a remedy given by China's Contract Law to validate oral contracts, including oral land sale contracts, that would otherwise be invalid for violating the requirement of writing (if courts consider writing to be mandatory or writing is mandated by law).¹¹⁸ The healing theory is triggered after claimants perform and accept the "main obligation" of oral land sale contracts.¹¹⁹ However, Contract Law does not specify what the main obligation is, so courts have delivered contradictory judgements about what conduct constitutes the main obligation in land sale contract cases.¹²⁰ As a result, the same conduct that triggers the healing theory in one case may not trigger it in another case, and vice versa. This has caused unfairness to Chinese claimants.¹²¹ As pointed out, the healing theory is designed to be a

¹¹⁶ *Id.*

¹¹⁷ Wei Wen, *Advancing the 'Healing Theory' of China's Contract Law for Oral Land Sale Contracts: A Legal Reform Recommendation*, 19 AUSTRALIAN J. ASIAN L. 1, 2 (2019).

¹¹⁸ *Id.*

¹¹⁹ *Id.*; Contract Law, *supra* note 4, at art. 36.

¹²⁰ Wen, *supra* note 117, at 3–4.

¹²¹ *Id.*

substitute for writing.¹²² Because this article has identified that writing has three core attributes, the substitute for writing must satisfy the following: (1) clearly prove oral contracts (the evidentiary attribute); (2) remind claimants to be cautious (the cautionary attribute); and (3) provide clear rules to avoid uncertainty (the channeling attribute).¹²³ Only through this analysis can the two specific types of conduct be identified and pinpointed in order to make the scope of the main obligation clear and precise in land sale contract cases.¹²⁴ The analysis of the attributes of writing in this article is conducive to resolving the widespread uncertainty brought on by land sale contracts. Accordingly, it is recommended that the future civil code adds the two specific types of conduct—make full, part, or advance payments; and transfer real property ownership—to clarify the application of the healing theory and to address the uncertainty.¹²⁵

Moreover, the two legal reform recommendations that are underpinned by the comparative analysis of this article also fill the gaps. These recommendations act as gap fillers because both the current Contract Law and the civil code drafts to date proposed by Chinese scholars do not have any section to mandate writing for land sale contracts, and they do not clarify the application of the healing theory.¹²⁶

Therefore, because the channeling function is desirable to resolve the uncertainty problems in China in land sale contract cases, it is more important in China. The channeling function maintains its importance despite the fact that Sino-Civilian literature does not embrace the notion of the Anglo-American channeling

¹²² *Id.* at 5.

¹²³ The attributes of writing also underpin the legitimacy of the healing theory and justify its existence in Contract Law. *Id.*

¹²⁴ *Id.* at 7–10.

¹²⁵ *Id.* at 12–13.

¹²⁶ Liang Huixing (梁慧星), *Zhongguo Minfadian Caoan Jianyigao* (中国民法典草案建议稿) [A DRAFT OF CIVIL CODE OF CHINA] 166 (2011); Wang Liming (王利明), *Zhongguo Minfadian Xuezhe Jianyigao Ji Lifa Liyou Zhaifa Zongzhepian Hetongpian* (中国民法典学者建议稿及立法理由 债法总则篇合同篇) [CIVIL CODE DRAFT AND ITS LEGISLATIVE RATIONALE, LAW OF OBLIGATIONS AND CONTRACT] 202 (2005).

function. After all, the certainty would enable contractual rights to be protected in a consistent, predictable, and fair manner. The certainty and fairness introduced by the channeling function would also make claimants less incentivized to pursue lawsuits. This would lead to a heightened value of the evidentiary attributes and cautionary attributes in reducing the courts' workloads and increasing the likelihood of contractual performance.

VII. DERIVATIVES OF THE CHANNELING FUNCTION

Although the channeling function is understood to make the presence of written form the sole and absolute test of ascertaining contractual intention,¹²⁷ the channeling function has derivatives. While these derivatives are treated as stand-alone, they nevertheless depend on the idea that written form is an immutable sign of contractual intention.

One such derivative is the "earmarking of intention to contract" function in the United States. The execution of written form, particularly if signed, earmarks the presence of contractual intention and the departure of pre-contractual negotiations.¹²⁸ However, this is arguably not an immutable sign.¹²⁹ The Sino-Civilian counterpart is the "line-drawing purpose" ("Trennungslinie"), suggesting that written form draws a line between pre-contractual negotiations and contract formation.¹³⁰ The line-drawing purpose is seen to be particularly important in land contracts cases, as negotiations are usually time-consuming and the binding effects of the meeting of minds are always in dispute.¹³¹ The presence of written contracts may eliminate these disputes as claimants may comprehend that oral pre-contractual expressions are not binding until formal written contracts are signed.¹³² Furthermore, where the more rigorous requirements of writing earmark the more important types of

¹²⁷ Perillo, *supra* note 28, at 49.

¹²⁸ *Id.* at 48–52.

¹²⁹ *Id.* at 50.

¹³⁰ Shiyuan, *supra* note 11, at 114.

¹³¹ *Id.*

¹³² *Id.*

commercial transactions, writing arguably has the earmarking-transaction-type function.¹³³

Notwithstanding, ascertaining contractual intention is not a major task of the statutory requirement of writing despite the fact that signed and written documents may record the legal content revealing such intention. For example, in the Chinese legal system, invitations to treat can be evidenced in signed and written form to defeat contractual formation and intention.¹³⁴ Similarly, in the United States, signed documents with “subject to contract” clauses may lack contractual intention despite the presence of written form and signatures. In particular, arguably there are real possibilities where claimants do not intend to be contractually bound despite the presence of written documents, such as making “gentlemen’s agreements” in writing.¹³⁵ Further, the earmarking-transaction-type function is also not a task of writing. Claimants can always employ writing to record less important contracts, and the contractual content plays a more decisive role to determine whether the contracts in question are serious commercial transactions.

Hence, the channeling function should be seen to require law to set out clear rules in contractual formality matters. When claimants comply with the legal rules, their contractual rights will be enforced by law. By this definition, the channeling function may overlap with the derivatives of the evidentiary function and the evidentiary purpose. Examples include the circulation purpose and the transaction safeguard purpose. As the channeling function enables written negotiable securities to be protected by law because of compliance with the statutory requirement of writing, the channeling function increases the security of transactions and boosts the circulation of negotiable securities.

¹³³ *Id.* at 50–52.

¹³⁴ Contract Law, *supra* note 4, at art. 14 & 15.

¹³⁵ 1 EDWARD ALLAN FARNSWORTH, FARNSWORTH ON CONTRACTS § 3.7, at 213–20 (3d ed. 2004) (discussing the possibilities where claimants do not intend to be contractually bound, such as making “gentlemen’s agreements”).

VIII. THE HIERARCHY OF THE ATTRIBUTES OF WRITING IN SINO-AMERICAN LITERATURE

The discussion so far evaluated the attributes of formality in China and the United States. This part focuses on their hierarchy. As noted by Professor Fuller, there is “an intimate connection” between the attributes.¹³⁶ Although each attribute of writing is treated to be stand-alone in Sino-Civilian and Anglo-American literature, the attributes have a hierarchy. The evidentiary, cautionary, and channeling attributes are three fundamental core attributes and the three core attributes have derivatives.

The evidentiary purpose (the evidentiary function) and the warning purpose (the cautionary function) are the first and second core attributes of formality. The evidentiary attributes are desirable for addressing the limitations of testimony in modern China. Furthermore, the English, Taiwanese, and German legislatures have accepted the evidentiary and cautionary attributes as valid reasons to tighten up the statutory requirement of formality for land sale contracts. This is a valuable experience to inform China about the desirability of writing.

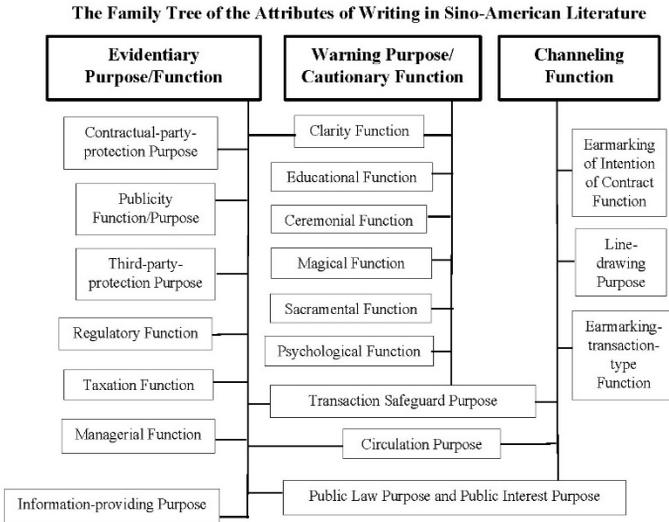
The channeling function is the third core attribute of formality. This function requires the law to provide clear and consistent rules in relation to contractual form matters. Accordingly, the courts have a clear basis to deliver consistent cases and claimants have clear rules to follow. The English legislature considers that the certainty introduced by the function justifies imposing a much stricter statutory requirement of writing for land contracts. As this function eradicates the uncertainty problems in China in land sale contract cases, this function is much more desirable there despite the fact that Sino-Civilian literature does not embrace the notion of this function.

Moreover, the attributes augment each other. As the channeling function increases legal certainty that leads to claimants being less incentivized to pursue lawsuits, this function augments the evidentiary attributes by reducing the numbers of lawsuits and increasing the likelihood of contractual performance.

¹³⁶ Fuller, *supra* note 28, at 803.

Novel attributes of formality may arise as individuals, enterprises, legislatures, governments, and societies continue to utilize the existing attributes. At least for now, the benefits introduced by writing have gone far beyond the evidentiary function, which was the original legislative intent of the statute of frauds, and have firmly embraced other attributes. This explains why the statutory requirement of writing for land contracts has outlived the statute of frauds’ legislative background and has become much stricter in England 300 years after its enactment. It also explains not only why written form is still desirable in the United States, but also why the need for formality has become stronger in Taiwan and Germany. The attributes of writing are solid underpinnings in China to mandate writing for land sale contracts and clarify the application of the healing theory in China’s future uniform civil code. This is done in order to address the uncertainty problems there in land sale contract cases.

As a summary, the family tree below unfolds the hierarchy of all attributes in a clear and novel fashion.



IX. CONCLUSION

In order to demonstrate the desirability of written form and provide solid underpinnings to mandate writing for land sale contracts, this article advances, synthesizes, and integrates the theoretical, doctrinal, and practical attributes of writing in Sino-American literature. In particular, the Anglo-American channeling attribute is not found in Sino-Civilian literature, but it is important to inform China as to how to achieve certainty in land sale contract cases. This article also borrows experience from other jurisdictions (England, Germany, and Taiwan).

Although all the attributes are treated as stand-alone in Sino-American literature, this article assesses the levels of their importance, separates the core attributes from their derivatives, and creates a hierarchy in the form of a family tree. This is done in order to have a much clearer focus and emphasis to highlight and apply the three core attributes of written form (the evidentiary, the cautionary, and the channeling attributes) in Sino-American literature. This article also identifies the attributes that are not relevant to writing in order to have a more informed understanding of the role of writing.

This article is timely. China's current Contract Law does not mandate writing for land sale contracts. This has caused nationwide uncertainty in relation to whether the requirement of writing is mandatory as a prerequisite for contractual remedies in land sale contract cases. Further, land sale contracts deserve to be mandated in writing. As a timely opportunity to fill this gap and address this problem, China's supreme legislature is now drafting the uniform civil code and could utilize the comparative analysis in this article as a solid underpinning to justify mandating writing for land sale contracts in the code. Hence, it is recommended that the future civil code mandates writing for land sale contracts and has a section to articulate that "[l]and sale contracts shall be in written form and signed by claimants" (or the equivalent). This is an effective solution to addressing the nationwide uncertainty in China about whether writing is mandatory in land sale contract cases. The analysis of the core attributes of writing is also conducive to solving the uncertainty relating to the contradictory application of the healing theory of the Contract Law in land sale contract cases.

Further, China's supreme legislature could utilize the analysis of this article as a part of its policy making process, to tighten or loosen the statutory requirement of writing for other types of contracts or agreements (such as lease contracts or building contracts) when drafting the future uniform civil code.

THE BEST OF BOTH METHODS: A PROPOSAL FOR A HYBRID INTERNATIONAL TRANSFER PRICING METHOD

C. Annalise Musselman

I. INTRODUCTION.....	58
II. BACKGROUND.....	63
A. ARM'S LENGTH PRINCIPLE	63
B. FORMULARY APPORTIONMENT.....	71
C. TRANSFER PRICING METHODS.....	77
III. AN ALTERNATIVE PROPOSAL.....	79
IV. RESIDUAL PROFIT SPLIT APPLIED TO BMW.....	88
V. CONCLUSION.....	92

This paper examines alternatives to the current international transfer pricing method, the arm's length standard, that will better suit increasingly intangible-related industries and ward off tax avoidance tactics by multinational corporations. Among other issues, the arm's length standard fails to consider that multinational enterprises (MNE's) operate differently from third party corporations, does not properly account for nontraditional assets, such as intangibles, and leaves taxpayers and governments with uncertainty throughout the transfer pricing process. In identifying a more appropriate method, this paper considers the varying transfer pricing methods currently used by multinational corporations around the world and contemplates the advantages and disadvantages of each method. This paper proposes a hybrid approach to transfer pricing and advocates for the use of the arm's length principle solely for transactions in which comparable data exists; conversely, when measuring transactions for which there is no similar data and the arm's length principle is inadequate, the residual profit split method should be utilized. The recommended method

is examined through a case study involving the BMW Group, a large multinational corporation that routinely deals with transfer pricing related decisions. The proposed transfer pricing method capitalizes on the most valuable features of both the arm's length standard and the formulary apportionment approach to solve prevalent issues caused by the current method.

I. INTRODUCTION

The BMW Zentrum, a modern, white, and pristine building, is visible from the lanes of southbound Interstate 85 in Spartanburg County, South Carolina. Most interstate drivers speeding by at 65 miles per hour only take their eyes off the road long enough to notice the uniquely shaped visitors center; however, the unknowing passerby is also driving past a seven million square-foot campus capable of producing 1,500 BMW vehicles per day through the employment of 11,000 people.¹ Every single BMW X-line vehicle in the world has progressed through the plant's multiple body shops, paint shops, and assembly halls as the Spartanburg plant is the global producer of all BMW X models.² Any local resident will quickly inform you of the positive effect the BMW Group brought to the Upstate of South Carolina. In addition to creating 11,000 jobs on its own automobile manufacturing plant, BMW brought with it more than 40 major automotive part suppliers to the state of South Carolina. The German automotive corporation brought new life to a state that was feeling the effects of the waning textile industry, South Carolina's economic driver for countless years.³ Today, practically

¹ THE BMW GROUP, *BMW Manufacturing*, <https://www.bmwgroup-plants.com/spartanburg/en/our-plant/site-infos.html> (last visited Nov. 13, 2020).

² *Id.*

³ David Wren, *Economic Driver: BMW's Impact on South Carolina's Manufacturing Growth, Psyche Has Been Immeasurable*, THE POST AND COURIER, (June 17, 2017), https://www.postandcourier.com/business/economic-driver-bmw-s-impact-on-south-carolina-s-manufacturing/article_29b50b10-51e4-11e7-b3dc-83f7d1a3d4c0.html (last visited Nov. 13, 2020).

every imaginable part of an automobile is produced in the Upstate of South Carolina.

As with any multinational corporation, there are many aspects to BMW that a passerby will not notice or even consider; these facets might encompass marketing schemes, research and development teams, and accounting departments. While such aspects are often overlooked, most likely even less thought is given to the transfer pricing methods employed by the multinational corporation. Bayerische Motoren Werke, better known as BMW, is headquartered in Munich, Germany, but has a presence all over the world.⁴ With 30 production and assembly facilities in 14 countries and a sales network in at least 140 countries, the BMW Group deals with transfer pricing-related decisions on a daily basis.⁵ Like BMW, the majority of the automotive manufacturers in the Upstate are members of multinational corporations; many of the Upstate locations are simply production plants or operational offices for a much larger company headquartered elsewhere. With so many ties to multinational corporations in its counties, the Upstate of South Carolina's growth could be affected by a change in an international taxation issue, such as transfer pricing.

Transfer pricing is the process of putting a price to a transaction between related parties, usually individual entities or subsidiaries of a large, multinational corporation.⁶ While transfer pricing itself is not inherently illegal, these companies have found that it is possible to manipulate their tax liabilities by moving profits to lower tax jurisdictions, allowing them to avoid paying taxes on these profits in average or high tax regions. Countries view transfer pricing as a threat to their annual tax revenue and their fear is well-founded; shifting multinational corporations' income from one country to a lower-tax jurisdiction has been estimated to result in 10% of

⁴ THE BMW GROUP, *The BMW Group – A Global Company*, <https://www.bmwgroup.com/en/company/locations.html> (last visited Nov. 13, 2020).

⁵ *Id.*

⁶ Alicia Tuovila, *Transfer Price*, INVESTOPEDIA (May. 29, 2020), <https://www.investopedia.com/terms/t/transferprice.asp> (last visited Nov. 13, 2020).

corporate revenue, or at least \$125 billion, to be lost tax revenue for countries around the world.⁷ Ideally, the international business world would allow for both multinational corporations' goals and the primary objective of transfer pricing rules to harmoniously thrive. Multinational corporations operate to maximize their after-tax profits, for the good of the company and shareholders.⁸ The "central goal of transfer pricing rules is to 'allocate a reasonable amount of income from a particular transaction to the appropriate taxpayers and jurisdictions, having regard to their inputs into the income-earning process.'"⁹ Because we live in a clearly imperfect world, it is not possible for these goals to coexist.

Regulations have been put into place to keep companies from taking advantage of the taxing jurisdictions; the principal standard that has been adopted to regulate the prices a corporation "charges" its related entities is the arm's length standard. While this standard has suited the international tax world for several years after its creation through U.S. tax law in 1935, it is becoming increasingly insufficient with changes in industries and entire economies.¹⁰ Instead of successfully identifying a similar widget to compare to the corporation's own widget, corporations are left stranded, attempting to find similar technology akin to their new, top of the line technology for valuation purposes. The business world is no longer centered on the industrial factory economy; instead of tangible goods and observable services, many companies' focuses have shifted to complex nontraditional assets and services that are

⁷ Peter Jansky & Miroslav Palansky, *Estimating the Scale of Profit Shifting and Tax Revenue Losses Related to Foreign Direct Investment*, 26 INT'L TAX & PUB. FIN. 1048, 1049 (2019).

⁸ J. Clifton Fleming, Jr. et al., *Formulary Apportionment in the U.S. International Income Tax System: Putting Lipstick on a Pig?*, 36 MICH. J. INT'L L. 1, 2–3 (2014).

⁹ Charles F. Connolly, *The New Transfer Pricing and Penalty Regulations: Increased Compliance, Increased Burdens, and the Search for a Safe Harbor*, 16 U. PA. J. INT'L BUS. L. 339, 340 (quoting David R. Black, *Splitting Profits: Finding the Right Transfer-Pricing Methodology*, 41 CAN. TAX J. 140, 141 (1993)).

¹⁰ Reuven S. Avi-Yonah, *The Rise and Fall of Arm's Length: A Study in the Evolution of U.S. International Taxation*, 15 VA. TAX. REV. 89, 97 (1995).

seemingly immeasurable. The arm's length method has lost its effectiveness as the sole international standard with the rise of incomparable assets. Changing times and developing industries require that the tax codes and agreements evolve; however, as the term "evolve" implies, the transition to an alternate transfer pricing system has grown into a marathon, not a brisk sprint.¹¹ The conversation of alternatives to the arm's length standard has been ongoing for several years.

It has been said that "international taxation is, to some extent, a zero-sum game" and this is evident in transfer pricing.¹² An alteration to the transfer pricing requirements might appease taxpaying MNE's, but leave taxing governments scrounging for revenue; likewise, modifications to the rules that increase reluctant MNE's tax liabilities will concurrently satisfy the governments' need for funds. All in all, it is impossible to please all involved parties in the world of taxation. Nevertheless, a new method of regulating transfer pricing that allows for a compromise of these contending objectives is possible. This paper will propose a change to the current transfer pricing standard that will allow for the concept of the arm's length standard to continue, but with modifications that consider the present and future types of goods and services. Readers of this paper are encouraged to consider the proposal and any alternative solutions that respond to the need for an accurate, fair, and equitable solution.

Consistency is a requirement for transfer pricing to be successful; without uniform application of the same method across the world, double taxation of multinational corporations will occur. Double taxation is simply "when the same income is taxed in two

¹¹ Josh White, *OECD Presents "Unified Approach" to Profit Allocation*, INT'L TAX REV. (Oct. 9, 2019), <https://www.internationaltaxreview.com/article/b1hhypmx1dh75/oecd-presents-unified-approach-to-profit-allocation> (last visited Nov. 13, 2020).

¹² Reuven S. Avi-Yonah, *The Structure of International Taxation: A Proposal for Simplification*, 74 TEX. L. REV. 1301, 1303 (1996).

different countries.”¹³ For example, if the United States has adopted the arm’s length standard, but other countries insist on using a variation of formulary apportionment, a corporation operating in the United States and abroad will most likely face double taxation because of the differing transfer pricing methods. Double taxation may even remain a threat with mutual agreement across the globe; not only is consistent legislation and regulation needed, consistent application is required to avoid double taxation.¹⁴ An alternative solution to the rising presence of intangible assets must be effective, but it must also be accepted and adopted around the world.

Before proposing a different way to regulate the transfer pricing process, this paper will lay a foundational basis in transfer pricing. Knowledge of the various transfer pricing methods is helpful in understanding the conversations that are currently taking place by international leaders, commentators, and students as they attempt to find the best, possible method. In Part II, this paper will discuss the current international method used in transfer pricing, the arm’s length standard, and will lay out the advantages and disadvantages of this method. Next, the paper will cover the alternative formulary apportionment method, examining the positive and negative attributes it could bring to the international taxation system. There are also specific transfer pricing methods that require some discussion before launching into the main part of the paper; we will examine the comparable uncontrolled price (“CUP”), cost plus, resale price, profit-split, and comparable profits (“CPM”) methods. It has been suggested that these methods are best viewed on a continuum between the arm’s length principle and the formulary apportionment option, so the paper will lay out the distinctions as well as the similarities between the techniques.¹⁵

After laying the proper groundwork, in Part III the paper will introduce a better alternative to the current transfer pricing method. Using suggestions from compelling commentators, the paper will

¹³ Julia Kagan, *Double Taxation*, INVESTOPEDIA, (May. 26, 2020), https://www.investopedia.com/terms/d/double_taxation.asp (last visited Nov. 13, 2020).

¹⁴ Harlow N. Higinbotham et al., *Effective Application of the Section 482 Transfer Pricing Regulations*, 42 TAX L. REV. 295, 302 (1987).

¹⁵ Avi-Yonah, *supra* note 10, at 93.

propose that the use of the arm’s length principle in combination with the residual profit split method will produce the best results in warding off tax avoidance. This portion of the paper will delve into the specifics of how combining the two, varying approaches will produce a “best of both worlds” solution. The paper will discuss the technicalities of the methods and explain how the current United States’ transfer pricing method is an example worth imitating.

In Part IV, the paper will put the recommendation into action with a scenario involving BMW. With 30 production and assembly facilities in 14 countries and a sales network in at least 140 countries, the BMW Group gives us an ideal illustration as the company deals with transfer pricing-related decisions on a daily basis.¹⁶ Hypothesizing the proposed method in action will allow readers to consider the advantages and disadvantages of this paper’s suggested method. In the end, readers should realize that there are various transfer pricing method options and that some of them are incrementally superior to the current arm’s length principle. Whether the proposed method is ultimately agreed upon, it is widely recognized that alterations should be made to the current arm’s length principle.

II. BACKGROUND

A. ARM’S LENGTH PRINCIPLE

The arm’s length principle is published in Article 9 of the OECD (Organisation for Economic Co-operation and Development) Model Tax Convention:

[Where] conditions are made or imposed between the two [associated] enterprises in their commercial or financial relations which differ from those which would be made between independent enterprises, then any profits which would, but for those conditions, have accrued to one of the enterprises, but, by reason of those conditions, have not so

¹⁶ THE BMW GROUP, *supra* note 4.

accrued, may be included in the profits of that enterprise and taxed accordingly.¹⁷

Arm's length treatment attempts to replicate transactions between unrelated companies in similar transactions.¹⁸ A version of the arm's length principle has been adopted by all advanced economies in the world. In the United States, the principle has been codified in the § 482 regulations of the Internal Revenue Code:

In determining the true taxable income of a controlled taxpayer, the standard to be applied in every case is that of a taxpayer dealing at arm's length with an uncontrolled taxpayer. A controlled transaction meets the arm's length standard if the results of the transaction are consistent with the results that would have been realized if uncontrolled taxpayers had engaged in the same transaction under the same circumstances (arm's length result). However, because identical transactions can rarely be located, whether a transaction produces an arm's length result generally will be determined by reference to the results of comparable transactions under comparable circumstances.¹⁹

Section one of Germany's External Tax Relations Act (Außensteuergesetz) contains the country's version of the arm's length standard.²⁰ Even though Germany's arm's length standard is practically identical to the § 482 in the U.S. Code, since BMW is headquartered in Germany and subject to that country's regulations, the automotive corporation follows their version of the arm's length standard. Put into practice, consider the two following hypothetical scenarios. In our first transaction, Company A produces chassis components and sells these to Company B for the completion of

¹⁷ OECD, OECD Transfer Pricing Guidelines for Multinational Enterprises and Tax Administrations 35 (2017).

¹⁸ *Id.*

¹⁹ 26 U.S.C. § 1.482-1(b).

²⁰ Außensteuergesetz (AStG) [Foreign Taxation Law], Sept. 8, 1972, BUNDESGESETZBLATT I [BGBl. I] [FEDERAL GAZETTE I] at 1713, § 1, as amended, Dec. 22, 2014 BGBl. I. at 2417.

Company B's automobiles; these two companies are not related, so this is considered an "uncontrolled transaction" and the terms of the transaction were conducted at "arm's length." In our second transaction, BMW's Dingolfing, Germany plant produces the chassis components and ships them to BMW's Spartanburg plant located in the United States for installation in an X-line vehicle. Both entities are owned by the BMW Group; therefore, they are related and this transaction is a "controlled transaction." To comply with transfer pricing regulations, this transaction's terms should be decided per the arm's length principle. If our second transaction involving BMW is accomplished with the same terms as the first hypothetical transaction, it was successfully conducted according to the arm's length principle.

While the international tax world is debating the diverse transfer pricing methods, there are some who staunchly defend the current, traditional arm's length standard. Those in favor of the arm's length standard advocate in favor of its flexibility and adaptability in each application.²¹ While the arm's length principle must be applied on a case-by-case basis, defenders of the principle argue that this is a beneficial attribute; transactions differ, so the approach to transfer pricing should reflect that. A substitute for the arm's length principle can be found in formulary apportionment methods: the use of aggregate data from many transactions to allocate profits across countries based on select factors.²² Some argue that the simplicity of formulary alternatives is deceptively appealing; multi-billion dollar transactions from one country's jurisdiction to another should not be confined to an elementary calculation. Additionally, many prefer the arm's length principle because it does not differentiate between multinational corporations

²¹ Brian D. Leppard, *Is the United States Obligated to Drive on the Right? A Multidisciplinary Inquiry into the Normative Authority of Contemporary International Law Using the Arm's Length Standard as a Case Study*, 10 DUKE J. COMP. & INT'L L. 43, 56 (1999).

²² TAX POL'Y CTR., *Tax Policy Center Briefing Book: A Citizens' Guide to the Fascinating (Though Often Complex) Element of the US Tax System* (2020), <https://www.taxpolicycenter.org/briefing-book/how-would-formulary-apportionment-work>.

and companies that are wholly operated within one country.²³ Advocates of the arm's length principle also tout the method's widespread acceptance around the world as a reason to maintain the status quo; they question the need for expensive and time-consuming debate on a method that is not necessarily broken in their eyes.²⁴ It is argued that a new concept will not be able to reach the consensus that the arm's length principle has enjoyed for 85 years now and that uniform agreement on a new method is impossible. Without agreement regarding each piece of the formula, countries will employ different methods with different results. In summary, many of the arguments for the arm's length standard stem from the "if it ain't broke, don't fix it" mentality.

However, critics of the arm's length standard argue that it is, indeed, broken. The considerable number of arguments against the use of the arm's length principle explains why many are exploring alternative transfer pricing options. First, the arm's length principle is applied on a case-by-case basis that diminishes governments' ability to enforce the principle and corporations' ability to follow the rules.²⁵ As both groups are increasingly faced with new transactions that are unlike ones seen before, it becomes difficult for them to accomplish their jobs. The contextual nature of the method also results in unnecessarily taking up time and money on both the government's and company's part.²⁶ Unless the corporation is dealing with familiar cases involving tangible goods and services with comparable transactions, compliance can be time-consuming for the corporation's accountants and tax attorneys. Professionals' time is taken up with the attempt to find similar transactions for their own company's transactions for which there may be no comparison. Effectively, corporations' resources are consumed through this system. The government is also burdened by the complications of

²³ Nissar Chamroo, "*The Arm's Length Principle (ALP) is too resource intensive, and time consuming, to be of practical use to taxpayers and tax authorities,*" LINKEDIN (Jan. 10, 2018), <https://www.linkedin.com/pulse/arms-length-principle-alp-too-resource-intensive-time-nissar-chamroo/>.

²⁴ Lepard, *supra* note 21.

²⁵ Fleming et al., *supra* note 8, at 15.

²⁶ Avi-Yonah, *supra* note 10, at 150.

the arm's length principle. Enforcement of the principle demands the time of highly-experienced Internal Revenue Service personnel that could be spent on other matters.²⁷ Similarly, the Tax Court's docket is filled with transfer pricing cases that could be avoided with a different method.²⁸ The arm's length principle has been described as a Pyrrhic victory; while the principle does restrict multinational corporations' income-shifting to lower-tax jurisdictions, it comes with steep costs.²⁹ These costs include time and money burdens, litigious controversies, and regularly noncompliant corporations. While a method that decreases tax avoidance should be considered a victory, the international tax standard should not be accompanied by so many burdens.

Second, notwithstanding the cost and time that goes into arm's length transfer pricing, the IRS' estimation of tax revenue from corporations' transfer pricing transactions differs wildly from corporations' measurement of their tax expenses to be paid. This discrepancy leads to attempts at resolution, usually in the form of a Tax Court case or negotiations by countries in the competent authority process; however, the end results of these cases and conventions are routinely amounts that neither party to the issue suggested at the outset.³⁰ The multitude of "possible answers" to the question presented to the court has led many people to doubt the integrity of the principle.³¹

Third, the arm's length principle gives tax attorneys, accountants, and governments quite possibly what they all fear most: uncertainty.³² These parties are unable to begin and end their

²⁷ Reuven S. Avi-Yonah & Ilan Benshalom, *Formulary Apportionment: Myths and Prospects – Promoting Better International Policy and Utilizing the Misunderstood and Under-Theorized Formulary Alternative*, 3 *WORLD TAX J.* 371, 377 (2011).

²⁸ Avi-Yonah, *supra* note 10, at 150.

²⁹ Avi-Yonah & Benshalom, *supra* note 27.

³⁰ Avi-Yonah & Benshalom, *supra* note 27; Cym H. Lowell & Peter L. Briger, *Adequacy of International Dispute Resolution Mechanisms*, 10 *GEO. MASON L. REV.* 725 (2002).

³¹ *Id.*

³² Avi-Yonah, *supra* note 10, at 150.

work with confidence in their performance. Companies cannot be sure that the numbers they submit to the Internal Revenue Service will be confirmed; they must wait until they receive notice of a dispute or the window of time for that notice passes before feeling satisfied with their conclusion. The companies' investors are also left with a feeling of uncertainty when perusing the corporation's financial statements.³³ On the other side of the tax return, the government is unable to estimate their tax revenue for the year because of the ambiguous guidelines set out for companies.³⁴

The fourth reason to be critical of the arm's length principle is that it opens the door for tax avoidance and abuse of the method. The US Treasury, GAO, OECD, and other such entities have all suggested that there is an absurd amount of tax revenue not being collected by governments' revenue services because of tax avoidance tactics.³⁵ Shifting multinational corporations' income from one country to a lower-tax jurisdiction has been estimated to result in 10% of corporate revenue, or at least \$125 billion, to be lost tax revenue for countries around the world.³⁶ The OECD predicts that \$240 billion is lost annually from multinational companies' tax avoidance.³⁷ The Tax Justice Network estimated an annual loss of \$500 billion, or 20% of corporate tax revenues, by governments because of profit shifting.³⁸ The very concept of tax avoidance makes it an extremely difficult number to pin down, but these

³³ Avi-Yonah & Benshalom, *supra* note 27.

³⁴ *Id.* at 377–78.

³⁵ *Abusive Offshore Tax Avoidance Schemes – Talking Points*, IRS, <https://www.irs.gov/businesses/small-businesses-self-employed/abusive-trust-tax-evasion-schemes-talking-points> (last visited Nov. 13, 2020); *Offshore Tax Evasion: IRS Has Collected Billions of Dollars, but May be Missing Continued Evasion*, GOV'T. ACCOUNTABILITY OFF., GAO-13-318 (Mar. 2013), <https://www.gao.gov/assets/660/653369.pdf>; *What is BEPS?*, OECD, <http://www.oecd.org/tax/beps/about/> (last visited Nov 12, 2020).

³⁶ Jansky & Palansky, *supra* note 7.

³⁷ *International Collaboration to End Tax Avoidance*, OECD, <https://www.oecd.org/tax/beps/> (last visited Nov. 13, 2020).

³⁸ Alex Cobham, *Tax avoidance and evasion – The scale of the problem*, TAX JUSTICE NETWORK (Nov. 2017), <https://www.taxjustice.net/wp-content/uploads/2017/11/Tax-dodging-the-scale-of-the-problem-TJN-Briefing.pdf>.

estimates give us a look into the magnitude of tax revenue loss felt by governments. The commonly-used arm's length principle does not put into effect rigid guidelines, inviting the possibility of abuse by companies employing the principle. There will always be tax dodgers, but a principle that invites avoidance and exploitation should not be the starting point for multinational companies' tax departments.

Fifth, this principle is not effective because "there is no public marketplace when trade occurs between related parties."³⁹ The arm's length principle simply produces an "educated guess" as to what the related companies believe the transaction is worth, but because the transaction did not occur on an open market, the approximation will continually be inaccurate.⁴⁰ Multinational companies consider the tax effects of their business decisions not only for the parent company, but also for all of their subsidiaries; the tax attorneys and accountants for these corporations treat the corporation's own subsidiaries much differently than they would a third-party entity.⁴¹ The arm's length principle does not account for the synergistic relationship between related companies.⁴² The assumption underlying the method is that each entity within a multinational corporation acts solely to maximize its own bottom line; however, a major benefit of a multinational entities' structure is that the whole benefits from the collection of the individual parts. "Integrated management processes such as administration, budgeting, and planning" allow companies to save money and therefore have greater effective profits. In fact, "the ability to efficiently internalize these costs is the essence of the MNE structure – and an important source of profitability."⁴³ A proper integration of multiple entities automatically saves a multinational corporation money, but the arm's length principle does not account for these

³⁹ Elizabeth Chorvat, *Forcing Multinationals to Play Fair: Proposals for a Rigorous Transfer Pricing Theory*, 54 ALA. L. REV. 1251, 1256 (2003).

⁴⁰ *Id.*

⁴¹ Avi-Yonah, *supra* note 10, at 130.

⁴² Chorvat, *supra* note 39.

⁴³ Avi-Yonah & Benshalom, *supra* note 27, at 379.

gains properly. A multinational group should not be expected to run their corporation as a third party would run their single-entity company.⁴⁴

Finally, the principle is becoming increasingly outdated as it faces the challenge of accounting for intangibles or non-traditional assets. The business world is no longer centered on the industrial factory economy; instead of tangible goods and observable services, many companies' focuses have shifted to complex nontraditional assets and services that are seemingly immeasurable. These nontraditional assets include intangibles, contract rights, and related risks. 'Intangibles' is an ever-growing category, including trade secrets, brand recognition, noncompetition agreements, goodwill, and proprietary methods. In an article discussing the myths and facts of formulary apportionment, the authors, Reuven S. Avi-Yonah and Ilan Benshalom, commented that, "the ownership of the intangible, its finance, and the risk associated with it are all conducted by the same MNE – which makes the process of assigning ownership to one subsidiary rather obscure."⁴⁵ The same author likened the idea of designating ownership of an intangible to solely one subsidiary in a multinational corporation to moving items from one pocket to another in the same piece of clothing, removing any real significance to the designation.⁴⁶ Similarly, it is pointless to attempt to allocate the rights and risks of an intangible that was created by more than one subsidiary of the corporation. Endeavoring to associate The Coca-Cola Company's Coca-Cola recipe and trade secret to each of its subsidiaries would be inconsequential as all of the subsidiaries have a part in maintaining the quality of the product and benefiting from the success of the company's secret recipe.

In conclusion, the drawbacks of the arm's length principle were best summed up by a tax compliance executive in a UK-based bank who said, "the arm's-length standard is interesting, but it's all

⁴⁴ Josh White, *OECD Looks Beyond the Arm's-Length Principle*, INT'L TAX REV. (Feb. 1, 2019), <https://www.internationaltaxreview.com/article/b1fydc48yqvvcz/oecd-looks-beyond-the-arms-length-principle> (last visited Nov. 12, 2020).

⁴⁵ Avi-Yonah & Benshalom, *supra* note 27, at 384.

⁴⁶ *Id.*

hypothetical.”⁴⁷ The principle effectively limits itself to measuring only “those entities with only routine functions, risks, and assets, using either closely comparable third parties or the entities’ own transactions with third parties.”⁴⁸ For the principle to be employed properly, the realities of a global economy must be considered and used in the measurement of transfer prices.⁴⁹

B. FORMULARY APPORTIONMENT

Formulary apportionment (FA) employs mathematical formulas as a rubric to allocate an MNE’s aggregate income to the country in which the production of income took place based on several economic factors.⁵⁰ The OECD defines FA as a method that “would allocate the global profits of an MNE group on a consolidated basis among the associated enterprises in different countries on the basis of a predetermined and mechanistic formula.”⁵¹ This method is based on the idea that the individual entities of an MNE have a shared bottom line.⁵² Three factors must be decided when applying FA: (1) which entities make up the unit to be taxed, (2) global profits of the unit, and (3) the formula to allocate the profits.⁵³ For example, if the BMW Group chose to utilize a formulary apportionment method, it would allocate all of its global profits using a determined formula. The company might choose to split its total profits among the 140 countries it is involved in using a formula of sales, assets, and payroll in equal proportion. This formula is:

⁴⁷ White, *supra* note 44.

⁴⁸ Chorvat, *supra* note 39, at 1262.

⁴⁹ *Id.* at 1259–62.

⁵⁰ Fleming Jr. et al., *supra* note 8, at 4.

⁵¹ OECD, *supra* note 17, at 39.

⁵² Charles F. Connolly, *The New Transfer Pricing and Penalty Regulations: Increased Compliance, Increased Burdens, and the Search for a Safe Harbor*, 16 U. PA. J. INT’L BUS. L. 339, 349.

⁵³ OECD, *supra* note 17, at 39.

$$Tax_C = Rate_C \times \pi_W \left[\frac{1}{3} \left(\frac{Assets(C)}{Assets(W)} + \frac{Sales(C)}{Sales(W)} + \frac{Payroll(C)}{Payroll(W)} \right) \right]$$

Tax = Tax Liability

Rate = Tax Rate

π = Profits

(c) = Country

(W) = Company

To arrive at the tax liability for the corporation in one particular country, BMW would use the formula portrayed above. The country's corporate tax rate is multiplied by the profits of BMW on a worldwide basis. In this hypothetical scenario, BMW chose to apportion their profits using one-third of the assets, sales, and payroll; therefore, each of these factors will be multiplied by a one-third fraction. The numerator for each of the remaining fractions includes only the assets, sales, and payroll in the country at hand; the denominator of the fraction includes the assets, sales, and payroll of the entire corporation, BMW.

First and foremost, formulary apportionment diminishes multinational companies' incentive to shift income from one country to another. Using a formula based on real, economic factors instead of solely the location of the income, formulary apportionment is a solution to the majority of the transfer pricing tax avoidance problem.⁵⁴ As long as taxation exists, tax avoidance and evasion will also continue; however, corporations will not be able to sustain their methods of avoiding taxes with the use of a formula in

⁵⁴ John T. VanDenburgh, *Closing International Loopholes: Changing the Corporate Tax Base to Effectively Combat Tax Avoidance*, 47 VAL. U. L. REV. 313, 345-46 (2012).

transfer pricing. The current system allows for corporations to shift income primarily through the relocation of intangibles to lower-tax jurisdictions.⁵⁵ A formulary apportionment of income does not allow for the location of the intangible to have much effect on their end tax liability.⁵⁶

Second, formulary apportionment would simplify tax systems around the world.⁵⁷ The simplification of tax requirements is almost always welcomed with open arms, especially a method that would accomplish it so significantly.⁵⁸ Using one formula instead of keeping track of the legal location or form of income will benefit both governments and corporations. Formulary apportionment would decrease the time and resources that the Internal Revenue Service spends on tracking income of multinational corporations. After the initial adjustments, that must be made with any new system, corporations will also be grateful for the simplicity of the new method. A corporation is likely already maintaining records of the location and amounts of their income, but will be able to spend less time pulling information together to report to the taxing agency.

Third, the simplicity and ease of formulary apportionment should also increase transparent compliance.⁵⁹ The tax codes of the world are seemingly ever changing; however, reform in this situation would not add to the complexity of the tax subject, it would instead streamline transfer pricing and the tax reporting that accompanies it. Those dealing with the transfer pricing for their corporation or another multinational corporation will know exactly what is expected of them. Instead of battling through the conjectures and hunches of the arm's length principle, the simplified formula allows for valuable corporate time to be spent on other matters. Since the majority of tax avoidance via transfer pricing methods is not done accidentally, the use of a formulary apportionment method

⁵⁵ Avi-Yonah & Benshalom, *supra* note 27, at 373.

⁵⁶ TAX POL'Y CTR., *supra* note 22.

⁵⁷ VanDenburgh, *supra* note 54, at 346.

⁵⁸ Emil M. Sunley, *The Pros and Cons of Formulary Apportionment*, CESIFO F. 36, 36 (2002), <https://www.ifo.de/DocDL/Forum102-focus6.pdf>.

⁵⁹ VanDenburgh, *supra* note 54, at 346.

will also take away the guesswork that some tax avoiders are hiding behind.⁶⁰

A fourth advantage of formulary apportionment is that a numerical formula will pave the way for consistent tax reporting. Instead of attempting to compare their corporation's transactions to comparable market transactions that may not currently exist, corporations will be able to employ formulas.⁶¹ The use of formulas and consistency go hand in hand; this is a positive effect of FA that is especially useful for the valuation of unique intangibles.

Fifth and finally, countries that have formerly lost tax revenue through corporations' tax avoidance tactics may be able to receive greater amounts of revenue through the use of FA. The United States and other countries that have higher tax rates could begin to earn the amounts that they initially estimate to reap.⁶² It's become obvious that multinational corporations located in higher tax jurisdictions are not reporting according to their real economic activity.⁶³ Lower-tax jurisdictions have benefited monetarily from the arm's length principle, but formulary apportionment methods will not allow for as much income-shifting to these "tax havens."

As with the arm's length principle, commentators have written on the disadvantages of the formulary apportionment method. First, some have argued that the method would cause administrative trouble for MNE's, because of the compilation of data needed to carry out the method. However, this argument is not effective since corporations with an international presence should already have access to this data if they are already utilizing it for other financial matters.⁶⁴ Assuming the formulary factors are thoughtfully and purposefully chosen as indicators of profit, the data required by the formula will already be on most, if not all, MNE's balance sheets and income statements.

⁶⁰ Joel Barker, Kwadwo Asare & Sharon Brickman, *Transfer Pricing As A Vehicle In Corporate Tax Avoidance*, 33 THE J. OF APPLIED BUS. RES. 9, 9 (2017).

⁶¹ Avi-Yonah & Benshalom, *supra* note 27, at 377-78.

⁶² TAX POL'Y CTR., *supra* note 22.

⁶³ *Id.*

⁶⁴ Avi-Yonah, *supra* note 10, at 156.

Second, it has been suggested that the formulary apportionment method is just as arbitrary as the arm's length standard.⁶⁵ Those who argue this point presuppose that countries will be able to pick and choose the formula's factors as they wish; however, as presented in the next point, formulary apportionment will work best with the consensus of countries around the world.⁶⁶ The method's structure is successful when countries come together and agree on the factors to put in play. While some commentators have said that formulary apportionment is theoretically subjective, most agree that it is not nearly as arbitrary as the arm's length principle in practice.⁶⁷ It will be difficult for multinational corporations to argue with an established formula that takes away their discretion to change the "origin" of their income.

Third, some have written that formulary apportionment is economically impractical in that it will lead to confusion, double taxation, and the violation of promises made in international treaties. These predictive arguments do have some merit, but do not account for the unavoidable fact that no perfect solution to the current tax avoidance issue exists. While confusion is inevitable at the outset of any alteration to a universal system, the resulting formulaic system should bring clarity to transactions involving intangibles and new technology, without complicating other transactions. Others argue that the arm's length standard has been the standard across the globe and attempting to change that will make for an uphill battle.⁶⁸

Avoiding double taxation requires uniformity of involved countries' tax systems and even simultaneous enactment of these systems to avoid double taxation or complete avoidance of tax.⁶⁹ Consensus of major economies and countries is needed for the method to properly work.⁷⁰ A unilateral decision by any one country

⁶⁵ Avi-Yonah & Benshalom, *supra* note 27, at 382.

⁶⁶ Connolly, *supra* note 52, at 349–50.

⁶⁷ Avi-Yonah & Benshalom, *supra* note 27, at 382.

⁶⁸ Connolly, *supra* note 52, at 350.

⁶⁹ Julie Roin, *Can the Income Tax Be Saved? The Promise and Pitfalls of Adopting Worldwide Formulary Apportionment*, 61 TAX L. REV. 169, 223 (2008).

⁷⁰ TAX POL'Y CTR., *supra* note 22.

to put a version of the formulary apportionment method to work will not be effective and will bring negative results: double taxation of some income and no tax for other income.⁷¹ This hypothetical result would be worse than the current international tax system, but is not necessarily realistic. Consensus will be a difficult achievement, however, it is possible. The United States has been known to lead the charge in the international tax world and having a successful example in the States' transfer pricing formulary methods aids in proving the validity of the method.⁷² For example, the vast differences between the corporate worlds of Montana and California make an agreement of transfer pricing methods seem impossible, yet there exists an agreement between these two states, and the other forty-eight states in the Uniform Division of Income for Tax Purposes Act.⁷³ This fact makes the concept of an agreement between countries possible and gives the United States credence to initially propose the idea.⁷⁴ Countries across the world are currently considering alternative methods to the arm's length standard, so we are potentially on the cusp of the ideal moment to make a change.⁷⁵ The existence of tax treaties between countries suggests a valid argument against the formulary apportionment method.⁷⁶ An international tax scholar has recommended a solution to this issue: propose the formulary approach as a discussion draft and invite other countries to enter negotiations, but announce that the approach will be adopted unilaterally if no agreement is reached within a specified time period (e.g., five years).⁷⁷ This is one workable resolution and there are others out there.

This paper's proposed method, discussed in Part III, will not result in a stark change in the methods used, so some of these arguments are likely over-exaggerating the possible issues. Tax

⁷¹ *Id.*

⁷² Connolly, *supra* note 52, at 350.

⁷³ *Construction and Application of Uniform Division of Income for Tax Purposes Act (UDITPA) – Apportionment of Business Income*, 80 A.L.R.6th 325.

⁷⁴ Avi-Yonah, *supra* note 10, at 157.

⁷⁵ *Id.* at 159.

⁷⁶ VanDenburgh, *supra* note 54, at 346.

⁷⁷ Avi-Yonah, *supra* note 10, at 159.

avoidance will likely continue under any alternative transfer pricing method; however, we must focus on finding the workable method that brings the most positive changes and the least negative side effects.⁷⁸ Commentators, as well as myself, believe that the formulary apportionment system will help to accomplish this goal.⁷⁹

C. TRANSFER PRICING METHODS

The final background discussion is in regard to the various methods used to carry out the broader terms “arm’s length” and “formulary apportionment.” Viewing these individual methods as a progressive series or continuum of slightly different concepts, instead of compartmentalizing each into separate camps, will assist in determining the best method.⁸⁰ Since various transfer pricing methods can produce similar results, it is more important to focus on the technical distinctions between each method to discover the best means to measure transfer prices. The traditional arm’s length standard and pure formulary apportionment method are the two bookends to this continuum.⁸¹ Another term for the arm’s length standard at one extreme of the continuum is the “comparable uncontrolled price” (CUP) method; this takes into consideration similar products or services from unrelated, but similar parties.⁸²

Next, the “cost plus” method is used “where semi finished goods are sold between associated parties, where associated parties have concluded joint facility agreements or long-term buy-and-supply arrangements, or where the controlled transaction is the provision of services.”⁸³ This method begins with the expenses of a transaction with a related party, then adds a cost plus mark-up to this amount.⁸⁴ This mark-up amount acknowledges each parties’ normal functions and operations as well as the risks assumed by each party

⁷⁸ Sunley, *supra* note 58, at 36–37.

⁷⁹ Avi-Yonah & Benshalom, *supra* note 27, at 398.

⁸⁰ Avi-Yonah, *supra* note 10, at 159.

⁸¹ *Id.* at 93.

⁸² 26 C.F.R. § 1.482-3.

⁸³ 26 C.F.R. § 1.482-3; OECD, *supra* note 17, at 111.

⁸⁴ *Id.*

in the transaction.⁸⁵ This mark-up represents the gross profit of the transaction and is determined using the ratio of gross profit to cost of goods sold (COGS) for a similar, unrelated party transaction.⁸⁶ The resale price method comes next on the continuum of methods. This approach is very much like the cost plus method with the exception that it is used by a reseller, not a manufacturer of the goods.⁸⁷ Therefore, the steps are seemingly switched: the method starts with the resale price (the price of the product at sale to an unrelated party after having purchased it from a related party) that is then decreased by the gross profit amount.⁸⁸ Again, this gross profit amount accounts for COGS: the expenses, operations, and risks incurred to produce the good.⁸⁹

The next method is the “comparable profit method” (CPM) that relies on data from outside the corporation.⁹⁰ This method determines the profit by “comparing it to the average profit earned by a very broad group of corporations operating in the same or a similar industry.”⁹¹ The progression of methods comes close to reaching the other bookend, pure formulary apportionment, with the profit split method. This method is different from the pure formulary approach in that comparable transactions are used to allot some of the profits.⁹² The profit split method first determines the profits that need to be split among related parties; then, “these profits are divided between the associated enterprises contributions, which should reflect the functions performed, risks incurred[,] and assets used by each enterprise in the controlled transactions.”⁹³ Finally, the other seemingly theoretical bookend is reached: pure formulary apportionment.

⁸⁵ UNITED NATIONS, *United Nations Practical Manual on Transfer Pricing for Developing Countries (2017)*, <https://www.un.org/esa/ffd/wp-content/uploads/2017/04/Manual-TP-2017.pdf>.

⁸⁶ *Id.* at 174.

⁸⁷ 26 C.F.R. § 1.482-3; Avi-Yonah, *supra* note 10, at 92.

⁸⁸ OECD, *supra* note 17, at 106–07.

⁸⁹ *Id.*

⁹⁰ 26 C.F.R. § 1.482-5; UNITED NATIONS, *supra* note 85, at 209.

⁹¹ Avi-Yonah, *supra* note 10, at 93.

⁹² 26 C.F.R. § 1.482-6; Avi-Yonah, *supra* note 10, at 94.

⁹³ UNITED NATIONS, *supra* note 85, at 206.

III. AN ALTERNATIVE PROPOSAL

Everywhere you look, there are products, marketing schemes, and industries that implicate or thrive on intangibles. Instead of a company's balance sheet brimming with tangible assets, it is becoming more common to find a company with a large amount of money invested in intangibles. A 2018 report found global intangible value "constitutes 52% of the overall enterprise value of all publicly traded companies worldwide."⁹⁴ In addition, the value of intellectual property in American companies is valued at over \$5.8 trillion dollars.⁹⁵ Technological innovation is a common denominator in expanding industries; it is likely that intangibles such as artificial intelligence and software will be an ever-increasing part of individuals and companies' lives.⁹⁶ As mentioned above, the current arm's length standard does not sufficiently account for intangibles, allowing multinational companies to take advantage of the principle; therefore, a change must be made to the transfer pricing rules to decrease tax avoidance. A complete overhaul is unnecessary; there are few tax professionals who wish to totally rebuild the transfer pricing system.⁹⁷ Until alterations are made, the arm's length principle will continue to be the norm. A conceivable method must be largely agreed upon before replacing the established rule. As the former director of tax at the OECD says, "it's like Brexit, you can't abandon ship without a clear plan or credible

⁹⁴ CORPORATE EXCELLENCE, *Global Intangible Value Exceeds US\$50 Trillion for the First Time* (2018), <https://www.corporateexcellence.org/en/resource/global-intangible-value-exceeds-us50-trillion-for/2315f4c0-da19-4426-792a-4bf9dbb5e99e> (last visited Nov. 13, 2020).

⁹⁵ Christopher Heer & Daryna Kutsyna, *Statistics on the Value and Importance of Intellectual Property*, HEER L. (Oct. 19, 2019), <https://www.heerlaw.com/value-intellectual-property-statistics> (last visited Nov. 13, 2020).

⁹⁶ Jared Hecht, *How Technology Is Driving Change In Almost Every Major Industry*, FORBES (Nov. 30, 2018), <https://www.forbes.com/sites/jaredhecht/2018/11/30/how-technology-is-driving-change-in-almost-every-major-industry/#157a2b672f6f> (last visited Nov. 13, 2020).

⁹⁷ White, *supra* note 44.

alternative.”⁹⁸ The same former director also created a list of prerequisites for an alternative system; this list consists of the following three requirements: “Is the alternative principle-based? Is it feasible in administrative terms? Can you reach a consensus on making it policy?”⁹⁹ With these stipulations in mind, this paper proposes a solution: the international tax regime should employ the arm’s length standard as currently prescribed, but utilize a residual profit split method, described in detail below, in circumstances in which the arm’s length standard is inadequate.

This paper’s solution to the current international search for a new and improved standard is a hybrid system. This system allows the arm’s length principle to shine in the areas for which it was established in the first place: “it was originally intended to be a credible, efficient, and easily administered benchmark for allocating MNE income.”¹⁰⁰ Keeping the arm’s length principle at the forefront of transfer pricing obviously addresses all three of the aforementioned prerequisites for an alternative solution, mainly because it was established for those very reasons. Therefore, attention must be given to whether this paper’s proposed supplement to the arm’s length principle, the residual profit split method, successfully achieves these requirements.

The U.S. Treasury Regulations allocate profit or loss through the use of the residual profit split method (“RPSM”) in two steps. First, it allocates “operating income to each party to the controlled transactions to provide a market return for its routine contributions to the relevant business activity.”¹⁰¹ Routine contributions are then defined by the regulations as a business activity that is the same or similar to activities unrelated parties in a similar market would conduct.¹⁰² Second, “the residual profit generally should be divided among the controlled taxpayers based upon the relative value of their nonroutine contributions to the relevant business activity.”¹⁰³ Regarding the second step, the IRS notes that simply because a

⁹⁸ *Id.*

⁹⁹ *Id.*

¹⁰⁰ Avi-Yonah & Benshalom, *supra* note 27.

¹⁰¹ 26 U.S.C. § 1.482-6(c)(3)(i)(A).

¹⁰² *Id.*

¹⁰³ 26 U.S.C. § 1.482-6(c)(3)(i)(B).

transaction involves intangible assets does not imply that it is a non-routine contribution; if market data is available, companies may be able to treat these transactions as routine and value them accordingly.¹⁰⁴ This paper's proposal revolves around the second step in the residual profit split method. The RPSM's purpose is to evaluate whether the allocation of income is in keeping with the arm's length standard—the value assigned to each taxpayer should also indicate “the functions performed, risks assumed, and resources employed by each participant in the relevant business activity.”¹⁰⁵ The residual profit split method is best applied to transactions involving intangible property since it adequately accounts for such non-routine transactions in the second step of the process.¹⁰⁶ The regulations provide several differing methods for the measurement of non-routine intangible property; however, as discussed below, reducing the number of variables will be beneficial for all parties utilizing the method.

The residual profit or loss (“residual income”) is allocated by different companies and countries using several varying formulas. These formulas allocate income based on a ratio of economic factors in different jurisdictions.¹⁰⁷ The possible inclusion and exclusion of factors in these formulas have resulted in a great deal of scholarly debate. While there is no foolproof set of factors, effort should be given to find factors that are not easy to manipulate but still maintain their effectiveness.¹⁰⁸ Though it may seem cynical, it is likely that the moment the residual profit split method's formula is agreed upon, companies will commence attempts at exploiting the factors for their own benefit.¹⁰⁹ The question is not if manipulation to the formula will occur, but how the corporation will undertake abuse to the system. While taxes are routinely considered in business decisions, the outcome with the lowest taxes may not always prevail against other non-tax considerations. A corporation will only

¹⁰⁴ *Id.*

¹⁰⁵ 26 U.S.C. § 1.482-6(a)-(b).

¹⁰⁶ 26 U.S.C. § 1.482-6(c)(3)(i)(B)(2).

¹⁰⁷ Roin, *supra* note 69, at 202.

¹⁰⁸ Avi-Yonah & Benshalom, *supra* note 27, at 391.

¹⁰⁹ *Id.*

attempt to manipulate the individual components of the formula if it is beneficial for the organization; so, if manipulation is costly to the organization or the return is insubstantial, the organization will not mess with the factors.¹¹⁰ Logically, the more each factor is susceptible to manipulation, the application of the formulary apportionment becomes less effective.¹¹¹ To minimize possible manipulation and allow for the formula's greatest efficacy in apportioning income, careful consideration should be given to the individual factors utilized.¹¹² Ideally, if all companies adhere to the residual profit split method in practice, the factors that are ultimately chosen do not make much difference.¹¹³

Among the most common factors adopted in the residual profit split method are sales, assets, and payroll, but other cost-based factors such as expenses for research and development or marketing have been utilized as well.¹¹⁴ Because of the close proximity and integrated business between the individual states, formulary apportionment, specifically the profit split method, has been promoted for use in transfer pricing between state jurisdictions.¹¹⁵ The states' have shown a preference for two sets of factors: the "Massachusetts formula" and a sales-based formula. The "Massachusetts formula" weighs property, payroll, and sales in equal proportion and allocates the corporation's income from that jurisdiction accordingly.¹¹⁶ A sales-based formula is even more self-explanatory: states use only sales to allocate residual income.¹¹⁷

¹¹⁰ *Id.* at 390.

¹¹¹ Roin, *supra* note 69, at 204.

¹¹² *Id.*

¹¹³ Avi-Yonah, *supra* note 12, at 1348.

¹¹⁴ Jason Eberhardt, *OECD Issues Final Revised Guidance on the Profit Split Method*, BKD THOUGHTWARE, (Sept. 18, 2018), <https://www.bkd.com/article/2018/09/oecd-issues-final-revised-guidance-profit-split-method>.

¹¹⁵ TAX POL'Y CTR., *supra* note 22.

¹¹⁶ Glen Rectenwald, *A Proposed Framework for Resolving the Transfer Pricing Problem: Allocating the Tax Base of Multinational Entities Based on Real Economic Indicators of Benefit and Burden*, 22 DUKE J. COMP. & INT'L L. 425, 444 (2012).

¹¹⁷ Roin, *supra* note 69, at 202.

The mobility of each factor must be considered, because as many of the states came to realize, factors relating to production are easily moved.¹¹⁸ Similarly, inventories and the value of goods can be marked down in the corporation's records to take advantage of the set formula; because of their nature, intangible items can also be effortlessly left off the corporation's balance sheet.¹¹⁹ Some argue that property does not generate accurate allocation of income since property is challenging to properly value; however, employees are not easily moved, so payroll might seem to be a relatively safe factor.¹²⁰ Taking the whole picture of the corporation into consideration, many corporations' plans to put workers, inventories, and assets in a jurisdiction with higher taxes will be deterred if the formula's factors focus on those items.¹²¹ This has been described as an "implicit tax" on the individual factors and will have an effect on a corporation's decisions.¹²² Conversely, a corporation is not likely to have a desire to move sales from one jurisdiction to another; multinational corporations want to sell as many goods and services in every jurisdiction in which they have a presence, regardless of the tax expense.¹²³ This attribute of sales has been termed its "inelasticity"; a corporation does not have a great incentive to maneuver sales from one country to another.¹²⁴

This paper proposes the sole factor of sales to allocate income via the residual profit split method. Diverse factors for the method—those mentioned above and additional, more obscure factors utilized by a few—make manipulation by corporations more likely and do not solve the issue of tax avoidance as successfully as the use of the sales factor. The prevalent and successful usage of the sales factor

¹¹⁸ *Id.* at 203.

¹¹⁹ Avi-Yonah & Benshalom, *supra* note 27, at 391.

¹²⁰ Susan C. Morse, *Revisiting Global Formulary Apportionment*, 29 VA. TAX REV. 593, 594 (2010).

¹²¹ Reuven S. Avi-Yonah, Kimberly A. Clausing & Michael C. Durst, *Allocating Business Profits for Tax Purposes: A Proposal to Adopt a Formulary Profit Split*, 9 FLA. TAX REV. 497, 509 (2009).

¹²² *Id.*

¹²³ *Id.*

¹²⁴ Morse, *supra* note 120, at 605.

in the United States bolsters this idea.¹²⁵ The use of sales addresses the issue of allocation of income related to intangibles by using the customer's location instead of giving corporations the opportunity to "relocate" the intangible asset to a lower-tax jurisdiction and escape taxes.¹²⁶ Outsourcing, independent contractors, and employee leasing could be utilized to lighten the tax burden for corporations; however, using sales to allocate income prevents this strategy.¹²⁷ Thus, sales as the exclusive factor eliminates any possible ties from the location of a corporation to the income statement of the corporation; the factor takes the power to manipulate income and taxes from corporations and levels the playing field for corporations around the world. Developing nations will challenge the utilization of only sales in the allocation of profits.¹²⁸ These countries contribute to the production of income for MNE's by other means, such as property used for production and a ready workforce, but would be precluded from collecting tax revenue in a sales-based apportionment method.¹²⁹ A recent article by Joseph Bankman, Mitchell Kane, and Alan Sykes considers policies currently employed by non-resident MNE's to reclaim some of the revenue withheld from their countries; these methods include regulation of prices, tariffs, and enterprises owned by the government.¹³⁰ If a sale-based formulary apportionment method is adopted, developing nations do have other means by which to collect revenue from production within their borders.

Practically, in addition to the simplicity of formulary apportionment, a single factor makes the method even more straightforward. Large corporations should be prepared for complicated principles and formulas; however, the simplification of

¹²⁵ *Id.*

¹²⁶ Orly Mazur, *Transfer Pricing Challenges in the Cloud*, 57 B.C.L. REV. 643, 690–91 (2016).

¹²⁷ Roin, *supra* note 69, at 205.

¹²⁸ Joseph Bankman, Mitchell Kane & Alan O Sykes, *Collecting the Rent: The Global Battle to Capture MNE Profits* 1–48 (NYU Law and Economics Research Paper No. 18–38, Stanford Law and Economics Olin Working Paper No. 527, 2018), <https://ssrn.com/abstract=3273112>, archived at <https://perma.cc/9ZVM-993G>.

¹²⁹ *Id.*

¹³⁰ *Id.*

the process will be beneficial for any party involved.¹³¹ Corporations, large or small, and taxing authorities will be grateful for a less demanding and uncomplicated formula.¹³² Countries with large markets abroad, such as India, United States, and Brazil, are likely to encourage the switch to a residual profit split method based on the destination of the corporation's sales.¹³³ These are the most noticeable and predictable results of changing to a hybrid transfer pricing system for international income tax allocation.

The introduction of the residual profit split method is, of course, not a perfect solution, but it is a real-world solution that is workable and fixes current issues. The most noticeable flaw of the arm's length principle is that it does not properly allocate multinational company's income in situations with income sources that are difficult to allocate. As the residual profit split method does not rely on comparable transactions for transfer pricing, it is an obvious answer to the issue presented.¹³⁴ The cost sharing method also does not depend on comparable transactions, but it is important to choose a single method for use in transactions with incomparable data. Granting each multinational corporation the opportunity to select the method that plays to their advantage would create a chaotic and unpredictable international tax regime.¹³⁵ While the cost sharing method's income allocation is not contingent on the availability of comparable transactions, this technique has been discredited for continually understating income, especially for companies in the United States.¹³⁶ Therefore, this paper proposes the use of the

¹³¹ Josh White, *Profit Split Method in IP Strategy Grows in Popularity*, INT'L TAX REV. (June 12, 2019), <https://www.internationaltaxreview.com/article/b1fydc217gthjm/profit-split-method-in-ip-strategy-grows-in-popularity> (last visited Nov. 13, 2020).

¹³² Avi-Yonah, Clausing & Durst, *supra* note 121.

¹³³ Michael J. Graetz & Rachael Doud, *Technological Innovation, International Competition, and the Challenges of International Income Taxation*, 113 COLUM. L. REV. 347, 418 (2013).

¹³⁴ Fleming Jr. et al., *supra* note 8, at 55.

¹³⁵ Sunley, *supra* note 58, at 36.

¹³⁶ Fleming Jr. et al., *supra* note 8, at 55.

residual profit split method to properly allocate income without sacrificing accuracy.

The reasons to alter the current system are convincing to many tax scholars and professionals; however, a proposal for change is always met with at least some opposition. While there are a few valid arguments against a hybrid combination of the arm's length principle and the residual profit split method, the benefits of the proposed method greatly outweigh the suggested disadvantages it could bring. As mentioned above, this proposal seeks to address the current issues the arm's length principle generates, but, because of the complexity and fallibility of the international tax world, it is impossible to produce a flawless proposition.¹³⁷ First, some commentators suggest that any system with formulary apportionment attributes could deliver arbitrary results.¹³⁸ As pointed out earlier in this paper, the arm's length principle is noticeably unpredictable and inconsistent in its application; using the residual profit split will decrease the possibility of arbitrariness. One commentator points out that, "to a large extent, the choice of any convention is always arbitrary."¹³⁹ Because formulary apportionment solutions are based on economic measurements, it will produce less arbitrary results than the arm's length principle in valuing items without similarities to other products.¹⁴⁰ Along these lines, many believe that certain countries and specific industries will benefit more than others from a sales-driven formula.¹⁴¹ Some believe that major exporting companies headquartered in the United States will gain substantially.¹⁴² Others are positive that a proposed method of this type is the most appropriate method for the oil and gas industry, but that it would ultimately burden the industry with

¹³⁷ Avi-Yonah & Benshalom, *supra* note 27, at 636.

¹³⁸ Avi-Yonah, Clausing & Durst, *supra* note 121, at 516.

¹³⁹ Lepard, *supra* note 21, at 117.

¹⁴⁰ Sienna C. White, *Cost Sharing Agreements & the Arm's Length Standard: A Matter of Statutory Interpretation?*, 19 FLA. TAX REV. 191, 220 (2016).

¹⁴¹ *Id.*

¹⁴² Avi-Yonah, Clausing & Durst, *supra* note 121, at 516.

greater tax liabilities.¹⁴³ It is important to remember that the current principle, and any suggested alternative, will have various effects on different countries, corporations, stakeholders, and industries; however, it is impossible to appease every party.

Many suggest that the transition to a new method will be a challenge. Of course, an adjustment to the current system may take some time for countries and companies; however, since the majority of the proposal utilizes the arm's length standard as it currently stands, the transition should be relatively seamless. With at least 150 countries employing transfer pricing regimes, a change in the system will take coordination and time.¹⁴⁴ Several commentators predict that the United States' adoption of a new transfer pricing system would likely encourage other countries to follow suit.¹⁴⁵ The United States has been a leader in various fields including taxation; even the current transfer pricing regulations were first approved and adopted by the United States.¹⁴⁶ Finally, some believe that a different transfer pricing system will only cause issues in the interaction between countries with disparate taxation systems. This suggestion neglects to consider that the current system was once proposed to countries with differing tax systems but has been workable for the past several years. While there are some obstacles to introducing the proposed arm's length principle with the residual profit split method into the world's economy, this new method will alleviate many of the issues that are prevalent with our current method.

¹⁴³ ITR Correspondent, *Profit Splits and Their Application in the Energy and Resources Sector*, INT'L TAX REV. (Mar. 5, 2019), <https://www.internationaltaxreview.com/article/b1f7mxsf1rmwkv/profit-splits-and-their-application-in-the-energy-and-resources-sector> (last visited Nov. 13, 2020); Avi-Yonah, Clausing & Durst, *supra* note 121, at 524.

¹⁴⁴ Robert Feinschreiber, *Applying Production-Based Transfer Pricing*, ACCT. TODAY (July 6, 2018), <https://www.accountingtoday.com/opinion/applying-production-based-transfer-pricing> (last visited Nov. 13, 2020).

¹⁴⁵ Avi-Yonah, Clausing & Durst, *supra* note 121, at 519–20.

¹⁴⁶ *Id.*

IV. RESIDUAL PROFIT SPLIT APPLIED TO BMW

The Upstate of South Carolina has seen substantial growth in the past few years: the Greenville-Spartanburg area has seen an increase, not only in popularity and population, but also in manufacturing and industry.¹⁴⁷ As with most growth, this beneficial expansion for the economy did not happen accidentally. South Carolina boasts of advantages to relocating or introducing ventures to the state, including fees in lieu of taxes for companies that invest at least \$2.5 million in the state of South Carolina.¹⁴⁸ Regardless of the tax benefits, South Carolina, specifically the Upstate cities, boasts of an environment conducive to the manufacturing industry. In a 2019 report produced by the Center for Business and Economic Research evaluating relevant factors such as each states' labor force quality, transportation infrastructure, and cost of doing business, South Carolina received a score of A for manufacturing industry health.¹⁴⁹

BMW's expansion to the United States through the establishment of its manufacturing plant in South Carolina naturally brought an incredible amount of industry with it. Automotive manufacturing makes up the majority of the manufacturing industry in the Upstate; this portion of South Carolina produces practically every imaginable part of an automobile including Michelin tires, Draexlmaier vehicle electric systems, Roechling air intake systems, and BMW's X-line vehicles. The majority of the automotive manufacturers in the Upstate are members of multinational corporations; many of the Upstate locations are simply production

¹⁴⁷ Smallare, *Greenville's Growth Rate*, GVLtoday (Nov. 11, 2019), <https://gvltoday.6amcity.com/greenville-sc-growth-rate/> (last visited Nov. 13, 2020); Dustin Waters, *Manufacturing Remains The Top Economic Driver in Spartanburg*, GREENVILLE BUS. MAG. (May 6, 2019), <http://www.greenvillebusinessmag.com/2019/05/06/197042/manufacturin-g-remains-the-top-economic-driver-in-spartanburg> (last visited Nov. 13, 2020).

¹⁴⁸ S.C. DEP'T. OF REVENUE, *Fee in Lieu*, <https://dor.sc.gov/tax/fee-in-lieu> (last visited Nov. 13, 2020).

¹⁴⁹ Michael J. Hicks, Srikant Deveraj & Riley Liechty, *Manufacturing Scorecard 2019*, CTR. FOR BUS. AND ECON. RES., <https://mfgscorecard.cberdata.org/files/National2019.pdf>.

plants or operational offices for a much larger company headquartered in France or Germany.¹⁵⁰ With so many ties to multinational corporations in its counties, the Upstate of South Carolina's growth could be affected by a change in the transfer pricing regulations. The multinational corporations with a presence in the Greenville-Spartanburg area of South Carolina chose the location with their bottom line in mind, considering tax advantages and disadvantages. The addition of the residual profit split method to their transfer pricing calculations may be beneficial or costly since no matter what transfer pricing method each corporation is currently employing, a change in the standard will influence every corporation's net income amount in some fashion.¹⁵¹

The profit of many of the MNE manufacturing companies in the Upstate is based in part on intangible assets. For instance, the brand recognition of BMW's emblem adorned with sky blue and white resembling the Bavarian flag is incomparable to other companies' branding.¹⁵² Similarly, the familiarity of the three initials, B.M.W., instead of the company's actual name, Bayerische Motoren Werke, is an asset to the company that is difficult to measure.¹⁵³ Just as BMW has intangibles, Roechling Group out of Duncan, SC creates customized plastics for automotive, medical, and industrial uses that are patented and tailor-made for specific clients.¹⁵⁴ These patented

¹⁵⁰ UPSTATE SC ALLIANCE, *Major Employers*, <https://www.upstatescalliance.com/data-resources/major-employers/> (last visited Nov. 13, 2020).

¹⁵¹ John McKinley & John Owsley, *Transfer Pricing and Its Effect on Financial Reporting: Multinational Companies Face High-risk Tax Accounting*, J. OF ACCT. (Oct. 1, 2013), <https://www.journalofaccountancy.com/issues/2013/oct/20137721.html>.

¹⁵² Christopher Parr, *The Origin of the BMW Logo*, BUS. INSIDER, (May 12, 2012, 8:47 PM), <https://www.businessinsider.com/the-origin-of-the-bmw-logo-2012-5> (last visited Nov. 13, 2020).

¹⁵³ Roger Sinclair & Kevin Keller, *A Case For Brands as Assets: Acquired and Internally Developed*, 21 J. BRAND MANAG. 286, 288 (2014), <https://link.springer.com/article/10.1057/bm.2014.8>.

¹⁵⁴ ROCHLING GROUP, *About the Group*, <https://www.roechling.com/roechling-group/about-the-group> (last visited Nov. 13, 2020).

plastics are different from other companies' manufactured plastics because of the individuality of the products and communication between the clients and the company in producing the plastic.¹⁵⁵ After reviewing the possible processes, many have pronounced the residual profit split method the superior method for the measurement of intangibles like those owned by BMW and Roechling.¹⁵⁶

In application, companies like BMW would follow the steps outlined by the Treasury Regulations when valuing their incomparable goods or processes, such as BMW's patented method and apparatus for holding an assembly for mounting on structural parts.¹⁵⁷ The company has conceived and patented several inventions, but this paper will use only one for the purpose of application. The BMW Group, headquartered in Munich, Germany, (hereinafter referred to as 'BMW Germany') has patented the assembly method and apparatus, yet the BMW manufacturing plant in Spartanburg, South Carolina (hereinafter referred to as 'BMW SC') utilizes both. To value the process and mechanism protected by a patent, the BMW Group should use the four steps of the residual profit split method. First, the residual profit split method requires a determination of the routine and non-routine contributions from each party.¹⁵⁸ Both parties provide non-routine contributions: BMW Germany through the development and patent of the assembly method and apparatus and BMW SC through the adaptation of the method and use of the apparatus in its assembly line and facilities. Next, we should determine if the residual profit split method is the best method for measuring this transaction.¹⁵⁹ Non-routine contributions make it impossible to identify market valuations for these contributions; therefore, the residual profit split method is the

¹⁵⁵ *Id.*

¹⁵⁶ Stanley I. Langbein, *United States Policy and the Taxation of International Intangible Income*, 50 U. MIAMI INTER-AM. L. REV. 277, 326 (2019).

¹⁵⁷ BMW AG, *Method and Apparatus for Holding an Assembly for Mounting on Structural Parts*, JUSTIA (Apr. 13, 1992), <https://patents.justia.com/patent/5346029> (last visited Nov. 13, 2020).

¹⁵⁸ 26 U.S.C. § 1.482-6(c)(3)(i)(A).

¹⁵⁹ *Id.*

best method for this transaction.¹⁶⁰ We should allocate income to the parties based on routine considerations.¹⁶¹ While most transactions between multinational entities involve both routine and non-routine contributions, this simple illustration considers only a non-routine contribution without any routine elements. In a more intricate transaction, routine contributions could also include manufacturing or distribution operations.¹⁶² Finally, we arrive at the most important step in the IRS' guidance for the residual profit split method that requires that we allocate residual profit or loss to the parties based on non-routine contributions.¹⁶³

The residual profit is the amount that remains after having subtracted the return on routine contributions calculated in the third step. In this example, the residual profit can be traced solely to intangibles. For the sake of illustration, assume that BMW Germany contributes 80% of the R&D expenses that cultivate the manufacturing assembly method and apparatus for use and BMW SC contributes 20% of the R&D expenses in developing the method for use in the Upstate South Carolina plant. Using sales as our denominator, BMW Germany will be apportioned 80% of the residual profit from the intangibles and BMW will be allotted 20% of the residual profit.

* * *

The use of the formulary profit split allows companies like the BMW Group to accurately and methodically value their contributions among several related entities. BMW's assembly line method and apparatus is unlike other corporations' processes; it is a unique, patented, and seemingly immeasurable intangible. While the arm's length standard is not well-suited for measuring such

¹⁶⁰ *Id.*

¹⁶¹ *Id.*

¹⁶² David Bell et al., *Profit Split Method: New OECD Guidance and Practical Applications*, DELOITTE (Nov 27, 2018), <https://www2.deloitte.com/content/dam/Deloitte/in/Documents/tax/in-tax-profit-split-method-new-oecd-guidance-practical-applications-noexp.pdf>.

¹⁶³ 26 U.S.C. § 1.482-6(c)(3)(i)(B).

intangibles, the addition of the residual profit split method to the current norm allows for a proper allocation of income to each country in which a corporation operates.

V. CONCLUSION

The increasing number of intangible assets on multinational corporations' balance sheets and the rise of tax avoidance in transfer pricing scenarios require an evaluation of the current transfer pricing standard. The combination of the arm's length principle with the residual profit split method is a viable and effective solution to these issues. The arm's length principle does have advantages—the method is best applied to transactions involving comparable assets. The use of a formulary apportionment method as a supplement to the arm's length principle in valuing transfers of goods or intangibles in which there is no corresponding good responds to the current valuation issues many tax scholars and professionals are attempting to resolve. The inclusion of a formula will also deter tax avoidance and evasion for the good of both countries and companies. Specifically utilizing the residual profit split method further responds to concerns of arbitrariness and inaccuracy that other methods have exhibited. The proposed transfer pricing method capitalizes on the most valuable features of both the arm's length standard and the formulary apportionment approach to solve prevalent issues caused by the current method.

**CORAL REEF CASE STUDY: COMPARING
CURRENT INTERNATIONAL AND DOMESTIC
CORAL REEF LAWS AND DIVING INTO THE
LEGAL IMPLICATIONS OF COUNTRIES FAILING
TO ADEQUATELY PROTECT AND CONSERVE
THESE ECOSYSTEMS AS CLIMATE CHANGE
WORSENS**

*Avery Douglas**

I.	BACKGROUND.....	96
	A. <i>WHAT IS A CORAL REEF?</i>	96
	B. <i>WHAT DO CORAL REEFS PROVIDE?</i>	97
	C. <i>ISSUES FACING CORAL REEFS</i>	100
	D. <i>WHY DOES IT MATTER?</i>	104
II.	ANALYSIS OF CURRENT LAWS AND POLICIES PROTECTING CORAL REEFS.....	105
	A. <i>INTERNATIONAL LAW</i>	105
	1. <i>United Nations Convention on the Law of the Sea (UNCLOS)</i>	106
	2. <i>The CITES Convention</i>	108
	3. <i>The Ramsar Convention</i>	109
	4. <i>Convention on Biological Diversity (CBD)</i>	111
	5. <i>United Nations Educational, Scientific and Cultural Organization (UNESCO)</i>	113
	6. <i>International Coral Reef Initiative</i>	116
	7. <i>Analysis and Concerns to Addressing Climate Change Impacts through International Means</i>	118
	B. <i>DOMESTIC LAWS</i>	121
	C. <i>UNITED STATES, FLORIDA REEF</i>	122

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1.	<i>Executive Order</i>	122
2.	<i>Under the Environmental Protection Agency (EPA)</i>	123
a.	<i>Clean Water Act (CWA)</i>	123
3.	<i>Under National Oceanic and Atmospheric Administration (NOAA)</i>	125
a.	<i>Magnuson-Stevens Fishery Conservation and Management Act (MSA)</i>	125
b.	<i>Coral Reef Conservation Act of 2000 (CRCA)</i>	126
c.	<i>National Coral Reef Monitoring Program (NCRMP)</i>	128
d.	<i>Coral Reef Early Warning System (CREWS)</i>	129
e.	<i>Marine Protected Areas (MPA)</i>	129
f.	<i>Florida Keys National Marine Sanctuary</i>	132
g.	<i>National Marine Fisheries Service (NMFS)</i>	134
h.	<i>Coastal Zone Management Act (CZMA)</i>	135
4.	<i>Analysis and Concerns</i>	138
D.	<i>AUSTRALIA, GREAT BARRIER REEF (GBR)</i>	140
1.	<i>Australian Government (Commonwealth)</i>	141
a.	<i>Great Barrier Reef Marine Park Act of 1975 (GBRMP Act)</i>	141
b.	<i>Environment Protection and Biodiversity Conservation Act of 1999 (EPBC Act)</i>	143
2.	<i>Queensland Government</i>	144
a.	<i>Coastal Protection and Management Act 1995</i>	144
b.	<i>Marine Parks Act 2004</i>	145
3.	<i>Great Barrier Reef Intergovernmental Agreement</i>	145
4.	<i>Reef Trust</i>	147
5.	<i>Analysis and Concerns</i>	148
E.	<i>LEGAL IMPLICATIONS</i>	151
1.	<i>Juliana v. United States</i>	151
a.	<i>Due Process; Fundamental Rights</i>	152
b.	<i>Public Trust Doctrine</i>	153
2.	<i>Other Pertinent Lawsuits and Actions</i>	155
a.	<i>Center of Biological Diversity (Center)</i>	155
b.	<i>Center of Biological Diversity v. EPA, et. seq.</i>	157

III. LOOKING FORWARD..... 159

IV. POLICY SUGGESTION & CONCLUSION 161

Scientists predict that 90% of the world’s coral reefs will disappear by 2050 due to climate change induced by human activity. If society continues being laissez-faire about how human impacts are affecting coral reefs, declines in ocean health and ecosystem services are projected to cost the global economy \$428 billion per year by 2050. Although countries understand the general sense of urgency when taking action to protect coral reef ecosystems, countries have taken different approaches in how to effectively legislate and regulate these delicate areas. When looking to international law, there have been dozens of multilateral agreements and conventions established over the past fifty years, but none of them have prevented or curbed the impact climate change has had on coral reef ecosystems enough to reverse the effect. Environmental non-profits, as well as individuals, have realized the importance of these ecosystems to everyday life. Some have tried to sue their own governments in order to spark action by bringing due process claims for failing to protect citizens from the harmful effects of increased greenhouse gas emissions and for federal agencies failing to upkeep water quality standards. Others have petitioned for more endangered species of coral reefs to be listed under the Endangered Species Act (ESA). And several suggest expanding the public trust doctrine to include a stable climate for future generations.

This paper concludes by providing insight into the future outlook of coral reef ecosystems with the advancement of new technologies and proposes creating a new, international treaty that encompasses and addresses every threat to coral reefs in one document. The proposed treaty would seek to have countries collaborate with each other to regulate the multitude of activities that threaten coral reefs, including climate change, by establishing more effective, domestic programs with enforcement and financial mechanisms in place.

I. BACKGROUND

A. *WHAT IS A CORAL REEF?*

Coral reefs are made up of polyps. A coral reef consists of hundreds to hundreds of thousands of individual polyps functioning together as one system.¹ These are known as colonial organisms.² Each polyp has a stomach that opens at one end.³ The opening, known as the mouth, is surrounded by tentacles which are often used as defense and hunting mechanisms.⁴ Additionally, these polyps secrete a substance made up of calcium carbonate that eventually hardens and builds upon each other to develop the reef structure.⁵ The coral polyps themselves are colorless, but reefs obtain their color from the tiny creatures living inside the polyps—algae called zooxanthellae.⁶ The relationship between the coral and the algae is symbiotic.⁷ The coral provides shelter, access to sunlight, and other qualities necessary for photosynthesis, while the algae share the nutrients produced by photosynthesis with the coral.⁸ According to the National Oceanic and Atmospheric Administration (NOAA), as much as 90% of the nutrients that algae produce are transferred to their coral hosts.⁹ Corals can be found all over the world throughout the oceans at varying temperatures, latitudes, and depths.¹⁰ However, there are some factors and environments that make it more optimal for corals to grow.¹¹ For example, corals need salt

¹ *Corals Tutorial*, NAT'L OCEAN SERV., NOAA, U.S. DEP'T OF COM., https://oceanservice.noaa.gov/education/tutorial_corals/welcome.html.

² *Id.*

³ *Id.*

⁴ *Id.*

⁵ *Coral Reefs*, LIVE SCI., <https://www.livescience.com/topics/coral-reefs>.

⁶ Rachel Ross, *What are Coral Reefs?*, LIVE SCI. (Sept. 24, 2018), <https://www.livescience.com/40276-coral-reefs.html>.

⁷ *Id.*

⁸ *Id.*

⁹ *Corals Tutorial*, *supra* note 1.

¹⁰ *Coral Reef Systems*, SCRIPPS INSTITUTION OF OCEANOGRAPHY, <https://scripps.ucsd.edu/projects/coralreefsystems/about-coral-reefs/biology-of-corals/> (last visited Dec. 1, 2019).

¹¹ *Id.*

water to survive, so areas where there is freshwater runoff or where rivers are merging into the ocean are not ideal.¹² Other factors influencing coral distributions within the oceans include: availability of food, the existence of species that help control algae, and availability of hard-bottom substrate (usually found closer to the shore).¹³ “Shallow coral reefs show prime growth rates in warmer water ranging from 70–85 degrees Fahrenheit.”¹⁴ “Reef-building corals also generally grow best at depths shallower than 230 feet.”¹⁵ “The most prolific reefs occupy depths of 60–90 feet”¹⁶

B. WHAT DO CORAL REEFS PROVIDE?

“Coral reefs are the ecosystems richest in biological diversity and are considered a focal point of interaction between marine ecology and coastal socioeconomics.”¹⁷

At a high level, coral reefs provide two kinds of benefits: economic benefits, which are tangible and immediate, and ecosystem services, which are often harder to realize because they can be direct or indirect.¹⁸ “An ecosystem service is any positive benefit that wildlife or ecosystems provide to people.”¹⁹ “Worldwide, coral reefs have a net present value of almost \$800 billion, and every year, they generate \$30 billion in net economic benefits.”²⁰

¹² *Id.*

¹³ *Id.*

¹⁴ *Id.*

¹⁵ *Id.*

¹⁶ *Id.*

¹⁷ RADOŠLAV S. DIMITROV, SCIENCE & INTERNATIONAL ENVIRONMENTAL POLICY: REGIMES AND NONREGIMES IN GLOBAL GOVERNANCE 131 (Rowman & Littlefield 2006).

¹⁸ J.C. Sylvan, *How to Protect a Coral Reef: The Public Trust Doctrine and the Law of the Sea*, 7 SUSTAINABLE DEV. L. & POL’Y 32, 32 (2006).

¹⁹ *Ecosystem Services*, NAT’L WILDLIFE FED., <https://www.nwf.org/Educational-Resources/Wildlife-Guide/Understanding-Conservation/Ecosystem-Services> (last visited Nov. 23, 2020).

²⁰ Sylvan, *supra* note 18.

Coral reefs are one of the most bio diverse ecosystems on the planet and yet only cover 1/10th of 1% of the ocean floor.²¹ “Coral reefs support more than 800 hard coral species and more than 4,000 species of fish.”²² Not only this but, reefs are an essential breeding ground for many species.²³ Coral reef structures not only provide support for animals but also for beaches by providing coastal protection.²⁴ Due to their rough and complex structures, coral reefs can break much of the wave energy that would normally cause beach erosion.²⁵ By serving as a buffer to shorelines from currents, waves, and storms, reefs help to prevent erosion, property damage, and loss of life.²⁶ With today's increasingly severe tropical storms, reefs prevent as much as \$4 billion in flood damages globally every year, according to a recent study in the journal *Nature Communications*.²⁷ Coastlines are often very dynamic and ever-changing, but ones protected by reefs are typically more stable.²⁸

As previously mentioned, there is an abundant variety and supply of fish that rely on reefs for protection and food.²⁹ These fish are a significant food source for over a billion people globally.³⁰ Nearly half of federally managed fisheries in the U.S. rely on coral reef systems during their life cycle.³¹ NOAA's National Marine Service suggests that the annual commercial value of U.S. fisheries from coral reefs is over \$100 million.³² “Globally, fisheries benefits account for \$5.7 billion of the total \$29.8 billion global net benefit

²¹ *Value of Corals*, SCRIPPS INSTITUTION OF OCEANOGRAPHY, <https://scripps.ucsd.edu/projects/coralreefsystems/about-coral-reefs/value-of-corals/> (last visited Dec. 1, 2019).

²² *Id.*

²³ *Id.*

²⁴ *Id.*

²⁵ *Id.*

²⁶ *Id.*

²⁷ Michael W. Beck et al., *The Global Flood Protection Savings Provided by Coral Reefs*, NATURE COMM. 1, 3 (June 12, 2018), <https://www.nature.com/articles/s41467-018-04568-z>.

²⁸ *Value of Corals*, *supra* note 21.

²⁹ *Id.*

³⁰ *Id.*

³¹ *Id.*

³² *Id.*

provided by coral reefs.”³³ Additionally, coral reef ecosystems produce chemical compounds used for defense of the organisms living within the reef.³⁴

Bioprospecting, the search for plant and animal species from which medicinal drugs and other commercially valuable compounds can be obtained,³⁵ is relatively new in the coral reef environment.³⁶ But already, organisms found in coral ecosystems are important sources of new medicines being developed to “induce and ease labor and to treat cancer, arthritis, asthma, ulcers, bacterial infections, heart disease, viruses, and other diseases, as well as sources of nutritional supplements, enzymes, and cosmetics.”³⁷

Coral reefs are extremely valuable to tourism and recreational sectors.³⁸ Millions of scuba divers and snorkelers travel to coral reefs to experience the plethora of sea life surrounding them every year.³⁹ Many reefs are just off the coast of smaller, lesser developed islands that depend on visitors to stimulate their economies and to help them ensure their local livelihood.⁴⁰ Through diving tours, recreational fishing trips, hotels, restaurants, and other businesses located near reef ecosystems, local economies are able to flourish.⁴¹ It is estimated that the “total global value of coral-reef based recreation and tourism [is] \$9.6 billion of the total global net benefit of coral reefs.”⁴²

³³ *Id.*

³⁴ *Id.*

³⁵ *Bioprospecting*, UN DEV. PROGRAMME (Mar. 15, 2016), <https://www.sdfinance.undp.org/content/sdfinance/en/home/solutions/bioprospecting.html> (last visited Nov. 23, 2020).

³⁶ *Value of Corals*, *supra* note 21.

³⁷ *Id.*

³⁸ *Id.*

³⁹ *Id.*

⁴⁰ *Coral Reef Conservation is Key to Small Islands*, WORLD WIDE FUND FOR NATURE (Jan. 10, 2005), <http://wwf.panda.org/?17756/coral-reef-conservation-is-key-to-small-islands>.

⁴¹ *Value of Corals*, *supra* note 21.

⁴² *Id.*

C. ISSUES FACING CORAL REEFS

“Climate change is the greatest global threat to coral reef ecosystems.”⁴³ If we continue doing nothing about how our human impacts are affecting oceans and coral reefs, declines in ocean health and ecosystem services are projected “to cost the global economy \$428 billion per year by 2050, and \$1.979 trillion per year by 2100.”⁴⁴ The speed and intensity of the future risks and impacts on these delicate ecosystems depend critically on future greenhouse gas emissions.⁴⁵ Society today must also combat the effects of climate change lingering from the past decades of emissions.⁴⁶ In 2007, the Intergovernmental Panel on Climate Change (IPCC) stated that the evidence is now “unequivocal” that the earth’s atmosphere and oceans are warming.⁴⁷ They concluded that these changes are primarily due to greenhouse gases.⁴⁸ The more these emissions can be curbed, the healthier our reef systems will be.⁴⁹

Coral reefs are threatened by three major climate change-induced stressors: warming, acidification, and loss of oxygen.⁵⁰ Rising sea temperatures brought on by climate change have become the greatest danger to coral reefs, according to NOAA.⁵¹ As the ocean is warming, marine heat waves are becoming more frequent and intense.⁵² If an organism is immobile or is unable to adapt to

⁴³ *How Does Climate Change Affect Coral Reefs?*, NOAA NAT’L OCEAN SERV., <https://oceanservice.noaa.gov/facts/coralreef-climate.html> (last visited Nov. 23, 2020).

⁴⁴ IPCC, *THE OCEAN AND CRYOSPHERE IN A CHANGING CLIMATE: SUMMARY FOR POLICYMAKERS*, 1-49 (Sept. 24, 2019), https://report.ipcc.ch/srocc/pdf/SROCC_FinalDraft_FullReport.pdf.

⁴⁵ *Id.*

⁴⁶ *Id.*

⁴⁷ *Id.* at SM1-4.

⁴⁸ *Id.* at 2-16.

⁴⁹ *Id.* at 1-49.

⁵⁰ *How Does Climate Change Affect Coral Reefs?*, *supra* note 43.

⁵¹ *See generally* IPCC, *supra* note 44.

⁵² *Id.* at 1-23.

warmer water, they are put at risk.⁵³ This impacts coral reef and fish populations by causing disease and death.⁵⁴ These disease outbreaks are likely to become more frequent as the oceans warm.⁵⁵

Ocean acidification occurs when there is a rise in ocean temperature due to carbon dioxide being absorbed into the ocean from the atmosphere.⁵⁶ Carbon dioxide that has been taken up by the ocean reacts with water molecules to increase the acidity of seawater, therefore, decreasing the pH.⁵⁷ This makes the water more corrosive for marine organisms that build their shells and structures out of mineral carbonates, like corals.⁵⁸ Gradually, this leads to the reduction of calcification rates in reef-building and reef-associated organisms.⁵⁹ Coral bleaching is an environmental stress response to this phenomenon that causes coral polyps to expel the algae whose photosynthesis provides the nutrients corals need to build reef structures.⁶⁰ “This type of heat stress affected 70% of the world’s coral reefs between 2014 and 2017.”⁶¹ Between 2016 and 2017, according to NASA, “half of the Great Barrier Reef died in bleaching events set off by high sea temperatures”.⁶² Bleaching

⁵³ See Ivan Nagelkerken, *How Will Marine Life Adapt to Warmer Oceans?*, WORLD ECON. F. (Oct. 29, 2015), <https://www.weforum.org/agenda/2015/10/how-will-marine-life-adapt-to-warmer-oceans/> (last visited Nov. 23, 2020).

⁵⁴ See generally *id.*

⁵⁵ See generally *id.*

⁵⁶ See generally *id.*

⁵⁷ See *id.*

⁵⁸ See generally *id.*

⁵⁹ Heron et al., *Impacts of Climate Change on World Heritage Coral Reefs: A First Global Scientific Assessment*. UNESCO WORLD HERITAGE CENTRE (June 23, 2017), <https://whc.unesco.org/en/news/1676/> (last visited Nov. 23, 2020).

⁶⁰ See *What Is Coral Bleaching?*, NOAA NAT’L OCEAN SERV. (last updated Nov. 5, 2020), https://oceanservice.noaa.gov/facts/coral_bleach.html (last visited Nov. 23, 2020).

⁶¹ Donavyn Coffey, *What Is Coral Bleaching?*, LIVE SCI. (Jan. 31, 2019), <https://www.livescience.com/64647-coral-bleaching.html>.

⁶² *Id.*

events have become more frequent in recent decades.⁶³ The most recent global scientific assessment of the status of coral reef ecosystems occurred in 2008 and estimated that “the world has effectively lost 19% of the original area of coral reefs; 15% are seriously threatened with loss within the next 10–20 years; and 20% are under threat of loss in 20–40 years.”⁶⁴ Seemingly insignificant temperature spikes of only 1.8 to 3.6 degrees Fahrenheit can trigger coral bleaching events that affect miles and miles of coral reef.⁶⁵ Mass bleaching happens gradually because as water temperature rises above the coral’s comfort zone, algae begin to leave and corals begin to essentially starve to death.⁶⁶ This bleached coral is still alive but without the symbiotic relationship of algae providing the corals energy, these structures are much more vulnerable.⁶⁷ This process transforms once vibrantly colored, life sustaining coral into a bright white, barren skeleton.⁶⁸ It is possible for corals to recover from bleaching.⁶⁹ For instance, if conditions return to normal, and continue to stay that way, corals can reobtain algae necessary for survival.⁷⁰ However, when prolonged periods of warmer temperatures occur coral “can struggle to regrow, reproduce and resist disease.”⁷¹ “Coral communities typically take 15 to 25 years to recover from mass bleaching.”⁷² There is a limited capacity for corals to adapt to climate change and current global targets of carbon

⁶³ See Clive Wilkinson, *Status of Coral Reefs of the World: 2008*, GLOBAL CORAL REEF MONITORING NETWORK (2008), at 1.

⁶⁴ *Id.* at 5.

⁶⁵ Coffey, *supra* note 61.

⁶⁶ Wilkinson, *supra* note 63.

⁶⁷ *Id.*

⁶⁸ *Id.*

⁶⁹ *Coral Bleaching*, AUSTRAL. MARINE CONSERVATION SOC’Y, <https://www.marineconservation.org.au/coral-bleaching/> (last visited Nov. 23, 2020).

⁷⁰ *Id.*

⁷¹ *Id.*

⁷² *Achieving Paris Goals Key to Survival of Coral Reefs*, UN CLIMATE CHANGE (July 6, 2018), <https://unfccc.int/news/achieving-paris-goals-key-to-survival-of-coral-reefs> (last visited Dec. 30, 2020).

emission reductions are insufficient for coral reef protection.⁷³ Therefore, lower emission targets should be pursued.⁷⁴

Ocean warming also reduces the amount of oxygen oceans can hold.⁷⁵ This in turn stratifies the water column and less oxygen is able to be transported to deeper depths where it is necessary to sustain life.⁷⁶ According to *National Geographic*, 70% of Earth's oxygen production comes from marine phytoplankton.⁷⁷ With marine plant species dying out, this number is set to decrease.⁷⁸

These significant climate-change stressors occur alongside other human-driven impacts, like unsustainable fishing practices and pollution that drastically impact our reef ecosystems.⁷⁹ Overfishing can lead to the depletion of key reef species worldwide.⁸⁰ Certain impacts of fishing on reefs vary from overexploitation of fish for food; removal of a species impacting multiple trophic levels, by-catch; and physical damage to reef environments.⁸¹ Pollution from land sources, such as runoff from agricultural sector, deforestation, storm water, impervious surfaces,

⁷³ See Mebrahtu Ateweberhan et al., *Climate Change Impacts on Coral Reefs: Synergies with Local Effects, Possibilities for Acclimation, and Management Implications*, NAT'L CTR FOR BIOTECHNOLOGY INFO. (June 28, 2013), <https://www.ncbi.nlm.nih.gov/pubmed/23816307>.

⁷⁴ *Id.*

⁷⁵ Chris Mooney, *Global Warming Could Deplete the Oceans' Oxygen – With Severe Consequences*, WASH. POST (Apr. 28, 2016, 11:28AM), <https://www.washingtonpost.com/news/energy-environment/wp/2016/04/28/global-warming-could-deplete-the-oceans-oxygen-levels-with-severe-consequences/>.

⁷⁶ *See id.*

⁷⁷ *Save the Plankton, Breathe Freely*, NAT'L GEOGRAPHIC, <https://www.nationalgeographic.org/activity/save-the-plankton-breathe-freely/> (last visited Nov. 23, 2020).

⁷⁸ *Id.*

⁷⁹ IPCC, *supra* note 44, at 49.

⁸⁰ *How Does Climate Change Affect Coral Reefs?*, *supra* note 43.

⁸¹ *Threats to Coral Reefs*, SCRIPPS INSTITUTION OF OCEANOGRAPHY, <https://sioweb.ucsd.edu/projects/coralreefsystems/about-coral-reefs/coral-in-crisis/> (last visited Dec. 1, 2019).

coastal development, and other construction, has negative effects on the coral reef ecosystem as well.⁸²

D. WHY DOES IT MATTER?

As previously discussed, coral reefs are important because they provide economic benefits as well as ecosystem services that benefit and support the global population. Ocean health depends on coral reef health because reefs create shelter and create essential nutrients for larger communities of fish and other sea life.⁸³ Approximately 25% of all ocean species depend on coral reefs.⁸⁴ Coral reefs are estimated to provide the U.S. \$30 billion in, not only economic value, but also social and cultural value.⁸⁵ Several million people in the U.S. live near a coral reef and benefit from it—whether that be from coastal protection or by the reef serving as source of food.⁸⁶ Current projections “indicate that climate-related loss of reef ecosystem services will cost the U.S. \$500 billion per year or more by 2100.”⁸⁷

According to a United Nations report, the world's coral reefs are at the epicenter of climate change impacts and species loss.⁸⁸ If the world warms another 0.9 degrees Fahrenheit, coral reefs are projected to diminish by 70%-90%.⁸⁹

⁸² *Id.*

⁸³ *Coral Reefs*, *supra* note 5.

⁸⁴ *Corals and Coral Reefs*, SMITHSONIAN (Apr. 2018), <https://ocean.si.edu/ocean-life/invertebrates/corals-and-coral-reefs> (last visited Nov. 23, 2020).

⁸⁵ *Id.*

⁸⁶ *Importance of Coral Reefs*, NAT'L OCEAN SERV., NOAA, U.S. DEP'T OF COM., https://oceanservice.noaa.gov/education/tutorial_corals/coral07_importance.html (last visited Nov. 23, 2020).

⁸⁷ Heron et al., *supra* note 59.

⁸⁸ Univ. of S. Cal., *Hope for Coral Recovery May Depend on Good Parenting*, SCI. DAILY (Sept. 16, 2019), <https://www.sciencedaily.com/releases/2019/09/190916081500.htm>.

⁸⁹ *Id.*

There are predictions that 90% of the world's coral reefs will disappear by 2050 due to climate change induced by human activity.⁹⁰ "A gain of 1.8 degrees Fahrenheit, the report says, means 99% of the world's coral will be in jeopardy."⁹¹ Current plans for decreasing global carbon dioxide emissions are not taking effect at a rate fast enough to save reefs.⁹²

II. ANALYSIS OF CURRENT LAWS AND POLICIES PROTECTING CORAL REEFS

A. INTERNATIONAL LAW

Coral reefs are found in most oceans around the world, and the protection of the coral organisms that inhabit these reefs is vital to protecting the health of our oceans. Due to the global importance of coral reefs, the international community has committed on numerous occasions to coordinate policy responses to the ongoing changes affecting coral reef ecosystems. The current makeup of international instruments pertaining to coral reefs has developed incrementally since the 1960s, with commitments tied to almost every anthropogenic driver of change in coral reef ecosystems.⁹³ In 2016, the United Nations Environment Programme (UNEP) joined together with the International Coral Reef Initiative (ICRI) to conduct an analysis of policies and governance mechanisms related to the protection of coral reefs.⁹⁴ This idea, Resolution 2/12 Sustainable Coral Reef Management, was passed by the United

⁹⁰ *Protecting Corals*, LOST CITIES: EXPLORE THE VIBRANT WORLD OF CORALS, <http://lostcities.org/#/story/protecting-corals> (last visited Nov. 23, 2020).

⁹¹ Univ. of S. Cal., *supra* note 88.

⁹² *See id.*

⁹³ R. Karasik et al., *Analysis of Policies Related to the Protection of Coral Reefs-Analysis of Global and Regional Policy Instruments and Governance Mechanisms Related to the Protection and Sustainable Management of Coral Reefs*, UN ENV'T PROGRAMME, ICRI, DUKE NICHOLAS INST. FOR ENV'T POL'Y SOLUTIONS (2019), [https://www.icriforum.org/wp-content/uploads/2020/05/Coral_Policy%20\(1\).pdf](https://www.icriforum.org/wp-content/uploads/2020/05/Coral_Policy%20(1).pdf).

⁹⁴ *Id.* at 7.

Nations Environment Assembly to “reiterate[] the need for international cooperation for the protection of coral reef ecosystems.”⁹⁵ These organizations found that there are at least 232 international instruments considered to directly or indirectly support conservation of coral reefs, and attempt to address common stressors in these ecosystems.⁹⁶ This body of coral reef-related instruments includes 150 global instruments—twenty-nine are legally binding instruments, whereas the rest are non-binding and voluntary.⁹⁷ Within these instruments, there are thirty-three policy commitments made to address climate change impacts on coral reefs, specifically focusing on cutting greenhouse gas emissions.⁹⁸ Some of the international instruments most relevant to coral reef ecosystems that are frequently cited in scientific literature include: the United Nations Convention on the Law of the Sea (UNCLOS) 1982, the Convention on the International Trade in Endangered Species (CITES), the Ramsar Convention, the Convention on Biological Diversity (CBD) 1992, and the UNESCO World Heritage Convention 1972.⁹⁹ Other partnerships, without binding effect, such as the ICRI have been instrumental in pushing coral reef conservation policies forward as well.¹⁰⁰ We will now look at these instruments in more detail.

1. *United Nations Convention on the Law of the Sea (UNCLOS)*

Arguably, the most important milestone for international policy related to conservation of coral reef ecosystems was the adoption in 1982 of UNCLOS.¹⁰¹ In 1994, this convention and following articles and annexes created a comprehensive, legal framework for all activities in the oceans and established the rights and obligations of

⁹⁵ *Id.*

⁹⁶ *Id.* at ix.

⁹⁷ *Id.*

⁹⁸ *Id.* at 19.

⁹⁹ *Id.* at 14.

¹⁰⁰ *Id.*

¹⁰¹ UN Convention on the Law of the Sea, Dec. 10, 1982, 1833 U.N.T.S. 297 [hereinafter UNCLOS].

states within the different maritime zones.¹⁰² UNCLOS shifted the legal assumption that the ocean was an inexhaustible commodity, and instead treated oceans as a vulnerable resource.¹⁰³ Due to the ecology of reefs, most reefs are found within coastal states' jurisdiction because reefs depend on photosynthesis and are located in areas where light is able to penetrate; and these states exercise sovereignty over their natural resources.¹⁰⁴ This entitles them to conserve or to exploit these ecosystems. UNCLOS established a new maritime zone beyond the territorial sea known as the exclusive economic zone (EEZ).¹⁰⁵ This zone can extend up to a limit of 200 nautical miles from beginning to the end of the territorial sea.¹⁰⁶ In the EEZ, coastal States have

sovereign rights for the purpose of exploring and exploiting, conserving and managing the natural resources, whether living or nonliving, of the waters superjacent to the sea-bed and of the sea-bed and its subsoil, and with regard to other activities for the economic exploitation and exploration of the zone, such as the production of energy from the water, currents and winds.¹⁰⁷

UNCLOS cautions states against undertaking actions that jeopardize the marine environment of their neighbors, but absent proof of trans boundary damage, no state can challenge the policies or practices of its neighbors.¹⁰⁸ The state decides the degree to which it will enforce these limits.¹⁰⁹ Under the maritime zones established under UNCLOS, the world's warm-water coral reefs fall under national jurisdiction.¹¹⁰ Approximately 85% of the world's warm-water coral reefs are estimated to be under the jurisdiction of twenty five countries: Australia, Bahamas, China, Cuba, Egypt, Eritrea,

¹⁰² Sylvan, *supra* note 18, at 34.

¹⁰³ *Id.*

¹⁰⁴ *Id.*

¹⁰⁵ See UNCLOS, *supra* note 101.

¹⁰⁶ *See id.*

¹⁰⁷ *Id.* at art. 56(a).

¹⁰⁸ Sylvan, *supra* note 18, at 34.

¹⁰⁹ *Id.*

¹¹⁰ R. Karasik et al., *supra* note 93, at 49.

Federated States of Micronesia, Fiji, France, India, Indonesia, Kiribati, Madagascar, Malaysia, Maldives, Marshall Islands, Mozambique, Papua New Guinea, Philippines, Saudi Arabia, Seychelles, Solomon Islands, Tanzania, United Kingdom, and the U.S.¹¹¹ These quasi-trustees have sovereign rights for their own conservation and sustainable management; for this reason, international coral reef instruments following UNCLOS mostly focus on action that should be taken by states.¹¹² About 16% of all enforcement commitments within the current international instruments that were included in the analysis are found in “UNCLOS, which requires States to adopt and enforce rules relating to the conservation and utilization of the living resources in the EEZ.”¹¹³

2. *The CITES Convention*

“One of the most significant conventions concerning coral reefs is the Convention on International Trade in Endangered Species of Wild Fauna (CITES).”¹¹⁴ The convention’s objectives are to “protect wildlife against such overexploitation and to prevent international trade from threatening species with extinction.”¹¹⁵ CITES is “in fact the only international legal mechanism with a mandate to protect species from overexploitation due to international trade.”¹¹⁶ This treaty is legally binding on the parties, and places obligations on both exporting and importing parties.¹¹⁷ The treaty requires that each signatory nation establish a CITES Management Authority who mainly issues permits.¹¹⁸ It also

¹¹¹ *Id.* at 17.

¹¹² *Id.* at 18.

¹¹³ *Id.* at 26.

¹¹⁴ Kristin Kushlan, *Coral Reefs: The Failure to Regulate at the International Level*, U.C. DAVIS ENVTL. L. & POL’Y J. VOL. 33:2, 318, 329–40 (2009).

¹¹⁵ *Id.* at 329.

¹¹⁶ *Id.*

¹¹⁷ *Id.* at 329, 336.

¹¹⁸ *How CITES Works*, CONVENTION ON INT’L TRADE IN ENDANGERED SPECIES OF WILD FAUNA & FLORA, <https://cites.org/eng/disc/how.php> (last visited Nov. 24, 2020).

requires a CITES Scientific Authority to monitor biological sustainability of trade.¹¹⁹ However, CITES is generally not self-executing and cannot be fully implemented until states at the domestic level have adopted legislation allowing them to implement and enforce all aspects of the Convention.¹²⁰ Of the countries addressed later on, Australia and the U.S. have both enacted proper legislation.¹²¹ The first coral species listed by CITES were black corals in 1981.¹²² Since then, CITES has listed over 2,000 species of hard coral and several non-reef-building corals.¹²³

3. *The Ramsar Convention*

The Convention on Wetlands of International Importance (the Ramsar Convention) was signed in Ramsar, Iran, in 1971.¹²⁴ It is an intergovernmental treaty that provides a framework for national action and international cooperation for the conservation and wise use of wetlands.¹²⁵ Coral reef ecosystems fall within the definition of wetland under this treaty and reefs are generally protected (subject to some limitations).¹²⁶ The mission statement set out at the convention signing was “[t]he conservation and wise use of wetlands through local and national actions and international cooperation, as a contribution towards achieving sustainable

¹¹⁹ *See id.*

¹²⁰ *National Laws for Implementing the Convention*, CITES, <https://cites.org/legislation> (last visited Nov. 24, 2020).

¹²¹ *See generally* Status of Legislative Progress for Implementing CITES, CONVENTION ON INT’L TRADE IN ENDANGERED SPECIES OF WILD FAUNA & FLORA (last updated Apr. 2019), <https://cites.org/sites/default/files/projects/NLP/Legislative%20status%20able%20April%202019.pdf> (last visited Nov. 24, 2020).

¹²² *Coral*, U.S. FISH & WILDLIFE SERV. INT’L AFF., <https://www.fws.gov/international/animals/coral.html> (last visited Nov. 24, 2020).

¹²³ *See id.*

¹²⁴ *About the Convention on Wetlands*, RAMSAR CONVENTION ON WETLANDS, <https://www.ramsar.org/about-the-convention-on-wetlands-0> (last visited Nov. 24, 2020).

¹²⁵ *Id.*

¹²⁶ *Id.*

development throughout the world.”¹²⁷ There are 170 Contracting Parties to the Convention, with 2,413 wetland sites, designated for inclusion in the Ramsar List of Wetlands of International Importance.¹²⁸

The Ramsar Convention encourages the designation of sites containing wetlands that are important for conserving biological diversity.¹²⁹ After these sites are designated, they “. . . are added to the Convention's List of Wetlands of International Importance and become known as Ramsar sites.”¹³⁰ Parties then must agree to establish and oversee a management framework aimed at conserving the wetland and ensuring its “wise use.”¹³¹ “Wise use under the Convention is broadly defined as maintaining the ecological character of a wetland.”¹³²

In total, there are approximately 850 Ramsar Sites that host coral formations.¹³³ However, only one coral reef in the U.S. is currently protected by this treaty—the Palmyra Atoll National Wildlife Refuge.¹³⁴ Ten reefs in Australia are designated as a

¹²⁷ *The Convention on Wetlands and its Mission*, RAMSAR CONVENTION ON WETLANDS, <https://www.ramsar.org/about/the-convention-on-wetlands-and-its-mission> (last visited Nov. 24, 2020).

¹²⁸ *The List of Wetlands of International Importance*, RAMSAR CONVENTION ON WETLANDS (Dec. 11, 2020), <https://www.ramsar.org/sites/default/files/documents/library/sitelist.pdf> (last visited Jan. 5, 2021).

¹²⁹ *The Ramsar Convention on Wetlands*, AUSTRALIAN GOV'T DEP'T OF ENV'T & ENERGY, <https://www.environment.gov.au/water/wetlands/ramsar> (last visited Nov. 24, 2020).

¹³⁰ *Id.*

¹³¹ *Id.*

¹³² *Id.*

¹³³ *Coral Reefs: Critical Wetlands in Severe Danger*, RAMSAR CONVENTION ON WETLANDS (June 1–9, 2015), https://www.ramsar.org/sites/default/files/documents/library/cop12_doc25_corals_fact_sheet_e.pdf.

¹³⁴ *Ramsar Sites Information Service*, RAMSAR, <https://rsis.ramsar.org/ris->

Wetland of International Importance,¹³⁵ seven of which are designated as threatened by climate change.¹³⁶ In the last decade, the Regional Wetland Action Plans have recognized the lack of integration of wetland management into climate change policies, but nothing of substantial nature has transpired.¹³⁷

At the 12th Meeting of the Conference of the Parties (COP) to the Convention on Wetlands in 2015, the parties discussed a more holistic approach to promoting more resilient coral reef systems and what that might encompass.¹³⁸ Ideas formed around zoning human activities surrounding reefs include management of activities on land, preservation of key habitat corridors, and integrating local coral reef users and stakeholders into management actions.¹³⁹ At the 13th Meeting of the COP in 2018, climate change priorities are listed including managing wetlands in a changing climate, in terms of dealing with the hydrological processes that maintain the values of many of the sites designated under the Ramsar Convention, and conducting an economic valuation of ecosystem services to inform climate change adaptation and provide targeted funding for the management of these Ramsar Sites affected by climate change.¹⁴⁰

4. *Convention on Biological Diversity (CBD)*

The Convention on Biological Diversity is an international convention that addresses imminent problems facing coral reef

search/?f%5B0%5D=regionCountry_en_ss%3AAustralia&f%5B1%5D=wetlandTypes_en_ss%3AMarine%20or%20coastal%20wetlands&f%5B2%5D=wetlandTypes_en_ss%3AC%3A%20Coral%20reefs&pagetab=1 (last visited Nov. 24, 2020).

¹³⁵ *Id.*

¹³⁶ *Id.*

¹³⁷ See generally *About the Convention on Wetlands*, *supra* note 124.

¹³⁸ *Coral Reefs: Critical Wetlands in Severe Danger*, *supra* note 133.

¹³⁹ *Id.*

¹⁴⁰ *Australia's National Report to the 13th Conference of the Contracting Parties to the Ramsar Convention*, (Oct. 21–29, 2018), AUSTRL. GOV'T DEP'T OF AGRIC., WATER & THE ENV'T, <https://www.environment.gov.au/water/wetlands/publications/publications/australias-national-report-13th-conference-contracting-parties-ramsar-convention>.

ecosystems.¹⁴¹ The Convention recognizes that, over the past decade, coral bleaching has increased substantially and continues to threaten marine biodiversity.¹⁴² “In 1998, . . . the [Convention] drew attention to an extensive, severe coral bleaching episode occurring that year as a result of abnormally high water temperatures.”¹⁴³ After identifying this occurrence as a possible consequence of climate change, the Convention requested the Subsidiary Body on Scientific, Technical and Technological Advice to analyze this phenomenon and provide pertinent information to the next meeting of the parties.¹⁴⁴ At the next meeting, the Conference decided to integrate coral reefs into a pre-existing program to develop and implement a specific work plan focusing on coral bleaching, in cooperation with the United Nations Framework Convention on Climate Change and other relevant bodies including CITES, RAMSAR, ICRI, and UNESCO.¹⁴⁵ The Conference again recognized that there is evidence that climate change is a primary cause of coral bleaching and is sufficient enough to warrant taking remedial measures.¹⁴⁶ After recognizing climate change was a pressing issue, specific work plans on coral bleaching and physical degradation and destruction of coral reefs were adopted.¹⁴⁷

“In 2015, the 193 member states of the United Nations confirmed their commitment to conserve at least 10 percent of coastal and marine areas by 2020, incorporating a target established

¹⁴¹ See generally *The Convention on Biological Diversity*, CONVENTION ON BIOLOGICAL DIVERSITY (Oct. 12, 2020), <https://www.cbd.int/convention/> (last visited Dec. 30, 2020).

¹⁴² *Coral*, CONVENTION ON BIOLOGICAL DIVERSITY (Dec. 14, 2007), <https://www.cbd.int/marine/coral.shtml> (last visited Dec. 30, 2020).

¹⁴³ *Id.*

¹⁴⁴ *COP 4 Decision IV/5 Conservation and Sustainable Use of Marine and Coastal Biological Diversity, Including a Programme of Work*, CONVENTION ON BIOLOGICAL DIVERSITY, <https://www.cbd.int/decision/cop/?id=7128> (last visited Dec. 1, 2019).

¹⁴⁵ *COP 5 Decision V/3 Progress Report on the Implementation of the Programme of Work on Marine and Coastal Biological Diversity (Implementation of IV/5)*, CONVENTION ON BIOLOGICAL DIVERSITY, <https://www.cbd.int/decision/cop/?id=7145> (last visited Dec. 31, 2020).

¹⁴⁶ See *id.*

¹⁴⁷ See *id.*

under the Convention on Biological Diversity into the U.N.'s 2030 Agenda for Sustainable Development."¹⁴⁸ These areas are known as marine protected areas (MPAs), which are defined as any protected area of "clearly defined geographical space, recognized, dedicated, and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values."¹⁴⁹ MPAs have been shown to maintain biodiversity, furnish "ecological benefits" to adjoining ecosystems, and stabilize ecosystems.¹⁵⁰ MPAs also "serve as important climate reference points for scientists."¹⁵¹ Although establishing an MPA or a reserve will not eliminate ocean acidification or global warming, it may be able to assist in ecosystem resilience to these overarching stressors.¹⁵²

The current work plan being implemented acknowledges the urgent need to manage coral reefs for resistance and resilience to instances of high sea temperatures and coral bleaching, and recovery from these events through "(1) management actions and strategies to support reef resilience, rehabilitation[,] and recovery; . . . (2) information gathering; . . . (3) capacity-building; . . . (4) policy development/implementation; . . . [and] (5) financing."¹⁵³

5. *United Nations Educational, Scientific and Cultural Organization (UNESCO)*

UNESCO is a specialized agency of the United Nations whose purpose is to contribute to advancing international collaboration to expand universal respect for human rights, justice, and the rule of

¹⁴⁸ *Marine Protected Areas Beyond National Jurisdiction*, THE PEW CHARITABLE TRUSTS 1, 2 (Mar. 2016), <https://www.pewtrusts.org/-/media/assets/2016/03/high-seas-mpa-policy-brief.pdf>.

¹⁴⁹ *Id.* at 1.

¹⁵⁰ *Id.* at 2.

¹⁵¹ *Id.*

¹⁵² *Id.*

¹⁵³ *COP 7 Decision VII/5 Marine and Coastal Biological Diversity*, CONVENTION ON BIOLOGICAL DIVERSITY, <https://www.cbd.int/decision/cop/?id=7742> (last visited Nov. 24, 2020).

law.¹⁵⁴ UNESCO has 193 Member States and eleven associate members.¹⁵⁵ Each country that is a Member State is entitled to one vote. The Conference meets every two years and is attended by Member States along with “observers for non-Member States, intergovernmental organizations[,] and non-governmental organizations.”¹⁵⁶

UNESCO pursues its goals through five major areas: education, culture, natural sciences, social and human sciences, and communication and information.¹⁵⁷ Because the reach of this organization is so extensive, we will look at the work UNESCO has done with the natural sciences (oceans, coral reefs) and focus specifically on its work securing the world's cultural and natural heritage through World Heritage Sites.¹⁵⁸

UNESCO has had a track record of protecting coral reef ecosystems. The UNESCO World Heritage Convention of 1972 recognized “the ways in which people interact with nature, and the fundamental need to preserve the balance between the two.”¹⁵⁹ World Heritage Sites are a magnet for international cooperation and may have the potential of receiving funding for heritage conservation projects.¹⁶⁰ Sites on the World Heritage List benefit from an implementation of a sweeping management plan that establishes adequate preservation measures, monitoring mechanisms, and an increase in public awareness of these areas.¹⁶¹

¹⁵⁴ See generally *UNESCO in Brief- Mission and Mandate*, UNESCO, <https://en.unesco.org/about-us/introducing-unesco> (last visited Nov. 24, 2020).

¹⁵⁵ *Member States List*, UNESCO, <https://en.unesco.org/countries> (last visited Nov. 24, 2020).

¹⁵⁶ *Governance*, UNESCO, <https://en.unesco.org/about-us/governance> (last visited Jan. 5, 2021).

¹⁵⁷ See *What We Do*, UNESCO, <https://en.unesco.org/themes/science-sustainable-future> (last visited Nov. 24, 2020).

¹⁵⁸ See generally *id.*

¹⁵⁹ *The World Heritage Convention*, UNESCO, <https://whc.unesco.org/en/convention/> (last visited Nov. 24, 2020).

¹⁶⁰ *Id.*

¹⁶¹ *Id.*

Recently in 2017, UNESCO's World Heritage Centre published the first ever worldwide scientific assessment analyzing the effects climate change has had on UNESCO World Heritage coral reefs.¹⁶² Of the twenty-nine World Heritage-listed coral reef sites, "[fifteen] were exposed to repeated severe heat stress during the 2014–2017 global bleaching event."¹⁶³ Recurrent bleaching was apparent on over half of the sites.¹⁶⁴ The assessment uncovered that twenty-five of the twenty-nine World Heritage reefs are "projected to severely bleach twice-per-decade by 2040 under a business-as-usual [carbon dioxide] emissions scenario."¹⁶⁵ The assessment concluded that limiting global average temperature increase to 1.5 degrees Celsius above pre-industrial levels, a goal set out in the Paris Agreement, is an imperative action to secure coral reef protection.¹⁶⁶ Conserving World Heritage-listed coral reef properties requires on-site management of these ecosystems and national and regional enabling legislation to restore resilience and minimize local human stressors, like emissions, while climate stabilization occurs.¹⁶⁷

In 2018, following this global assessment, UNESCO members created an initiative to address ways to "strengthen coral reef adaptation to climate change."¹⁶⁸ The initiative seeks to implement an effective strategy for climate change resilience in five coral reefs on UNESCO's World Heritage List: "the Rock Islands Southern Lagoon (Palau), the Lagoons of New Caledonia (France), the Belize Barrier Reef Reserve System (Belize), the Ningaloo Coast, and the

¹⁶² Scott F. Heron et al., *Impacts of Climate Change on World Heritage Coral Reefs: Update to the First Global Scientific Assessment*, UNESCO WORLD HERITAGE CENTRE 1, 1 (2018), <https://unesdoc.unesco.org/ark:/48223/pf0000265625/PDF/265625eng.pdf.multi>.

¹⁶³ *Id.*

¹⁶⁴ *Id.*

¹⁶⁵ *Id.*

¹⁶⁶ *Id.* at 3.

¹⁶⁷ *Id.* at 4.

¹⁶⁸ *UNESCO Calls for Concerted Action to Strengthen the Resilience of Coral Reefs*, UNESCO (July 8, 2019), <https://en.unesco.org/news/unesco-calls-concerted-action-strengthen-resilience-coral-reefs> (last visited Nov. 24, 2020).

Great Barrier Reef (Australia).”¹⁶⁹ The four-year initiative is supplied with a \$9 million budget.¹⁷⁰ In July 2019, UNESCO members met to take stock of the initiative again because it is necessary to take swift action to reverse the impact of rising sea temperatures.¹⁷¹ The UNESCO Director-General suggested that UNESCO was “the most appropriate platform to accelerate this effort” and suggested this effort must be done on a global scale to be effective.¹⁷² “The evaluation recognizes the importance of the United Nations Decade of Ocean Sciences for Sustainable Development, which will begin in 2021 and be coordinated by UNESCO through the Intergovernmental Oceanographic Commission (IOC).”¹⁷³ The IOC has also announced plans to use Remote Sensing technologies to gather data for the mapping and greater understanding of coral reef communities.¹⁷⁴

6. *International Coral Reef Initiative*

The International Coral Reef Initiative (ICRI) was founded in 1994 by eight governments including Australia and the U.S.¹⁷⁵ It was initially announced at the First Conference to the Parties on the Convention of Biological Diversity.¹⁷⁶ The mission of this informal network is to “identify and promote needed action without directly engaging in policymaking” and to be “an open forum for like-minded political actors to discuss coral reef issues, share information, promote research, identify priorities, and facilitate policy action.”¹⁷⁷ ICRI views themselves as an advocacy group because they do not “develop, fund, or implement coral reef

¹⁶⁹ *Id.*

¹⁷⁰ *Id.*

¹⁷¹ *Id.*

¹⁷² *Id.*

¹⁷³ *Id.*

¹⁷⁴ *OTGA/INOAS: Remote Sensing of Coral Reefs*, IOC-UNESCO (Oct. 20–23, 2019), http://ioc-unesco.org/index.php?option=com_oe&task=viewEventRecord&eventID=2474 (last visited Nov. 24, 2020).

¹⁷⁵ *About Us*, INT’L CORAL REEF INITIATIVE, <https://www.icriforum.org/about/> (last visited Nov. 24, 2020).

¹⁷⁶ *Id.*

¹⁷⁷ Kushlan, *supra* note 114, at 327.

policy.”¹⁷⁸ ICRI identifies areas of policy needed at both the local and national levels.¹⁷⁹ Members believe an informal structure allows ICRI to become “more effective in influencing national governments and relevant international institutions when it is viewed as a flexible mechanism instead of a competing agency.”¹⁸⁰

Today, ICRI consists of “governments, international development banks, non-governmental organizations, scientists, and corporate actors from the private sector who meet annually for nonbinding discussions.”¹⁸¹ ICRI’s discussions and gatherings have involved representatives from up to eighty governments and some of the aforementioned international organizations, such as UNEP and IOC-UNESCO.¹⁸² ICRI meets every four years and consists of a diverse group of professionals including natural scientists; resource managers and users; economists; conservationists; and educators who yearn to promote coral reef science, management, and conservation.¹⁸³ ICRI’s research and strategies have been taken into consideration by policymakers and binding conventions.¹⁸⁴ Unlike governmental bodies and conventions whose focus is not streamlined, this body is solely focused on coral reef preservation and has become a steward in this area.¹⁸⁵ For example, “the work of ICRI is regularly acknowledged in [UN] documents, highlighting” ICRI’s “important cooperation, collaboration and advocacy role within the international arena.”¹⁸⁶ This includes United Nations General Assembly resolutions, UNEP Governing Council decisions, and documents from Multilateral Environmental Agreements such as the CBD or the Ramsar Convention.¹⁸⁷ Today, the ICRI focuses

¹⁷⁸ *Id.* at 327.

¹⁷⁹ *Id.* at 327–28.

¹⁸⁰ *Id.* at 328.

¹⁸¹ *Id.* at 327.

¹⁸² *Id.*

¹⁸³ *Id.*

¹⁸⁴ *Id.*

¹⁸⁵ See generally INT’L CORAL REEF INITIATIVE, *supra* note 175.

¹⁸⁶ *Id.*

¹⁸⁷ ICRI, *Coral Reefs and the UN*, INT’L CORAL REEF INITIATIVE, <https://www.icriforum.org/icri-coral-reefs-and-the-un/> (last visited Jan. 5, 2021).

on generating scientific data about coral reefs.¹⁸⁸ The ICRI established Global Coral Reef Monitoring Network (GCRMN) to provide the information needed for further discussions related to protection of the world's coral reefs.¹⁸⁹ Additionally, ICRI created the International Coral Reef Action Network (ICRAN) "whose mandate is to assist in capacity building for reef management in developing countries."¹⁹⁰

7. *Analysis and Concerns to Addressing Climate Change Impacts through International Means*

There are many difficulties that hinder the success of policy action or the adoption of a new convention to protect coral reef ecosystems from the threat of climate change. As we have seen, many countries and organizations have expressed their concerns over the state of the world's coral reefs in various international forums and conferences. However, these "discussions in such institutional settings have not led to collective[,] remedial policy action."¹⁹¹ Current efforts such as CITES, CBD, and other treaties address some of the threats coral reefs are facing like the exportation of coral or the reduction of greenhouse gases, however, "there is no single convention or international organization that attempts to protect all of the world's coral reefs at an international level" from every human stressor.¹⁹² This may be in part because people do not view coral reef conservation as a global issue but rather a domestic or even localized one even though everyone on this planet has a stake in the health of all of the world's coral reefs.¹⁹³

Some environmentalists "believe that an international coral reef treaty [may] be ineffective or unable" to address the myriad of issues threatening the world's coral reefs because of the variety and locality

¹⁸⁸ See generally *Our Networks*, INT'L CORAL REEF INITIATIVE, <https://www.icriforum.org/groups/our-networks> (last visited Nov. 24, 2020).

¹⁸⁹ *Id.*

¹⁹⁰ Kushlan, *supra* note 114, at 329.

¹⁹¹ *Id.*

¹⁹² *Id.* at 330.

¹⁹³ See generally R. Karasik et al., *supra* note 93.

of issues.¹⁹⁴ Many of the threats to coral reefs, while common to all reefs, vary greatly by location, both ecologically and socially.¹⁹⁵ Due to the particularity of local issues facing coral reefs, numerous conservation groups believe that coral reef conservation efforts must be a “bottom-up process driven by local communities.”¹⁹⁶ Even if that were the process, the need for local regulation does not necessarily lead to the creation of an international program or policy.¹⁹⁷ On the bright side, ICRI’s approach does “focus on local actions and often there is no mention at these conferences of global or regional policy measures” while global conventions force commitments on states and localities for enforcement of their creation of regulation.¹⁹⁸ As previously noted, the breadth of international coral reef-related instruments is vast, but the commitments placed on the Member-States privy to said instrument are often vague, general, and voluntary.¹⁹⁹ For example, some commitments are focused on marine ecosystems at-large or on the economic sectors of human activity that may drive changes in coral reef ecosystems, rather than focusing on protecting coral reef ecosystems themselves from climate change. States have the primary responsibility for achieving 75% of the commitments laid out in the body of international reef-related instruments.²⁰⁰ In addition, the coordination among “the 232 international reef-related policy instruments and the 591 commitments they contain presents” a challenge for those governments trying to implement locally-appropriate processes and responses for achieving set goals.²⁰¹ Another issue relating to regionalized commitments is that while these states work to translate these commitments into localized initiatives, the intensity of the drivers of change and the estimated

¹⁹⁴ Kushlan, *supra* note 114, at 330.

¹⁹⁵ *Id.*

¹⁹⁶ *Id.*

¹⁹⁷ *Id.*

¹⁹⁸ *Id.* at 331.

¹⁹⁹ R. Karasik et al., *supra* note 93, at ix.

²⁰⁰ *Id.*

²⁰¹ *Id.* at xi.

rates of change in coral reef ecosystems have only increased.²⁰² It is a constant moving target.

Within the aforementioned analysis conducted by UNEP and ICRI assessing gaps in the design of international instruments set out to address policies related to the protection of coral reefs, many pointed to lacking governance mechanisms.²⁰³ “Of the 591 reef-related commitments, only 13[%] were linked to references of enforcement mechanisms. Of these, one sixth were commitments [found] in the [UNCLOS] treaty.”²⁰⁴ These commitments “require states to adopt and enforce the measures needed to deliver the commitments in the instrument, and in some cases the global, legal instruments require states to report to the conferences of the parties to monitor progress.”²⁰⁵ Even with these measures in place, there are few and far between enforcement mechanisms that result in penalties referenced in the body of international reef-related instruments for failing to adopt appropriate measures or for failure to report back.²⁰⁶ Therefore, there is not an incentive to comply with commitments, other than a moral incentive, especially if coming up with a process to meet the goal of the commitment results in economic harm.²⁰⁷

Financial mechanisms in order to help fund the costs of compliance and meeting of the commitments are often lacking in these instruments as well.²⁰⁸ This presents a unique “challenge for the many low-income and lower-middle-income states with responsibility for delivering reef-related commitments.”²⁰⁹ “Of the 591 reef-related commitments, [approximately] 25[%] make reference to financing provisions or mechanisms.”²¹⁰ Of these, only a handful “actually describe the establishment or enhancement of

²⁰² *Id.* at vii.

²⁰³ *Id.* at x.

²⁰⁴ *Id.*

²⁰⁵ *Id.*

²⁰⁶ *Id.*

²⁰⁷ *Id.*

²⁰⁸ *Id.*

²⁰⁹ *Id.*

²¹⁰ *Id.*

financial mechanisms.”²¹¹ Most commitments with financial provisions could be considered general calls to developed states and development finance institutions asking to provide additional financing to support developing states who are trying to fulfill commitments.²¹² The other 75% of commitments expect states to come up with the funding themselves.

Although international efforts have been instrumental in raising awareness of the issues facing coral reefs and importance of protecting these delicate ecosystems, the 591 international instruments relating to coral reefs do not seem to be doing enough. Instead, rather than establishing a treaty or convention that addresses the multitude of stressors affecting reefs, the current international instruments are tackling global issues in a piecemeal manner. This does not seem to be effective. As previously identified, these international instruments all place a heavy burden on states to fulfill commitments because of the various issues pertaining to different coral reefs all over the world. Current and efficiently enforced legislation and implementation have to be done at the domestic level, whether that be at the state or local level even if an international treaty of this sort was to be established.

B. DOMESTIC LAWS

The U.S. and Australia have two different, domestic approaches to conserving and managing coral reefs. This paper will specifically look at how the U.S. protects the Florida Reef and how Australia conserves the Great Barrier Reef. The Florida coral reef system is the third largest in the world and contains “nearly 1,400 species of plants and animals and over 500 species of fish.”²¹³ The Great Barrier Reef is the world’s longest and largest coral reef complex

²¹¹ *Id.*

²¹² *Id.* at x–xi.

²¹³ John Vidal, *How Did Half of the Great Florida Coral Reef System Disappear?*, THE GUARDIAN (Dec. 27, 2017, 5:30 PM), <https://www.theguardian.com/environment/2017/dec/27/how-did-half-of-the-great-florida-coral-reef-system-disappear-climate-bleaching> (last visited Dec. 30, 2020).

containing over 2,900 individual reefs.²¹⁴ It includes around 300 species of hard coral, and around 10% of the world's total fish species.²¹⁵ In addition to the domestic legislation and action discussed, both countries are also parties to the above-mentioned international treaties, conventions, and initiatives (UNCLOS, CITES, Ramsar, CBD, UNESCO, and ICRI).

C. *UNITED STATES, FLORIDA REEF*

Prior to the 1990's not much was done to specifically target coral reef protection. This is not to say that major environmental legislation, such as the National Environmental Protection Act (NEPA), the Clean Water Act (CWA), Magnuson-Stevens Fishery Conservation and Management Act (MSA), and the Coastal Zone Management Act (CZMA), did not do anything to protect coral reefs. They do encompass provisions that take coral reefs into consideration, but these acts did not target coral reefs as area of significant concern. However, the "world's first recorded widespread coral bleaching" event took place in the late 90s, which raised the necessary awareness to spark action to conserve coral reef ecosystems.²¹⁶

1. *Executive Order*

In 1998, President Bill Clinton signed Executive Order 13089, entitled "Coral Reef Protection,"²¹⁷ which called "for all federal agencies whose activities may affect coral reef ecosystems to: identify such actions; use their programs and authorities to protect and enhance coral reef ecosystems; and ensure that any actions they authorize, fund, or carry out will not degrade the condition of coral

²¹⁴ *Great Barrier Reef Facts*, GREAT BARRIER REEF, <http://www.greatbarrierreef.org/about-the-reef/great-barrier-reef-facts/> (last visited Dec. 11, 2020).

²¹⁵ *Id.*

²¹⁶ Vidal, *supra* note 213.

²¹⁷ Exec. Order No. 13089, 63 F.R. 32701 (1998), <https://www.govinfo.gov/content/pkg/FR-1998-06-16/pdf/98-16161.pdf>.

reef ecosystems.”²¹⁸ The Executive Order also established a Coral Reef Task Force (CRTF) to develop and implement “coordinated efforts to map and monitor U.S. coral reefs; research the causes of, and solutions to coral reef decline; . . . mitigate coral reef degradation . . . and implement strategies to promote conservation and sustainable use of coral reefs internationally.”²¹⁹ The CRTF is leading a Coral and Climate Adaptation Planning (CCAP) project in partnership with the Environmental Protection Agency (EPA), National Oceanic and Atmospheric Administration (NOAA), and the Department of the Interior (DOI).²²⁰ The project “aims to develop guidance and tools for improving adaptation to changing environmental conditions in coral reef management.”²²¹ “Climate change is not only affecting coral reefs directly [through coral bleaching], but it is also affecting inputs of other stressors such as land-based pollution.”²²² The goal of the project is to develop knowledge and tools “that will help coral reef managers achieve successful adaptation planning and implementation.”²²³

2. *Under the Environmental Protection Agency (EPA)*

a. *Clean Water Act (CWA)*

The “EPA protects coral reefs by implementing Clean Water Act programs that protect water quality in watersheds and coastal zones of coral reef areas” by monitoring current conditions of U.S. coral reefs, conducting research into the causes of coral reef deterioration, and developing ways for coral reefs to adapt to

²¹⁸ *What EPA is Doing to Protect Coral Reefs*, U.S. ENVTL. PROT. AGENCY, <https://www.epa.gov/coral-reefs/what-epa-doing-protect-coral-reefs> (last visited Dec. 11, 2020).

²¹⁹ *About*, U.S. CORAL REEF TASK FORCE, <https://www.coralreef.gov/about/> (last visited Dec. 11, 2020).

²²⁰ *EPA Research about Coral Reefs*, U.S. ENVTL. PROT. AGENCY, <https://www.epa.gov/coral-reefs/epa-research-about-coral-reefs#Biological-Criteria> (last visited Dec. 11, 2020).

²²¹ *Id.*

²²² *Id.*

²²³ *Id.*

warming ocean temperatures.²²⁴ Many of these programs are operated in combination with other federal agencies and states.²²⁵

Through the CWA, the EPA attempts to “reduce land-based sources of pollution that degrade coastal waters and coral reefs that live in them. Improving coral reef health by addressing local stressors will enhance their natural resilience.”²²⁶ There are many sections under the CWA that help address human impacts to coral reefs, but we will focus on the most pertinent. Under Section 106 of the CWA, the “EPA provides assistance to states . . . and interstate agencies . . . to establish and implement ongoing water pollution control programs.”²²⁷ Section 319 allows states to receive grant money that supports activities in order to assess specific nonpoint source implementation projects.²²⁸ Section 402 works with states to improve the environmental protections provided by National Pollutant Discharge Elimination System permits.²²⁹ Section 403 lays out criteria to ensure that dredging and ocean disposal is conducted in a way that does not adversely impact reefs.²³⁰ Section 404 works with the U.S. Army Corps of Engineers (USACE) to minimize impacts to coral reefs from discharges of dredged or fill material and to provide compensatory mitigation for unavoidable

²²⁴ *What EPA is Doing to Protect Coral Reefs*, *supra* note 218.

²²⁵ *Id.*

²²⁶ *Id.*

²²⁷ *Water Pollution Control (Section 106) Grants*, U.S. ENVTL. PROT. AGENCY, <https://www.epa.gov/water-pollution-control-section-106-grants> (last visited Dec. 11, 2020).

²²⁸ *319 Grant Program for States and Territories*, U.S. ENVTL. PROT. AGENCY, <https://www.epa.gov/nps/319-grant-program-states-and-territories> (last visited Dec. 11, 2020).

²²⁹ *Clean Water Act, Section 402: National Pollutant Discharge Elimination System*, U.S. ENVTL. PROT. AGENCY, <https://www.epa.gov/cwa-404/clean-water-act-section-402-national-pollutant-discharge-elimination-system> (last visited Dec. 11, 2020).

²³⁰ *Clean Water Act Section 403: Ocean Discharge Criteria*, U.S. ENVTL. PROT. AGENCY, <https://www.epa.gov/cwa-404/clean-water-act-section-403-ocean-discharge-criteria> (last visited Dec. 11, 2020).

impacts.²³¹ The EPA also helps states adopt water quality standards to increase protection of corals by supporting development of biological assessment methods and biological criteria for states.²³² Additionally, the EPA consults with NOAA to ensure that updated criteria are fully protective of Endangered Species Act (ESA) listed coral species and their critical habitats.²³³

3. *Under National Oceanic and Atmospheric Administration (NOAA)*

*a. Magnuson-Stevens Fishery Conservation and Management Act (MSA)*²³⁴

The MSA “is the primary law governing marine fisheries management in U.S. federal waters.”²³⁵ It became law in 1976 and “fosters long-term biological and economic sustainability” of U. S. fisheries.²³⁶ The MSA extended U.S. jurisdiction out to 200 nautical miles and created eight regional fishery management councils.²³⁷ The act’s objectives are to reduce overfishing, rebuild overfished stocks, and to solidify a sustainable seafood supply.²³⁸

Although the main focus of this act is the protection of fisheries, this interconnects with protecting coral reefs because of these codependent relationships between species and reef ecosystems. The MSA actually authorizes the drafting of a Fishery Management

²³¹ *Overview of Clean Water Act Section 404*, U.S. ENVTL. PROT. AGENCY, <https://www.epa.gov/cwa-404/overview-clean-water-act-section-404> (last visited Dec. 11, 2020).

²³² *What EPA is Doing to Protect Coral Reefs*, *supra* note 218.

²³³ *Id.*

²³⁴ Magnuson-Stevens Fishery Conservation and Management Act, 16 U.S.C. § 1801 (1972), NOAA FISHERIES, <https://www.fisheries.noaa.gov/resource/document/magnuson-stevens-fishery-conservation-and-management-act>.

²³⁵ *Id.*

²³⁶ *Magnuson-Stevens Act*, NOAA FISHERIES, <https://www.fisheries.noaa.gov/topic/laws-policies#magnuson-stevens-act> (last visited Dec. 12, 2020).

²³⁷ *Id.*

²³⁸ *Id.*

Plan for Coral and Coral Reefs of the Gulf of Mexico and South Atlantic to preserve “all corals on the seabed in U.S. federal waters (of the Gulf) from harvest, sale, and destruction from fishing related activities.”²³⁹ Additionally, the MSA Reauthorization Act of 2006 included international provisions in order to assist international fisheries management organizations.²⁴⁰ Collaboration with the international community could really improve management practices of fisheries, as well as reefs.

*b. Coral Reef Conservation Act of 2000 (CRCA)*²⁴¹

The CRCA created NOAA’s “Coral Reef Conservation Program (CRCP) and established a number of mandates for NOAA aimed at the preservation . . . and restoration of coral reef ecosystems.”²⁴² The Act requires CRCP to establish a National Coral Reef Action Strategy (NAS) and to provide funding to state and local projects assisting in implementing the strategy.²⁴³ The Act also contains criteria for awarding these grants and places timelines for review, often soliciting input from MSA “fishery management councils and affected National Marine Sanctuaries.”²⁴⁴ “The CRCA provides authority for NOAA to implement a national program to conserve coral reef ecosystems.”²⁴⁵ Through the program, NOAA “conducts activities, such as mapping, monitoring,” research, enhancing public awareness, assisting states in removing marine debris from reefs, and “conducting cooperative management” of

²³⁹ Sylvan, *supra* note 18.

²⁴⁰ Magnuson-Stevens Fishery Conservation and Management Reauthorization Act of 2006, 16 U.S.C. §§ 1801 et seq. (2007), <https://www.congress.gov/bill/109th-congress/house-bill/5946>.

²⁴¹ Coral Reef Conservation Act of 2000, 16 U.S.C. §§ 6401 et seq. (2000), https://www.coris.noaa.gov/activities/actionstrategy/08_cons_act.pdf.

²⁴² *Coral Reef Conservation Act*, NOAA (Sept. 20, 2012), <https://coast.noaa.gov/data/Documents/OceanLawSearch/CoralReefConservationAct.pdf>.

²⁴³ *Id.*

²⁴⁴ *Id.*

²⁴⁵ *Id.*

reefs.²⁴⁶ The Act “authorizes NOAA to enter into cooperative agreements with” NGOs for specific purposes and, in the event of a coral reef emergency, “to provide emergency grant money to state and local governments.”²⁴⁷ In Florida, the Department of Environmental Protection helps in coordinating efforts to implement the CRCP.²⁴⁸ The CRCP leads the Southeast Florida Coral Reef Initiative, which contributes to conserving coral reefs.²⁴⁹

On August 1, 2019, the Restoring Resilient Reefs Act of 2019 was introduced by Senator Marco Rubio (FL) to “reauthorize the Coral Reef Conservation Act of 2000 and to establish the United States Coral Reef Task Force.”²⁵⁰ The House of Representatives also introduced a matching bill that was introduced by Representative Darren Soto (FL) on August 1, 2019.²⁵¹ The Act’s objective was to protect and restore the condition of the U.S. coral reef ecosystems combating the rise of ocean temperatures, ocean acidification, coral bleaching, and invasive species.²⁵² Florida Governor Ron DeSantis supported the bill stating, “Florida depends on coral reefs. Not only are they essential to the health of our marine ecosystem, they are vital to coastal resiliency, stand as the first line of defense against storm surge in Southeast Florida and play a key role in our tourism economy.”²⁵³ Even though it seems there has

²⁴⁶ *Id.*

²⁴⁷ *Id.*

²⁴⁸ *Coral Reef Conservation Program*, FLA. DEP’T OF ENVTL. PROT., <https://floridadep.gov/rcp/coral> (last visited Dec. 12, 2020).

²⁴⁹ *Id.*

²⁵⁰ Restoring Resilient Reefs Act of 2019, S. 2429, 116th Cong. (2019), <https://www.congress.gov/bill/116th-congress/senate-bill/2429?q=%7B%22search%22%3A%5B%22Restoring+Resilient+Reefs+Act+of+2019%22%5D%7D&s=1&r=2>.

²⁵¹ Restoring Resilient Reefs Act of 2019, H.R. 4160, 116th Cong. (2019), <https://www.congress.gov/bill/116th-congress/house-bill/4160/text?q=%7B%22search%22%3A%5B%22H.R.+4160%3A+Restoring+Resilient+Reefs+Act+of+2019%22%5D%7D&r=1&s=1>.

²⁵² *Id.*

²⁵³ Alex Harris, *Florida’s Coral Reefs are in Trouble. Here’s a New \$160 Million Plan to Save Them*, MIAMI HERALD (Aug. 2, 2019, 12:47 PM), <https://www.miamiherald.com/news/local/environment/article233412922.html>.

been overwhelming support of the reauthorization of CRCA in 2019, reauthorization “has been pending in Congress since 2004, although NOAA’s authority under the statute” has continued.²⁵⁴

c. National Coral Reef Monitoring Program (NCRMP)

NOAA established this program to focus on coral reef monitoring efforts with partners across the U.S.²⁵⁵ NCRMP establishes a framework for conducting observations of biological and climatic indicators in the U.S.²⁵⁶ The goals of the program are to develop consistent standard operating procedures others can follow and implement to improve monitoring efforts, establish partnerships with federal and state partners, collect “scientifically sound, geographically comprehensive biological” and climate data in U.S. coral reef areas, and to “provide periodic assessments of the status” of U.S. coral reef ecosystems.²⁵⁷

Scientists look at certain indicators when analyzing climate trends. These include changes in water temperature, chemistry of the reef structures to analyze ocean acidification, and growth and erosion rates of coral.²⁵⁸ This extensive analysis helps to provide a comprehensive view of climate change impacts on coral reef ecosystems and help identify areas of weakness. The data may also provide insight for resiliency efforts.²⁵⁹ Above all, this data can be used to inform policy makers of the most current science and can aid them in drafting more effective climate change legislation.

²⁵⁴ *Coral Reef Conservation Act*, *supra* note 242.

²⁵⁵ NOAA’s National Coral Reef Monitoring Program, NOAA CORAL REEF INFO. SYS., <https://www.coris.noaa.gov/monitoring/> (last visited Dec. 12, 2020).

²⁵⁶ *Id.*

²⁵⁷ *Id.*

²⁵⁸ *National Coral Reef Monitoring Program: Monitoring Climate-Driven Impacts*, NOAA CORAL REEF INFO. SYS., <https://www.coris.noaa.gov/monitoring/climate.html> (last visited Dec. 12, 2020).

²⁵⁹ *Id.*

d. Coral Reef Early Warning System (CREWS)

Through CREWS, NOAA “is working to establish an integrated regional network of climate and biological monitoring stations to strengthen the [Caribbean] region’s early warning mechanism.”²⁶⁰ Because climate change is intensifying, increasing ocean acidification and coral bleaching of coral reefs, it is imperative to monitor the parameters that impact these ecosystems in order to improve climate risk planning and management.²⁶¹ These stations collect data that allow for the “development of climate models and ecological forecasting in coral reef ecosystems.”²⁶² Currently, these are only being stationed in the Caribbean, but with the continued successful collection of data from these monitoring systems and the spread of technology, these have the potential to be deployed worldwide.

e. Marine Protected Areas (MPA)

The National MPA Center was established following the Executive Order referenced earlier in Executive Order 13158. The order directs the Department of Commerce through NOAA, the Department of the Interior through the U.S. Fish and Wildlife Service, and other federal agencies to work closely with states, fishery management councils, and groups with an interest in marine resource conservation to develop a comprehensive National System of MPAs.²⁶³ Executive Order 13158 defined an MPA as “any area of the marine environment that has been reserved by federal, state, tribal, territorial, or local laws or regulations to provide lasting protection for part or all of the natural and cultural resources

²⁶⁰ *Coral Reef Early Warning System (CREWS)*, CARIBBEAN CMTY. CLIMATE CHANGE CTR., <https://www.caribbeanclimate.bz/caribbean-climate-change-tools/coral-reef-early-warning-system-crews/> (last visited Dec. 12, 2020).

²⁶¹ *See id.*

²⁶² *Id.*

²⁶³ Exec. Order No. 13158, 65 F.R. 34910 (2000), <https://nmsmarineprotectedareas.blob.core.windows.net/marineprotectedareas-prod/media/archive/pdf/eo/execordermpa.pdf>.

therein.”²⁶⁴ MPAs “provide important recognition to a limited number of ocean habitats that are under assault.”²⁶⁵ They “coordinate the work of federal agencies with overlapping jurisdiction in the sanctuary areas, providing more integrated protection.”²⁶⁶

MPAs are designated by levels of protection, such as National Marine Sanctuaries, which U.S. coral reef ecosystems currently fall under.²⁶⁷ A national marine sanctuary is “a specific designation created in federal legislation . . . to ensure conservation and management for areas of special national significance.”²⁶⁸

The MPA Center is located within NOAA's National Ocean Service and is a division of the Office of National Marine Sanctuaries.²⁶⁹ The MPA Center is currently working on building resilience to climate change impacts.²⁷⁰ Their efforts have attempted to foster coordination among the MPA programs at the federal and state level to address stewardship when dealing with climate change issues impacting reefs.²⁷¹ The Center points out the major impacts

²⁶⁴ *Id.*

²⁶⁵ Mary Gray Davidson, *Protecting Coral Reefs: The Principal National and International Legal Instruments*, 26 HARV. ENVTL. L. REV. 499, 510–23 (2002), Westlaw.

²⁶⁶ *Id.*

²⁶⁷ *Marine Protected Areas Building Resilience To Climate Change Impacts*, NAT'L MARINE PROTECTED AREAS CTR., https://nmsmarineprotectedareas.blob.core.windows.net/marineprotectedareas-prod/media/archive/pdf/helpful-resources/mpas_climate_change_march_2013.pdf (last visited Dec. 12, 2020).

²⁶⁸ HAROLD F. UPTON & EUGENE H. BUCK, CONG. RES. SERV., RL32154, MARINE PROTECTED AREAS: AN OVERVIEW (2010), <https://fas.org/sgp/crs/misc/RL32154.pdf>.

²⁶⁹ *National MPA Center*, NAT'L MARINE PROTECTED AREAS CTR., <https://marineprotectedareas.noaa.gov/aboutmpas/mpacenter/> (last visited Dec. 12, 2020).

²⁷⁰ *Marine Protected Areas in a Changing Climate*, NAT'L MARINE PROTECTED AREAS CTR., <https://marineprotectedareas.noaa.gov/sciencestewardship/climatechangeimpacts/> (last visited Dec. 12, 2020).

²⁷¹ *Id.*

climate change will have on MPAs, including increased water temperature leading to ocean acidification and changing habitats.²⁷² Climate change requires a more concerted effort to restore, preserve, and protect the ecological integrity and resilience of ocean and coastal ecosystems, so they can withstand the additional stress of climate change.²⁷³ MPAs help address climate change through the permanent legal and management infrastructure in place to protect their resources.²⁷⁴ MPAs also serve as carbon sinks—over half of the global biological carbon is stored in living marine organisms—that help mitigate climate change impacts.²⁷⁵ As sea temperatures rise, these MPAs can create a safe haven for shifting species and habitats because other stressors like pollution are less prevalent in these areas.²⁷⁶ MPAs also serve as control areas for monitoring and collecting data to learn about emerging threats to coral reefs that, when shared, can be beneficial for other reef systems.²⁷⁷ Although the designation of MPAs, particularly marine sanctuaries, is a positive step in recognizing the negative human impact on the oceans, it alone is insufficient to ensure the preservation of the marine environment.²⁷⁸

²⁷² *Id.*

²⁷³ See *Guide for Considering Climate Change in Coastal Conservation*, NOAA, U.S. DEP'T OF COM., <https://coast.noaa.gov/data/digitalcoast/pdf/considering-climate-change.pdf>.

²⁷⁴ See Sylvan, *supra* note 18.

²⁷⁵ See *Ocean Plankton Reducing Greenhouse Gases By Using More Carbon Dioxide*, SCI. DAILY (Nov. 18, 2007), <https://www.sciencedaily.com/releases/2007/11/071117121016.htm>.

²⁷⁶ Davidson, *supra* note 265.

²⁷⁷ *Id.*

²⁷⁸ *Id.*

f. Florida Keys National Marine Sanctuary

Florida is the only state in the U.S. to have extensive shallow coral reef formations near its coasts.²⁷⁹ Millions of people visit the Florida Keys every year to explore the coral reefs and are estimated to have an asset value of \$7.6 billion.²⁸⁰ The Florida Keys National Marine Sanctuary was created under federal law to ensure the continued protection of this reef system.²⁸¹ In fact, the Sanctuary protects 2,900 square nautical miles of waters off the Florida coast.²⁸² Approximately 60% of the protected area falls within state waters, but the State of Florida consented to allowing the sanctuary to be effective in the area of overlap.²⁸³ This creates a unique partnership between NOAA and the State of Florida under a co-trustee agreement.²⁸⁴ NOAA mainly partners with the Florida Department of Environmental Protection (DEP).²⁸⁵ The Florida Fish and Wildlife Conservation Commission also assists with enforcement of sanctuary regulations in partnership with NOAA's

²⁷⁹ *Petition To List 83 Coral Species Under The Endangered Species Act Before The Secretary of Commerce*, CTR. FOR BIOLOGICAL DIVERSITY (Oct. 20, 2009), https://www.biologicaldiversity.org/campaigns/coral_conservation/pdfs/Coral_petition_10-20-09.pdf.

²⁸⁰ *A National Coral Reef Action Strategy Report to Congress on Implementation of the Coral Reef Conservation Act of 2000 and the National Action Plan to Conserve Coral Reefs in 2002-2003*, U.S. DEP'T OF COM., NOAA, https://ocean.floridamarine.org/efh_coral/pdfs/action_reef_final.pdf.

²⁸¹ *Florida Keys National Marine Sanctuary Administration and Legislation*, NAT'L OCEAN SERV. FLA. KEYS NAT'L MARINE SANCTUARY, <https://floridakeys.noaa.gov/legislation.html?s=about> (last visited Dec. 12, 2020).

²⁸² *History of Florida Keys National Marine Sanctuary*, NAT'L OCEAN SERV. FLA. KEYS NAT'L MARINE SANCTUARY, <https://floridakeys.noaa.gov/history.html?s=about> (last visited Dec. 12, 2020).

²⁸³ *Florida Keys National Marine Sanctuary Administration and Legislation*, *supra* note 281.

²⁸⁴ *Id.*

²⁸⁵ *Id.*

Office of Law Enforcement.²⁸⁶ Not only does the sanctuary work with other agencies to protect Florida’s coral reef ecosystem but additionally with universities and non-governmental organizations.²⁸⁷

Some of these federal and state agency relationships are fostered by legislation that created the sanctuary in the first place.²⁸⁸ These include the National Marine Sanctuaries Act of 1972 and the Florida Keys National Marine Sanctuary and Protection Act.²⁸⁹ The National Marine Sanctuary Act authorizes the Department of Commerce “to designate and protect areas of the marine environment with special national significance due to their conservation, recreational, ecological, historical, scientific, cultural, archeological, educational, or esthetic qualities as national marine sanctuaries.”²⁹⁰ The Florida Keys National Marine Sanctuary and Protection Act designated the sanctuary “to be managed as a national marine sanctuary under the National Marine Sanctuary Act.”²⁹¹

In August 2019, NOAA and the U.S. Fish and Wildlife Service published a Draft Environmental Impact Statement (DEIS) for the Sanctuary, establishing a restoration blueprint.²⁹² NOAA prepared the DEIS in order to comply with the National Environmental Protection Act (NEPA), which, broadly speaking, requires federal agencies to create an impact statement for certain actions that significantly affect the quality of the human environment.²⁹³ This blueprint proposes to expand the Sanctuary boundary, update sanctuary and marine zone regulations, modify and establish new

²⁸⁶ *Id.*

²⁸⁷ *Id.*

²⁸⁸ *Id.*

²⁸⁹ *Id.*

²⁹⁰ *Id.*

²⁹¹ *Id.*

²⁹² *Draft Environmental Impact Statement for Florida Keys National Marine Sanctuary: A Restoration Blueprint*, NOAA, FLA. KEYS NAT’L MARINE SANCTUARY (Aug. 2019), <https://nmsfloridakeys.blob.core.windows.net/floridakeys-prod/media/blueprint/deis-fknms-restoration-blueprint.pdf>.

²⁹³ *Id.*

marine zones, and revise the sanctuary's nonregulatory management plan.²⁹⁴ The purpose of this proposal is to modernize the outdated regulations and marine zones that were established in the 1990s and to continue to meet the purposes and policies of the National Marine Sanctuaries Act.²⁹⁵ If allowed, this blueprint would be a good first step in achieving the most up to date, scientifically-sound, and efficient management practices.

g. National Marine Fisheries Service (NMFS)

NOAA's NMFS, along with the U.S. Fish and Wildlife Service, is in charge of the protection and conservation of endangered and threatened marine species under the Endangered Species Act (ESA).²⁹⁶ However, NOAA is solely responsible for listing endangered and threatened corals. Listing a coral as endangered means that it is illegal for any person under U.S. jurisdiction to *take* that species of coral.²⁹⁷ "Taking" includes harassing, harming, wounding, collecting, importing, exporting, transporting or selling.²⁹⁸ NOAA also has the duty of designating critical habitats, monitoring, developing recovery plans, providing grants to states for species conservation, entering into agreements with other nations to encourage conservation of species, and investigating ESA violations.²⁹⁹

The NMFS has listed seven species of coral in the southeast part of the U.S. (this case study focuses on Florida, the Southeast region) as threatened: the Boulder Star Coral, Elkhorn Coral, Lobed Star Coral, Mountainous Star Coral, Pillar Coral, Rough Cactus Coral,

²⁹⁴ *Id.*

²⁹⁵ *Id.*

²⁹⁶ *Endangered Species Conservation*, NOAA FISHERIES, <https://www.fisheries.noaa.gov/topic/endangered-species-conservation> (last visited Dec. 12, 2020).

²⁹⁷ *Id.*

²⁹⁸ *Protective Regulations for Threatened Species Under the Endangered Species Act: Section 4(d)*, NOAA FISHERIES, <https://www.fisheries.noaa.gov/national/endangered-species-conservation/protective-regulations-threatened-species-under-endangered>.

²⁹⁹ *Endangered Species Conservation*, *supra* note 296.

and Staghorn Coral.³⁰⁰ However, even though designating a species of coral as endangered or threatened may help alleviate some human made stressors like takings, if we continue with the status quo these corals will still be harmed by warming sea temperatures as a result of climate change.

h. Coastal Zone Management Act (CZMA)

The CZMA was passed by U.S. Congress in 1972, and is administered by NOAA.³⁰¹ Its overall goal is to protect, restore and/or enhance the resources of the nation's coastal zone.³⁰² The CZMA puts into action three national programs: the National Coastal Zone Management Program, the National Estuarine Research Reserve System, and the Coastal and Estuarine Land Conservation Program (CELCP).³⁰³ The National Coastal Zone Management Program attempts to deal with issues through state and coastal management programs, the reserve areas act as laboratories to help us understand human impacts on coastal areas, and CELCP provides funds to state and local governments to purchase threatened coastal and estuarine lands or obtain conservation easements.³⁰⁴

Section 303 of the CZMA “declares that it is national policy to . . . encourage and assist the states to exercise effectively their responsibilities in the coastal zone through the development of management programs to achieve wise use of the land and water

³⁰⁰ *Species Directory: ESA Threatened & Endangered*, NOAA FISHERIES, https://www.fisheries.noaa.gov/species-directory/threatened-endangered?species_title=&field_species_categories_vocab_target_id=100000069&field_species_status_value=All&field_region_vocab_target_id=1000001121 (last visited Dec. 12, 2020).

³⁰¹ Coastal Zone Management Act 16 U.S.C. § 1451 (1972). [18.2.1(a)].

³⁰² *Id.*

³⁰³ *See generally id.*

³⁰⁴ *Coastal Zone Management Act*, THE OFF. FOR COASTAL MGMT., NOAA, <https://coast.noaa.gov/czm/act/> (last visited Dec. 12, 2020).

resources of the coastal zone” and should provide for the “protections of . . . coral reefs . . . within the coastal zone.”³⁰⁵

CZMA sets up a national framework for states to manage coastal resources.³⁰⁶ If a state chooses “to develop a coastal zone management program and the program is approved, the state or territory (1) becomes eligible for several federal grants and (2) can perform reviews of federal agency actions in coastal areas.”³⁰⁷ For instance, the State of Florida created the Florida Coastal Management Program (FCMP) to implement statewide coastal management programs.³⁰⁸ It was approved by NOAA in 1981 with the Florida Department of Environmental Protection (DEP) serving as the lead agency.³⁰⁹ The Program is based on a network of nine agencies implementing statutes that protect and enhance the state's natural, cultural, and economic coastal resources.³¹⁰ “The program's goal is to coordinate local, state, and federal agency activities using existing laws to ensure that Florida's coast is just as valuable to future generations”³¹¹ The coastal zone in Florida encompasses the entire state but is divided into two tiers.³¹² Only coastal cities and counties that include or are contiguous to state water bodies are eligible to receive coastal management funds.³¹³ Every five years, FCMP undergoes an assessment that allows its state agencies to brainstorm new projects to help continue to improve coastal management; these state agencies can then submit these ideas for

³⁰⁵ Coastal Zone Management Act, *supra* note 301.

³⁰⁶ *Coastal Zone Management Act (CZMA): Overview and Issues for Congress*, CONG. RES. SERV. (2019), <https://fas.org/spp/crs/misc/R45460.pdf>.

³⁰⁷ *Id.*

³⁰⁸ *Florida Coastal Management Program*, FLA. DEP'T OF ENVTL. PROT., <https://floridadep.gov/rcp/fcmp> (last visited Dec. 12, 2020).

³⁰⁹ *Coastal Zone Management Programs*, NOAA OFFICE FOR COASTAL MGMT., <https://coast.noaa.gov/czm/mystate/> (last visited Dec. 12, 2020).

³¹⁰ *Coastal Zone Management Programs*, *supra* note 309.

³¹¹ *Id.*

³¹² *Florida Coastal Management Program*, *supra* note 308.

³¹³ Coastal Zone Management Act, *supra* note 301.

funding through the CZMA.³¹⁴ Previous efforts of the FCMP helped Aquatic Preserves from across the state implement their management plan, and another project allowed local communities opportunities to enhance coastal resilience planning, making these areas more prepared for future climate change threats.³¹⁵

Additionally, the Florida DEP is authorized under the Florida Coral Reef Protection Act (CRPA) of 2009 as the states lead trustee for coral reef resources and can delegate reef protection authority to other state or local government agencies.³¹⁶ The Department may fine those who damage coral reefs from \$150 to \$1000 per square meter.³¹⁷ Florida has also enacted state laws to protect coral reefs. House Bill 53/SB 232 became effective July 1, 2018 and established the Southeast Florida Coral Reef Conservation Area, which consists of the sovereignty submerged lands and states waters off certain counties in Florida.³¹⁸ The bill was created due to growing concern of environmental changes resulting from human activities impacting coral reefs.³¹⁹ The bill allows the state to bring in federal money to

³¹⁴ *The Coastal Zone Enhancement Program*, NOAA OFFICE FOR COASTAL MGMT., <https://coast.noaa.gov/czm/enhancement/>.

³¹⁵ *Final Evaluation Findings: Florida Coastal Management Program September 2007 to July 2015*, NOAA OFFICE FOR COASTAL MGMT. (Apr. 2016), <https://coast.noaa.gov/data/czm/media/Florida-CMP.pdf>.

³¹⁶ *Florida's Coral Reef Protection Act*, FLA. DEP'T OF ENVTL. PROT. (2016), <https://floridadep.gov/sites/default/files/coral-reef-protection-052016.pdf>.

³¹⁷ *Id.*

³¹⁸ H.B. 53 Ch. 2018-30, 120th Leg. Reg. Sess. (Fla. 2018), <http://laws.flrules.org/2018/30>.

³¹⁹ *Fla. House of Rep. Final Bill Analysis H.B. 53*, FLA. HOUSE OF REP., (Mar. 22, 2018) <https://www.myfloridahouse.gov/Sections/Documents/loaddoc.aspx?FileName=h0053z1.NRPL.DOCX&DocumentType=Analysis&BillNumber=0053&Session=2018>.

monitor these reefs due to the coral disease epidemic that began in 2014 and coral bleaching events that have ravaged Florida's reefs.³²⁰

The U.S. finally has come to recognize the value of coral reefs and has created legislation and mechanisms in attempt to protect these ecosystems to some extent.

4. *Analysis and Concerns*

Even though it seems that progress has been made in this area, many countries around the world do not think the U.S. has done enough; instead, the U.S. has fallen behind when it comes to environmental policy.³²¹ A prime example is the U.S. withdrawing from the Paris Agreement.³²² Not just this decision, but the current Administration and numerous politicians in Washington have raised concerns about whether or not climate change exists. This doubt, in regard to the science behind global warming, hinders effective legislation passing through Congress and becoming a law that could better protect coral reef ecosystems.

The U.S. has created various, multi-faceted laws that touch upon conserving coral reef ecosystems over the years, but until mass coral bleaching events began to occur, coral reefs were not the focus of legislation. The drastic impact of the events on coral reefs sparked the need for protection. Therefore, one could argue Executive Order 13089 should have been executed years or even decades earlier, when scientists pointed to warming trends in oceans, rather than taking a reactive approach to such vulnerable and delicate ecosystems that millions of species depend on daily.

³²⁰ Dan Sweeney, *South Florida Coral Reef Conservation Bill Heads to Gov. Scott*, SUNSENTINEL (Feb. 7, 2018, 4:35 PM) <https://www.sun-sentinel.com/news/florida/fl-reg-coral-reef-conservation-rick-scott-bills-20180206-story.html> (last visited Dec. 16, 2020).

³²¹ *See Paris Agreement Only Chance for Coral Reef Survival*, IUCN (Sept. 22, 2017), <https://www.iucn.org/news/secretariat/201709/paris-agreement-only-chance-coral-reef-survival---iucn> (last visited Dec. 16, 2020).

³²² *See id.*

Fragmentation of coral reef conservation law and policy is an issue with domestic and international policy.³²³ “Success of coral reef conservation depends on a unified authority with jurisdiction extending . . . over a wide range of . . . coastal issues” relating to reefs.³²⁴ An effective approach to coral reef protection must look at the bigger picture and address the full gambit of risks facing that particular coral reef ecosystem, including climate change, pollution, taking of species, and overfishing, rather than splitting each issue out and delegating it to a specific agency. Similarly, Florida laws protecting coral reefs and species focus mainly on the prevention of human contact, such as taking coral, rather than tackling overarching threats of climate change; the continued decline of corals in Florida waters is indication of the inadequacy of these laws.³²⁵

Many different bodies have authority to protect the Florida Reef through a variety of means. Although cooperative federalism between the federal, state, and local levels seems like the quintessential way to enforce a policy, it is often a hindrance to conservation. Divided authority often encompasses conflicting conservation goals for coral reef ecosystems and may undermine any opportunity for their sustainable use.³²⁶ The U.S. Congress, Florida State Legislature, federal agencies, and state agencies have similar goals but achieve these goals in different ways through task forces, implementation of acts, monitoring programs, MPAs, and passing legislation. An example in the MPA context relates to this fragmentation of jurisdiction and authority issue. Even when reefs are officially “protected,” a mandate to regulate on behalf of a species, an area, a process, or a habitat may not guarantee protection in an area subject to fractured jurisdiction or authority.³²⁷ As the number of MPAs in the U.S. continues to grow, coastal states will have to choose which rules will govern reef conservation through the states coastal management program, therefore, increasing inconsistency in conservation implementation.

³²³ See generally Sylvan, *supra* note 18.

³²⁴ *Id.* at 34.

³²⁵ See Florida’s Coral Reef Protection Act, *supra* note 316.

³²⁶ See *id.*

³²⁷ See generally *id.*

There is a lack of funding designated to conserving coral reefs. Other governments designate and invest much more capital into protecting their own reefs. Funding for many of the state implemented initiatives comes from grants received from the federal government, but it would be helpful if there was another source of funding from a private foundation focused on climate change impacts on coral reefs.

Another issue arises when local communities that depend on reefs for food have a strong incentive not to establish MPAs or marine reserves in areas that are most productive regardless of whether they are fragile ecosystems because they want to make a profit.³²⁸ The U.S. at large often has conflicting interests between what is economically sound and what is environmentally sound. Additionally, the U.S. needs to obtain “greater control over human activities located away from coral reefs that contribute to reef degradation.”³²⁹ This includes human behavior contributing to global climate change.³³⁰

In order to safeguard coral reef systems in the U.S., it is paramount that the U.S. drafts legislation or establish an agreement that tackles the multitude of human-made problems affecting coral reefs to better prepare for the future impact of climate change. Additionally, it is important that we streamline and designate specific authority in a jurisdiction to avoid conflicting interests and confusion.

D. AUSTRALIA, GREAT BARRIER REEF (GBR)

Australia is conscientious about the importance of conserving biodiverse reefs and the threats facing them. The GBR is a critical, natural asset that provides \$6.4 billion a year to Queensland and Australian economies.³³¹ The GBR also supports over 64,000 jobs

³²⁸ See generally Sylvan, *supra* note 18.

³²⁹ Davidson, *supra* note 265.

³³⁰ *Id.*

³³¹ *Reef Facts*, AUSTL. GOV'T GREAT BARRIER REEF MARINE PARK AUTH., <http://www.gbrmpa.gov.au/the-reef/reef-facts> (last visited Dec. 16, 2020).

in the area.³³² Each year, the Australian and Queensland governments jointly invest approximately \$200 million in the GBR's health.³³³ This investment was especially necessary after the 2016 coral bleaching events where the northern third of the GBR experienced an unprecedented loss of corals.³³⁴ A study showed that "29% of the 3,863 reefs comprising the [GBR] lost [approximately] two-thirds . . . of their corals, transforming the ability of these reefs to sustain full ecological functioning."³³⁵ The Australian government and the Queensland government have worked together to implement important reef-legislation over the years.

1. *Australian Government (Commonwealth)*

a. *Great Barrier Reef Marine Park Act of 1975 (GBRMP Act)*

The main piece of legislation that has encouraged protection of the GBR has been the Great Barrier Reef Marine Park Act of 1975.³³⁶ As contained in this Act, the Commonwealth is responsible for the management of the Great Barrier Reef Marine Park

³³² Camila Domonoske, *Australia Investing \$377 Million To Protect Great Barrier Reef*, NPR (Apr. 30, 2018, 12:13 PM), <https://www.npr.org/sections/thetwo-way/2018/04/30/607037119/australia-investing-377-million-to-protect-great-barrier-reef>.

³³³ *Managing and Protecting the Great Barrier Reef*, AUSTRALIAN GOVERNMENT DEPARTMENT OF ENVIRONMENT & ENERGY, <https://www.environment.gov.au/marine/gbr/protecting-the-reef> (last visited Dec. 16, 2020).

³³⁴ Hayley Halpin, *Great Barrier Reef Corals Experiencing 'Catastrophic Die-Off' as Result of Global Warming* (Apr. 19, 2018, 4:20PM), <https://www.thejournal.ie/great-barrier-reef-corals-global-warming-3966571-Apr2018/>.

³³⁵ *Id.*

³³⁶ *Great Barrier Reef Marine Park Act of 1975*, AUSTRALIAN GOVERNMENT FEDERAL REGISTER OF LEGISLATION, <https://www.legislation.gov.au/Details/C2018C00076>.

(GBRMP), within the Great Barrier Reef Region.³³⁷ The GBRMP extends over 1,430 miles along the Queensland coastline and generally spans over Queensland State coastal waters to the low-water mark.³³⁸

The Act provides for the establishment, control, care, and development of the GBRMP, and establishes the Great Barrier Reef Marine Park Authority (GBRMP Authority). The GBRMP Authority provides for zoning plans, creates management plans, regulates use of permitted and prohibited activities within the Park, and facilitates a collaborative approach to management of the Great Barrier Reef World Heritage sites in collaboration with the Queensland government.³³⁹ An example of this beneficial cooperation is the relationship between the Queensland Great Barrier Reef Coast Marine Park and the GBRMP.³⁴⁰ “The Queensland Great Barrier Reef Coast Marine Park and the Queensland island national parks form part of the Great Barrier Reef World Heritage Area.”³⁴¹ Queensland is in charge of managing the Great Barrier Reef Coast Marine Park, established under the *Marine Parks Act 2004*.³⁴² The Queensland Great Barrier Reef Coast Marine Park covers the area between low and high water marks and many waters within the limits of the State of Queensland.³⁴³ The GBRMP Authority creates zones of different protection in attempt to provide for greater cooperation between managers and users.³⁴⁴

One benefit of forming a specific body to effectively manage the GBR is that the zoning “of integrated and multiple-use management, allow[s] for sustainable utilization of the reef by a

³³⁷ See generally Great Barrier Reef Intergovernmental Agreement 2015, AUSTR. GOV'T DEP'T OF ENV'T & ENERGY, <https://www.environment.gov.au/system/files/pages/7a85531d-9086-4c22-bdca-282491321e46/files/gbr-iga-2015.pdf>.

³³⁸ *Id.* at 4.

³³⁹ See *id.* at 5–7.

³⁴⁰ *Id.*

³⁴¹ *Id.* at 5.

³⁴² *Id.* at 4.

³⁴³ *Id.*

³⁴⁴ See *Managing and Protecting the Great Barrier Reef*, *supra* note

wide range of users with numerous and often conflicting needs.”³⁴⁵ The most effective MPAs (such as the GBRMP) generally have certain things in common.³⁴⁶ For instance, several zones can and generally should exist within a single MPA, contributing to the strength of MPAs in protecting the biodiversity of a location, rather than trying to address each individual human impact separately.³⁴⁷

The GBRMP Authority has taken the position that climate change is the greatest threat to the GBR and that actions taken now will matter in the future.³⁴⁸ They encourage immediate action to decrease greenhouse gas emissions in order to limit the negative impacts climate change has on the reef ecosystems.³⁴⁹

*b. Environment Protection and Biodiversity
Conservation Act of 1999 (EPBC Act)*

The EPBC Act, protects nationally significant matters including the Great Barrier Reef World and National Heritage areas in accordance with UNESCO.³⁵⁰ The Commonwealth government is responsible for regulating activities that have “a significant impact on matters of ‘national environmental significance’ as defined by the Act, and on the environment within Commonwealth land and waters.”³⁵¹ At-large, this Act is wide in scope and covers World Heritage sites, Ramsar wetlands, threatened species, biodiversity

³⁴⁵ *Marine Protected Areas of the World*, WORLD RESOURCES INST., <https://www.wri.org/resource/marine-protected-areas-world> (last visited Dec. 20, 2020).

³⁴⁶ *Id.*

³⁴⁷ Elizabeth A. Fulton et al., *Modelling Marine Protected Areas: Insights and Hurdles*, THE ROYAL SOC’Y PUB. (Nov. 5, 2015), <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4614735/>.

³⁴⁸ *Position Statement Climate Change*, AUSTL. GOV’T GREAT BARRIER REEF MARINE PARK AUTHORITY, <https://elibrary.gbrmpa.gov.au/jspui/bitstream/11017/3460/5/v1-Climate-Change-Position-Statement-for-eLibrary.pdf>.

³⁴⁹ *Id.*

³⁵⁰ Environment Protection and Biodiversity Conservation Act 1999, AUSTL. GOV’T FED. REG. OF LEGIS., <https://www.legislation.gov.au/Details/C2019C00275>.

³⁵¹ *Id.*

protection, the GBRMP, bilateral agreements, conservation agreements, and environmental assessments.³⁵²

Prior to this Act, the GBRMP Act was not completely integrated with the national environmental law.³⁵³ The EPBC Act made more comprehensive investigation powers available for purposes of the GBRMP Act, so that a single investigation system applies to the marine park.³⁵⁴ Now, “marine park users now have a duty to take reasonable steps to prevent or minimize environmental harm” and if they breach this duty there can be fines, other civil, and even criminal penalties.³⁵⁵ Negligence of being unaware of the marine park, zones, and restrictions of uses is not an excuse under the law, unless it is an honest and reasonable mistake.³⁵⁶

2. *Queensland Government*

The Queensland government is responsible for natural resource management; land use planning; and regulation of activities on the islands, coasts, and hinterlands adjacent to the Great Barrier Reef World Heritage Area.³⁵⁷ Because most of the GBR is located in Queensland, the Queensland government has passed its own legislation to protect the GBR. The most important pieces of legislation are discussed below.

a. Coastal Protection and Management Act 1995

The Coastal Protection and Management Act provides for the protection, conservation, and management of the coastal zone,

³⁵² *Id.*

³⁵³ *Safeguarding the Great Barrier Reef Marine Park*, AUSTL. GOV'T DEP'T OF THE ENV'T & ENERGY, <https://www.environment.gov.au/epbc/publications/factsheet-safeguarding-great-barrier-reef-marine-park> (last visited Dec. 29, 2020).

³⁵⁴ *See id.*

³⁵⁵ *Id.*

³⁵⁶ *Id.*

³⁵⁷ *See Managing and Protecting the Great Barrier Reef*, *supra* note 333.

including its resources and biological diversity; ensures land use, development decisions, and safeguards life and property from the threat of coastal hazards; and encourages the enhancement of knowledge of coastal resources and the effect of human activities on the coastal zone.³⁵⁸

b. Marine Parks Act 2004

The Marine Park Act helps establish marine parks, zones, zoning plans, management plans, cooperative implementation of international responsibilities, and intergovernmental agreements, a coordinated approach with other environment conservation legislation, monitoring mechanisms, and the “Commonwealth and the State have agreed that, in conserving marine parks, the State is to maintain, as far as practicable, legislation in line with the Commonwealth Act.”³⁵⁹ The coordinated effort between the Commonwealth and the State to protect the marine parks like the GBR is vital to the success of these efforts. The GBRMP Authority and the Queensland Parks and Wildlife Service operate a joint Field Management Program for the marine national parks. The program helps protect and maintain “well-functioning marine and island ecosystems that support economic, traditional[,] and recreational uses of the Great Barrier Reef”³⁶⁰

3. Great Barrier Reef Intergovernmental Agreement

This Agreement was signed in 2009 by the Prime Minister and Queensland Premier as an update to a former agreement known as

³⁵⁸ Coastal Protection and Management Act 1995, QUEENSL. GOV'T, <https://www.legislation.qld.gov.au/view/whole/html/inforce/current/act-1995-041>.

³⁵⁹ Marine Parks Act 2004, QUEENSL. GOV'T, <https://www.legislation.qld.gov.au/view/whole/html/inforce/current/act-2004-031>.

³⁶⁰ *Managing Marine Parks*, QUEENSL. GOV'T, <https://www.qld.gov.au/environment/coasts-waterways/marine-parks/managing> (last visited Dec. 29, 2020).

the Emerald Agreement of 1979.³⁶¹ It is meant to provide a framework for the Australian and Queensland governments to work together to better protect the GBR.³⁶² Within the Agreement, the governments identify major pressures to the reef including climate change impacts, water quality concerns, and coastal development issues that were not foreseen in the earlier agreement.³⁶³ Both governments recognize these concerns cannot be effectively addressed by either government alone.³⁶⁴

The reauthorized 2015 Agreement reflects the shared vision in the Reef 2050 Plan.³⁶⁵ The most updated plan was released in July 2018 and renews the intergovernmental commitment to protecting the GBR World Heritage Area under UNESCO and outlines concrete management measures to ensure the reef is preserved now and for future generations.³⁶⁶ The Agreement articulates objectives, respective jurisdictions, and accountabilities.³⁶⁷ After the unprecedented, climate-driven mass coral bleaching events in 2016 and 2017, the Plan puts a stronger focus on climate change as a key pressure to the GBR.³⁶⁸ In fact, the Plan cites linkages to international efforts and domestic plans and strategies to mitigate and adapt to climate change, such as the Paris Agreement and the Queensland Climate Transition Strategy.³⁶⁹ The Strategy sets a goal

³⁶¹ *Great Barrier Reef Intergovernmental Agreement*, AUSTL. GOV'T DEP'T OF AGRIC., WATER & THE ENV'T, <https://www.environment.gov.au/marine/gbr/protecting-the-reef/intergovernmental-agreement>.

³⁶² *Id.*

³⁶³ *Id.*

³⁶⁴ *Id.*

³⁶⁵ *Id.*

³⁶⁶ Reef 2050 Long-Term Sustainability Plan, COMMONWEALTH OF AUSTL. (2018) <https://www.environment.gov.au/system/files/resources/35e55187-b76e-4aaf-a2fa-376a65c89810/files/reef-2050-long-term-sustainability-plan-2018.pdf>.

³⁶⁷ *See id.*

³⁶⁸ *Id.*

³⁶⁹ *Id.*

for Queensland to achieve zero net emissions by 2050.³⁷⁰ Other highlights include aligning water quality targets with the Reef 2050 Water Quality Improvement Plan 2017-2022 and setting out a structure to oversee the implementation of management in a way that engages industry, the science community and the Australian people.³⁷¹ Revisions to the plan will be informed by the Outlook Report that the Australian government publishes every year.³⁷² The most recent of which is the Great Barrier Reef Outlook Report 2019.³⁷³ This comprehensive risk assessment of 45 threats (including climate change) to the GBR ecosystem and states that without additional local, national, and global action on the greatest of these threats the overall outlook will remain very poor.³⁷⁴

4. *Reef Trust*

The Reef Trust is being carried out by the Australian government, in collaboration with the Queensland government, and the GBRMP Authority.³⁷⁵ Together, “the Australian government has committed over \$700 million . . . to provide innovative, targeted investment focused on improving water quality, restoring coral reef ecosystem health,” and enhancing species protection in the GBR region.³⁷⁶ However, the Australian government is not the only party putting funds in the trust; the Reef Trust is able to consolidate investment from the philanthropic and investment sectors as well. The Reef Trust includes governance and enforcement mechanisms

³⁷⁰ *Pathways to a Clean Growth Economy Queensland Climate Transition Strategy*, DEP’T OF ENV’T & HERITAGE PROTECTION, QUEENSL. GOV’T, https://www.qld.gov.au/__data/assets/pdf_file/0026/67283/qld-climate-transition-strategy.pdf.

³⁷¹ Reef 2050 Long-Term Sustainability Plan, *supra* note 366.

³⁷² *Id.* at 366.

³⁷³ *See generally Great Barrier Reef Outlook Report 2019: In Brief*, AUSTRAL. GOV’T GREAT BARRIER REEF MARINE PARK AUTHORITY, <http://www.gbrmpa.gov.au/our-work/outlook-report-2019/outlook-report-2019-in-brief>.

³⁷⁴ *Id.*

³⁷⁵ *The Reef Trust*, AUSTRAL. GOV’T DEP’T OF AGRIC., WATER & THE ENV’T, <http://www.environment.gov.au/marine/gbr/reef-trust> (last visited Dec. 23, 2020).

³⁷⁶ *Id.*

to make sure funds are directed towards prioritized projects and efforts.³⁷⁷ Scientists and other experts provide input to assist in deciding which projects will receive funding.³⁷⁸ These projects are released in phases and funding is released continuously throughout the application and assessment processes.³⁷⁹ The Reef Trust also helps in facilitating the *Reef 2050 Plan*, by focusing on known critical areas for investment, such as improving water quality and habitats along the Great Barrier Reef.³⁸⁰

5. *Analysis and Concerns*

Australia has been a leader on many issues in the environmental realm but must do more to confront the degradation of the GBR and other environmental challenges facing Australia and the world.³⁸¹ The World Wildlife Fund polled Australian attitudes regarding ocean ecosystems and protecting the Great Barrier Reef.³⁸² “Nine out of ten agree[d] that” more needs to be done to “protect . . . oceans and marine life.”³⁸³ In fact, protecting the GBR is the most important environmental issue for Australians, 94% found it important.³⁸⁴ 59% of Australians described the GBR as having environmental value to them (habitat, global, and economic

³⁷⁷ *Id.*

³⁷⁸ *The Reef Trust*, AUSTRAL. GOV'T DEP'T OF AGRIC., WATER & THE ENV'T, <https://www.environment.gov.au/marine/gbr/reef-trust> (last visited Dec. 23, 2020).

³⁷⁹ *Id.*

³⁸⁰ Reef 2050 Long-Term Sustainability Plan, *supra* note 366.

³⁸¹ David Suzuki, *Australia's Environmental Leadership Needed Now More Than Ever*, HUFF POST (July 18, 2015, 7:56 AM), https://www.huffingtonpost.com/david-suzuki/australia-inspired-me-to-tackle-climate-change_b_7980512.html (last visited Dec. 23, 2020).

³⁸² Australian Attitudes to Nature 2017 Report Prepared for WWF-Australia, WWF, ROY MORGAN RES. (2018), <https://webcache.googleusercontent.com/search?q=cache:WHmJMcx8a1sJ:https://www.wwf.org.au/ArticleDocuments/353/pub-backyard-barometer-australian-attitudes-to-nature-05jun18.pdf.aspx+&cd=2&hl=en&ct=clnk&gl=us&client=safari>.

³⁸³ *Id.*

³⁸⁴ *Id.*

value).³⁸⁵ 89% of Australians think that the Great Barrier Reef is the most important natural place to be protected.³⁸⁶ “Coral bleaching followed by climate change are [perceived] to be the two greatest threats to the Great Barrier Reef’ amongst the general population.”³⁸⁷

This study goes to show that Australians value the GBR and recognize the significance of its deterioration being primarily due to climate change. It also shows that Australians want to do more to protect the GBR from climate change impacts.

With this being said, Australia has taken major strides in creating effective policies that address the issues facing coral reefs, instituting reporting schemes, securing funding, and establishing cooperative agreements amongst multiple actors. Although Australia’s reef-related policies are not perfect, their strategy approaches protection of the GBR as a whole by focusing on the importance and value the GBR provides; addressing climate change impacts; and other human made impacts like water quality concerns, coastal development, and species protection. The U.S. could learn from this all-encompassing approach.

There are some issues that prevent more effective legislation from being passed to safeguard the GBR. One of the most prominent being the highly politically motivated Australian Parliament.³⁸⁸ Some members of Parliament have questioned whether climate change is man-made, and others deny it entirely.³⁸⁹ Some members preach that it is possible to turn things around for the reef without

³⁸⁵ *Id.*

³⁸⁶ *Id.*

³⁸⁷ *Id.*

³⁸⁸ See Jon Brodie & Alana Grech, ‘*This Situation Brings Me to Despair*’: Two Reef Scientists Share Their Climate Grief, YALE CLIMATE CONNECTIONS (Oct. 3, 2019), https://www.yaleclimateconnections.org/2019/10/this-situation-brings-me-to-despair-two-reef-scientists-share-their-climate-grief/?fbclid=IwAR1P7IKvrZF0iXdTpKFRhxDPulap186kTHfW2u7Fw3eRHm_nkKsjMaojQc4 (last visited Dec. 25, 2020).

³⁸⁹ See *id.*

tackling global warming.³⁹⁰ Another example exemplifying distrust in science is the Senate of the Australian Parliament voting in favor of inquiring whether farming and poor water quality actually harms the GBR as Queensland introduced new environmental laws to protect the GBR.³⁹¹ There has been some push back from the certain parties seeking land management changes, and campaigns against further state regulation that would actually benefit the GBR.³⁹² Additionally, some North Queensland politicians have undermined the science that informs their own policies by advocating for a national watchdog to verify scientific papers because of certain politicians' doubts about climate change.³⁹³

Another roadblock is that the Commonwealth of Australia, Queensland government, and GBRMP Authority attempt to raise awareness about the importance of reducing GHG emissions to help protect the GBR, but actual CO₂ emissions have increased "in almost every sector of Australia's economy."³⁹⁴ Australia is one of the world's top twenty polluting countries.³⁹⁵ Australia's greatest contribution to global warming is through coal being exported and

³⁹⁰ See David Ritter, *Australia's Politicians Have Betrayed the Great Barrier Reef and Only the People Can Save It*, THE GUARDIAN (Apr. 9, 2017, 5:02 PM), <https://www.theguardian.com/environment/2017/apr/10/australias-politicians-have-betrayed-the-great-barrier-reef-and-only-the-people-can-save-it> (last visited Dec. 25, 2020).

³⁹¹ Paul Karp, *Senate Inquiry Into Great Barrier Reef Seen as Bid to Discredit Queensland Laws*, THE GUARDIAN (Sept. 27, 2019, 5:42 PM), <https://www.theguardian.com/environment/2019/sep/17/senate-inquiry-into-great-barrier-reef-seen-as-bid-to-discredit-queensland-laws> (last visited Dec. 25, 2020).

³⁹² *Id.*

³⁹³ Brodie & Grech, *supra* note 388.

³⁹⁴ Adam Morton & Lisa Cox, *How Does Scott Morrison's Climate Declaration at the United Nations Stack Up?*, THE GUARDIAN (Sept. 26, 2019, 5:06 PM), <https://www.theguardian.com/environment/2019/sep/26/how-does-scott-morrison-s-climate-declaration-at-the-united-nations-stack-up> (last visited Dec. 25, 2020).

³⁹⁵ *Each Country's Share of CO₂ Emissions*, UNION OF CONCERNED SCIENTISTS (July 16, 2008), <https://www.ucsusa.org/resources/each-countrys-share-co2-emissions> (last visited Dec. 25, 2020).

burned.³⁹⁶ Some suggest closing down the coal mining industry, while ensuring new green jobs for all affected workers and communities, but this becomes difficult when financial institutions continue to invest in fossil fuel projects that endanger the reef.³⁹⁷

For Australia to create more effective policy choices, politicians must cross the aisle and acknowledge climate change is real. As a society, Australians must decrease greenhouse gas emissions.

E. LEGAL IMPLICATIONS

If the world follows the same trajectory, climate change will continue to produce a range of harmful effects, including ocean acidification. This is expected to worsen and further have a disastrous impact on reefs. As we have seen, the international community, the U.S., and Australia have all taken a variety of actions to protect coral reef ecosystems from these stressors, but what is the remedy if actors feel governments acting alone or together are not doing enough to conserve coral reef ecosystems for future generations? Although this has not been challenged specifically, some have argued that private litigation could be used to combat climate change.³⁹⁸ Others suggest expanding the public trust doctrine to protect our climate system.³⁹⁹

1. *Juliana v. United States*

The plaintiffs challenged the policies and acts of the Executive branch, including the President of the U.S. and many federal agencies.⁴⁰⁰ They challenged a multitude of decisions the defendants have made in regard to regulating CO₂ emissions, granting fossil fuel extraction permits, tax breaks for the fossil fuel industry, construction of pipelines, and authorization of marine coal

³⁹⁶ See generally Suzuki, *supra* note 381.

³⁹⁷ Ritter, *supra* note 390.

³⁹⁸ JOHN SPRANKLING & RAYMOND R. COLETTA, PROPERTY A CONTEMPORARY APPROACH, 909–916 (West Academic Publishing, 3d ed. 2018).

³⁹⁹ *Id.*

⁴⁰⁰ *Juliana v. United States*, 217 F. Supp. 3d 1224 (Or. 2016).

projects.⁴⁰¹ They assert that the defendant's actions have "substantially caused the planet to warm and the oceans to rise."⁴⁰² The main questions the Court must answer are "whether defendants are responsible for some of the harm created by climate change," whether there is even a claim the plaintiffs may bring to challenge climate change policy in court, and whether the Court can force the defendants to change their current policies.⁴⁰³

a. Due Process; Fundamental Rights

The plaintiffs attempted to bring a due process claim alleging that the defendants have directly caused atmospheric CO₂ to rise to levels that dangerously interfere with a stable climate system; the defendants are knowingly endangering health and welfare by approving fossil fuel development and the defendants, after knowingly creating this situation, are continuing to enhance the danger by allowing fossil fuel production and consumption.⁴⁰⁴ The court is required to uphold a challenged governmental action if it "implements a rational means of achieving a legitimate governmental end."⁴⁰⁵ However, if the government action infringes on a fundamental right, the court applies strict scrutiny and will only allow an infringement if it is narrowly tailored and serves a compelling state interest.⁴⁰⁶

Fundamental rights include those that are enumerated somewhere in the Constitution and rights and liberties that are either (1) "deeply rooted in this Nation's history and tradition" or (2) fundamental to our "scheme of ordered liberty."⁴⁰⁷ This means that new fundamental rights may be formed but the courts must exercise "reasoned judgment" when deciding to do so.⁴⁰⁸ Some environmentalist believe that the right to a climate system is

⁴⁰¹ *See id.* at 1234.

⁴⁰² *Id.*

⁴⁰³ *Id.*

⁴⁰⁴ *Id.* at 1248.

⁴⁰⁵ *Kim v. United States*, 121 F.3d 1269, 1273 (9th Cir. 1997).

⁴⁰⁶ *Id.*

⁴⁰⁷ *McDonald v. City of Chicago*, 561 U.S 742, 767 (2010).

⁴⁰⁸ SPRANKLING & COLETTA, *supra* note 398.

fundamental to sustaining human life and that it should be protected as such.⁴⁰⁹ The court determined that the plaintiffs properly alleged infringement of a fundamental right.⁴¹⁰

b. Public Trust Doctrine

The Public Trust Doctrine is rooted in ancient Roman law.⁴¹¹ The doctrine “requires the sovereign, or state, to hold in trust designated resources for the benefit of the people.”⁴¹² This means that no government can legitimately abdicate its core sovereign powers, for example the government’s police powers.⁴¹³ The doctrine “recognizes the public right to many natural resources, including ‘the air, running water, the sea and its shore.’”⁴¹⁴ The trust bars the sovereign from “depriving a future legislature of the natural resources necessary to provide for the well-being and survival of its citizens.”⁴¹⁵ It traditionally applied to commerce and fishing in navigable waters, but the doctrine’s uses have been expanded by the courts overtime.⁴¹⁶ For example, in *Marks v. Whitney*, the California Supreme Court broadened the definition of public trust to include

⁴⁰⁹ *Id.*

⁴¹⁰ *Id.*

⁴¹¹ *Public Trust Doctrine*, WATER EDUC. FOUND., <https://www.watereducation.org/aquapedia/public-trust-doctrine> (last visited Dec. 30, 2020).

⁴¹² *Id.*

⁴¹³ SPRANKLING & COLETTA, *supra* note 398.

⁴¹⁴ *Public Trust Doctrine*, *supra* note 411.

⁴¹⁵ CHRISTINE A KLEIN ET AL., NATURAL RESOURCES LAW: A PLACE-BASED BOOK OF PROBLEMS AND CASES (Wolters Kluwer 2018), https://books.google.com/books?id=JvdJDwAAQBAJ&pg=PA735&lpg=PA735&dq=%20depriving%20a%20future%20legislature%20of%20the%20natural%20resources%20necessary%20to%20provide%20for%20the%20well%20being%20and%20survival%20of%20its%20citizens.%20&source=bl&ots=wXHNHXwcaQ&sig=ACfU3U0CmDVXT0TFEU4c4nxObQ8WuNKGIA&hl=en&sa=X&ved=2ahUKEwjR4LSV8_btAhW1slkKHS9zBjUQ6AEwAHoECAMQA#v=onepage&q=%20depriving%20a%20future%20legislature%20of%20the%20natural%20resources%20necessary%20to%20provide%20for%20the%20well%20being%20and%20survival%20of%20its%20citizens.%20&f=false

⁴¹⁶ *Public Trust Doctrine*, *supra* note 411.

“fish, wildlife, habitat[,] and recreation” because ““public trust uses are sufficiently flexible to encompass changing public needs.””⁴¹⁷

The Juliana lawsuit is part of a wave of environmental cases asserting that state and national governments have abdicated their responsibilities under the doctrine because the defendants have violated their duties to current and future trustees by failing to protect the atmosphere water, seas, seashores, and wildlife.⁴¹⁸ The plaintiff’s injuries relate to the effects of ocean acidification and rising ocean temperatures and, therefore, they have adequately alleged harm to public trust assets.⁴¹⁹ The Court ultimately denied the Defendants’ motion to dismiss and the lawsuit is ongoing.⁴²⁰

Tying this argument into the legitimacy of protecting coral reefs would turn upon “whether the State has exercised its police power in conformity with the federal laws and Constitution.”⁴²¹ One view maintains that the legislature is the most appropriate body to decide what is in the interest of the public.⁴²² In fact, the Florida legislature decided to include the public trust doctrine in the state’s constitution.⁴²³ Another approach relates to the public interest argument being used as a defense against takings claims by private parties contesting conservation restrictions on private land.⁴²⁴ Some have argued that because coral reefs in the U.S. are limited in scope and fixed in location they could be reduced to private ownership and the public trust would then create a pseudo-easement on the land.⁴²⁵ However, ““the individual States have the authority to define the limits of the lands held in public trust and to recognize private rights in such lands as they see fit.””⁴²⁶

⁴¹⁷ *Id.*

⁴¹⁸ SPRANKLING & COLETTA, *supra* note 398.

⁴¹⁹ *Id.*

⁴²⁰ *Id.*

⁴²¹ *See Douglas v. Seacoast Products, Inc.*, 431 U.S. 265, 284–285 (1977).

⁴²² Sylvan, *supra* note 18 at 34.

⁴²³ *Id.*

⁴²⁴ *See id.*

⁴²⁵ *See id.*

⁴²⁶ *See id.*

If two legitimate public property rights, like recreational fishing and coral reef conservation, are in conflict, typically, the courts are left to decide.⁴²⁷ Referenced previously, courts have amended the purposes of the doctrine throughout the years, adding conservation, but without creating a hierarchy among them.⁴²⁸ Marine living resources that “should be conserved and managed for the benefit of the state, its people, and future generations” were added to the Constitution of Florida.⁴²⁹ “This seems to suggest that the vitality of the ecosystem in general is paramount to any particular use . . .” of the ecosystem.⁴³⁰ With this discussion, Courts in the future may appropriately expand the doctrine to protect a stable climate system for the interest of the public, in turn better protecting reefs from climate change threats.

2. *Other Pertinent Lawsuits and Actions*

a. *Center of Biological Diversity (Center)*

The Center is a non-profit, environmental organization dedicated to the protection of species and their habitats through “science, policy, and environmental law.”⁴³¹ The Center is “concerned with the conservation of endangered species, including coral species, and the effective implementation of the ESA.”⁴³²

In 2009, the Center of Biological Diversity petitioned to list 83 coral species under the ESA.⁴³³ The National Marine Fisheries Service (NMFS) under NOAA had jurisdiction over this petition.⁴³⁴ The NMFS was required to determine whether the petition presented substantial scientific or commercial information indicating that the

⁴²⁷ *See id.*

⁴²⁸ *Public Trust Doctrine, supra* note 411.

⁴²⁹ FLA. CONST., art. X, § 16(a).

⁴³⁰ Sylvan, *supra* note 18.

⁴³¹ *Petition To List 83 Coral Species Under The Endangered Species Act Before The Secretary of Commerce, supra* note 279.

⁴³² *Id.*

⁴³³ *Id.*

⁴³⁴ *Id.*

petition may be warranted.⁴³⁵ The science supporting the petition indicated that climate change and ocean acidification greatly threatened the survival of the 83 coral species at issue.⁴³⁶ In fact the species were threatened “with extinction before the mid-century due to the increasing frequency of mass bleaching events at harmful[] intervals and the projected dissolution of corals due to ocean acidification.”⁴³⁷ Both Congress and the Supreme Court have obliged NOAA to prioritize species survival and recovery “whatever the cost.”⁴³⁸ Due to their vital importance, imperiled corals identified in this petition were believed to warrant immediate protection under the ESA.⁴³⁹ A handful of the petitioned corals were located in Florida and Australia.⁴⁴⁰ In 2014, because of this petition, twenty species of coral (five species located in Florida) are now “protected as ‘threatened’ under the [ESA] because global warming” and ocean acidification are driving them towards extinction.⁴⁴¹ This level of “protection under the [ESA] will provide these corals with habitat protections, recovery planning, and prohibition of federal actions that could jeopardize the corals.”⁴⁴²

Additionally, in August 2019, the Center also filed a lawsuit against the NMFS in order to protect twelve endangered coral species (“five species of Florida and Caribbean corals and seven

⁴³⁵ 16 U.S.C. § 1533(b)(3)(A).

⁴³⁶ *Petition To List 83 Coral Species Under The Endangered Species Act Before The Secretary of Commerce*, *supra* note 279.

⁴³⁷ *Id.*

⁴³⁸ See *TVA v. Hill*, 437 U.S. 153, 154 (1978).

⁴³⁹ *Petition To List 83 Coral Species Under The Endangered Species Act Before The Secretary of Commerce*, *supra* note 279.

⁴⁴⁰ *Id.*

⁴⁴¹ Shaye Wolf, *20 Corals Protected Under Endangered Species Act Because of Global Warming, Ocean Acidification*, CTR. FOR BIOLOGICAL DIVERSITY (Aug. 27, 2014), https://www.biologicaldiversity.org/news/press_releases/2014/corals-08-27-2014.html.

⁴⁴² *Id.*

species of Pacific corals”).⁴⁴³ The Center recognized the safeguards needed to protect the Florida Reef and reefs surrounding the Pacific Islands from mass extinction due to climate change, pollution, and overfishing.⁴⁴⁴ The plaintiffs argued that the corals all received ESA protection in 2014 (as previously mentioned), but they did not receive the critical habitat protection the law requires, and they need this level of protection in order to not become extinct.⁴⁴⁵ In a press release, an attorney at the Center stated: “You can’t save these vanishing corals without protecting their most important habitat. It’s time for the Trump administration to stop dragging its feet and give these corals the help they desperately need.”⁴⁴⁶ No further action has been taken by the D.C. District Court where the lawsuit was filed.

b. Center of Biological Diversity v. EPA, et. seq.

In November 2018, the Center filed a complaint against the EPA for declaratory and injunctive relief.⁴⁴⁷ The complaint alleges that Oregon’s coastal waters are experiencing a water quality problem due to ocean acidification which has stripped the seawater of calcium carbonate, in turn, making it difficult for marine organisms to build shells (or build reefs).⁴⁴⁸ Consequently, shellfish production has declined and scientists have linked this to ocean acidification.⁴⁴⁹

The Clean Water Act requires each state to identify any water bodies that fail to meet the state’s water quality standards and list

⁴⁴³ Emily Jeffers, *Safeguards Needed Around Florida, Pacific Islands to Prevent Mass Extinction*, CTR FOR BIOLOGICAL DIVERSITY (Aug. 21, 2019), <https://biologicaldiversity.org/w/news/press-releases/lawsuit-filed-protect-habitat-12-endangered-coral-species-2019-08-21/> (last visited Dec. 30, 2020).

⁴⁴⁴ *Id.*

⁴⁴⁵ *Id.*

⁴⁴⁶ *Id.*

⁴⁴⁷ Ctr. for Biological Diversity v. United States E.P.A., 2018 WL 6521805 (Or.) (Trial Pleading), Westlaw.

⁴⁴⁸ *See id.*

⁴⁴⁹ *See id.*

those bodies as “impaired” waters.⁴⁵⁰ The state has to submit this list to the EPA and the EPA is required to approve or disapprove of it within thirty days.⁴⁵¹ Within the list submitted, the state must identify the pollutant causing the impairment, when known, and then develop a plan to improve water quality for the impaired water body based on the severity of the pollution and the sensitivity of the water’s use.⁴⁵² The Oregon Department of Environmental Quality (DEQ) “failed to include any marine waters impaired due to ocean acidification on its 2012 [303(d)] list.”⁴⁵³ The state submitted its impaired waters list to the EPA and it was partially approved and partially disapproved. The EPA partially disapproved the list due to DEQ’s failure to list 332 impaired water bodies.⁴⁵⁴ Accordingly, the plaintiff sought a declaration that the EPA’s failure to identify impaired waters in Oregon within thirty days of the EPA’s disapproval of Oregon’s 2012 303(d) list violated the EPA’s mandatory duty under Section 303 of the Clean Water Act, 33 U.S.C. § 1313(d)(2), and constitutes an agency action unlawfully withheld or unreasonably delayed under the Administrative Procedure Act, 5 U.S.C. § 706(1).⁴⁵⁵ The plaintiff also sought an order requiring the EPA to promptly identify and finalize its rulemaking to add additional impaired waters, including those due to ocean acidification, to Oregon’s 2012 303(d) list.⁴⁵⁶ In March 2019, this action was dismissed.

Although there have not been any lawsuits suing the government for lack of action in regard to protecting coral reefs from climate change impacts, we can learn from the cases, petitions, and complaints that have attempted to conserve coral reefs in a vague sense. The *Juliana* case is a first step at establishing a stable climate as a fundamental right; this claim was not thrown out and that speaks volumes to the importance of a functioning planet now and in the

⁴⁵⁰ 33 U.S.C. § 1313(d) (2018).

⁴⁵¹ 33 U.S.C. § 1313(d)(2) (2018); 40 C.F.R. § 130.7(d)(2) (2018).

⁴⁵² 40 C.F.R. § 130.7(b)(4) (2018).

⁴⁵³ *Ctr. for Biological Diversity v. United States E.P.A.*, 2018 WL 6521805 (Or.), Westlaw.

⁴⁵⁴ *Id.*

⁴⁵⁵ *Id.*

⁴⁵⁶ *Id.*

future. The due process argument could likewise be used in a case where a plaintiff is suing the government for lack of action in protecting coral reefs because the government is aware of the value reefs provide and the onset harm humans have caused to these ecosystems. The public trust doctrine was expanded to include conservation uses and this could pertain to the government not being allowed to deprive future generations of the natural resources (food supply, habitats, and protection that coastal reefs provide) necessary to provide for the well-being and survival. Petitioning for more coral reefs species to be placed on the ESA list has also benefitted corals, but at the same time has also been somewhat ineffective. This is because of the time it took from the original petition to the actual listing (five years) and then it was not actually enforced and now has triggered further litigation. It also looked like there was hope for claims brought against the EPA for violating the CWA and for procedural issues, but the case was later dismissed. It would have been interesting to see if the EPA finalized a rule adding waters that have been impacted by ocean acidification to the impaired water's list, inducing more protection of these areas. If this had been the case, coral reefs impacted by ocean acidification and the waters surrounding these ecosystems may have been able to get more protection under the CWA. This is likely to come up again as climate change persists.

III. LOOKING FORWARD

The complex nature of coral reef ecosystems makes protection and conservation of these areas, both on the international level and domestic level, extremely challenging. But with every challenge, innovation occurs, and society finds solutions. The University of Southern California, James Cook University, and the Australian Institute of Marine Science are working together to study coral's ability to shuffle their symbionts, the algae colonies inside their cells, as an adaptation mechanism to potentially gain an advantage in a changing environment.⁴⁵⁷ Researchers have found that adult coral can pass along this ability to shuffle their symbionts to their offspring, allowing them to have a head start in establishing an

⁴⁵⁷ Univ. of S. Cal., *supra* note 88.

energy supply.⁴⁵⁸ Although this breakthrough shows that corals may be more adaptable, they still need time to be able to adapt.⁴⁵⁹

Recent scientific reviews on the future of coral reefs suggest that corals may not be able to adapt quickly enough to avoid major reef ecosystem loss on a global scale as a result of numerous stressors.⁴⁶⁰ Some believe that increasing efforts to reduce these threats is pertinent but it might be “too little and/or too late” and direct intervention is required.⁴⁶¹ One group has done just that. The Coral Restoration Foundation in Florida is rebuilding thousands of square acres of the reef by cutting coral microfragments, strengthening the fragments in a laboratory and replanting them in the ocean.⁴⁶² This is known as assisted evolution.⁴⁶³ Divers plant small corals in underwater nurseries on rows of artificial trees that mimic a coral reef structure and nourish themselves until they are ready to be replanted.⁴⁶⁴ By collecting microfragments and placing them in genetic banks under water and in labs, scientists are able to analyze variations of genotypes for restoration and climate resilience.⁴⁶⁵ The scientists have also experimented with medical pastes that can be injected into the reefs to contain the spread of disease.⁴⁶⁶ The scientists recognize this is not a long-term solution that is going to take the place of mitigating climate change.⁴⁶⁷ The process is extremely time consuming and labor intensive, but it will help ward off total devastation to the Florida Reef system in the

⁴⁵⁸ See *supra* text accompanying note 88.

⁴⁵⁹ See *supra* text accompanying note 88.

⁴⁶⁰ Madeleine J. H. van Oppen, *Building Coral Reef Resilience Through Assisted Evolution*, NAT’L CTR. FOR BIOTECHNOLOGY INFO. (2015), <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4345611/>.

⁴⁶¹ *Id.*

⁴⁶² Evan Halper, *Racing to Save Florida’s Coral From Climate Change, Scientists Turn to a Once-Unthinkable Strategy: “Assisted Evolution,”* LA TIMES (July 9, 2018, 3:00 AM), <https://www.latimes.com/science/sciencenow/la-na-pol-coral-climate-change-20180709-htmstory.html> (last visited Dec. 29, 2020).

⁴⁶³ *Id.*

⁴⁶⁴ *Id.*

⁴⁶⁵ *Id.*

⁴⁶⁶ *Id.*

⁴⁶⁷ *Id.*

meantime while governments solve the root problem: climate change.⁴⁶⁸ NOAA has already commended the Foundation's efforts and acknowledge the positive difference it is making.⁴⁶⁹ Their goal is to scale up their processes so that they can be effective at restoring reefs all over the world, like the Great Barrier Reef.⁴⁷⁰ Introducing genetically superior corals has the potential to enable reefs to persist in the future.⁴⁷¹ However, there are risks involved regarding ecological consequences that must be analyzed before this process is scaled globally.⁴⁷²

As science advances, more innovative solutions to mitigating climate change impacts on coral reefs, like the ones discussed, will hopefully come to fruition and benefit more of society.

IV. POLICY SUGGESTION & CONCLUSION

Regulatory mechanisms currently in place are inadequate to protect coral reefs from climate change impacts. Many domestic policies described above have overlapping purposes but leave many gaps in the protection of coral reefs. While a few domestic laws in the U.S. and Australia have been to some degree effective, coral reefs ultimately must require protection at the international level. Coral reef ecosystems worldwide have similar overriding problems facing them, but they are affected differently depending on the location of a particular coral reef.

Looking toward the future, we need an initiative that must be international in scope and localized in implementation. I propose an all-encompassing, international treaty focused solely on coral reef protection; that would be modelled after the successful pieces of the domestic policies and international instruments previously discussed. These include: increasing the number of MPAs, creating something similar to the Reef Trust in Australia in order to help smaller countries comply with commitments in the treaty, and

⁴⁶⁸ *Id.*

⁴⁶⁹ *Id.*

⁴⁷⁰ *Id.*

⁴⁷¹ van Oppen, *supra* note 460.

⁴⁷² *Id.*

perhaps even implementing a CZMA scheme in all coastal areas around the globe. This treaty needs to focus on making the protection of coral reefs an international priority by addressing the multitude of factors leading to the demise of coral reefs, including, but not limited to, increased greenhouse gas emissions, overfishing, takings, pollution, etc., while also encouraging and helping local communities to participate on the smaller scale. The treaty must establish enforceable standards and guidelines for how countries are to implement regulation of activities harming the reefs and to develop sustainable development tactics. It is also necessary for the treaty to address how countries can afford to comply, by offering financial assistance, creating a trust with private donors, or coordinating efforts with non-profits focused on reef conservation.

If a new treaty is not feasible, another avenue that could protect reefs more effectively is reworking or adding to the current structures in place. An example could be adding more reef species to CITES. The signatories of CITES are required to report on the trade of each species and this could help the international community better estimate how much overharvesting is actually occurring to better assess the harm. MPAs can be highly effective tools for protecting biodiversity when the areas are large such as the GBR and the Florida Keys National Marine Sanctuary. Therefore, it would be beneficial to expand and designate more areas as MPAs in order to better monitor, collect data, and improve management practices. UNESCO could also designate more threatened reefs as World Heritage Sites. However, this might not be enough because UNESCO has previously warned that 25 of the 29 coral reefs on the list already are at risk for devastating back-to-back bleaching events by 2040.⁴⁷³ They also warn that 29 of the reefs, which include the reef in Florida and the Great Barrier Reef in Australia, will no longer host functioning ecosystems by 2100 if climate change is not confronted.⁴⁷⁴ In essence, any of these actions will incrementally help reefs, but if we do not address the bigger picture, decreasing greenhouse gas emissions, these smaller actions might not be enough to save these ecosystems in the long run. It would be more

⁴⁷³ Halper, *supra* note 462.

⁴⁷⁴ *See supra* text accompanying note 462.

advantageous for society to have an innovative treaty proactively tackling all the issues facing coral reefs in one document.

Coral reef survival is at a tipping point as climate change worsens. The protection of these delicate ecosystems is a global issue and more coordinated efforts must be taken by local, state, and international actors to preserve their existence for future generations.