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List Of Abbreviations

AIIB	–	Asian Infrastructure Investment Bank
ARF	–	ASEAN Regional Forum
ASEAN	–	Association of Southeast Asian Nations
DoC	–	Declaration of the Conduct of Parties in the SCS
EEZ	–	Exclusive Economic Zone
FONOPs	–	Freedom of Navigation Operations
GMCR	–	Graph Model (for) Conflict Resolution
GMR	–	General Metrarationality
PRC	–	People’s Republic of China (China)
ROC	–	Republic of China (Taiwan)
SEQ	–	Sequential Stability / Simultaneous Stability
SIM	–	Strategic Impact (of two or more DMs moving together at the same time from a given state)
SMR	–	Symmetric Metrarationality
UNCLOS	–	United Nations Convention on the Law of the Sea
US	–	United States of America
WW2	–	Second World War

Useful facts

Family Names: Chinese and other names in East Asia start with the family name, and then only comes the first name.

Billion, Trillion: The US metric system is used. A billion has 9 zeros: 1.000.000.000, a trillion has 12 zeros: 1.000.000.000.000

Abstract (English)

The conflict in the South China Sea, between China and other riparian states of Southeast Asia and external powers, has been around since the 1970s. But it was only the rise in oil prices and the rise of China as an economic power and military power in the 2000s-2010s that intensified the conflict. While political literature tends to focus on China's concerns, or discuss conflicts between the US and China, the Chinese Blue Silk Road plan has sparked new room for discussion. Instead of a military solution, there is now also a peaceful solution in perspective that China supports with new institutions; such as the Asian Infrastructure Investment Bank. The following research question is answered in game form: The Research Question: "What are the options and priorities of China, the Philippines, Vietnam and external players such as the US, India and Japan to act in the South China Sea Conflict?" as well as a secondary question: "How can this Conflict be displayed by game-theoretic models and will the outcome be displayed similar to what the facts on the ground are?"

The basic model is an extended chicken game and the expansion of the prisoner dilemma, used to determine options for the game. Priorities arise from a discussion of the various players from the real situation of the conflict in the South China Sea. Readers can understand how they can build such a game scenario themselves, and at the same time find out how real conflict situations can be implemented as options and scenarios. Both the game and the conflict in the South China Sea and the main players China, the Philippines, Vietnam, the USA, India and Japan, as in summer of 2018, are discussed.

Abstract (German)

Den Konflikt im Südchinesischen Meer, zwischen China und anderen Anrainerstaaten aus Südostasien und externen Mächten, gibt es schon seit den 1970er Jahren. Aber erst durch den Anstieg der Ölpreise und dem Aufstieg Chinas als Wirtschaftsmacht und Militärmacht in den 2000er-2010er Jahren, haben den Konflikt verstärkt. Während politische Literatur sich meistens auf das Anliegen Chinas konzentriert, oder Konflikte zwischen den USA und China diskutieren, hat der Chinesische Plan der ‚Blue Silk Road‘ neuen Raum für Diskussionen entfacht. Statt einer militärischen Lösung ist nun auch einer friedliche Lösung in Sichtweise, die China mit neuen Institutionen unterstützt, wie beispielsweise der ‚Asian Infrastructure Investment Bank‘. In dieser Arbeit werden beide Möglichkeiten ‚Konflikt‘ oder ‚Konfliktlösung‘ durch den Einsatz des Multiplayer-Games GMCR+ analysiert. Es wird die Forschungsfrage in Spielform beantwortet: Welche Optionen und Prioritäten haben China, die Philippinen, Vietnam und externe Akteure wie die USA, Indien und Japan, um im Südchinesischen Meereskonflikt zu agieren? Und die Nebenfrage: Wie kann dieser Konflikt durch spieltheoretische Modelle dargestellt werden und wird das Ergebnis ähnlich wie die reale Situation im Südchinesischen Meer in Spielform dargestellt?

Als Grundmodell wird dabei ein erweitertes Chicken-Game und die Erweiterung des Prisoner-Dilemma herangezogen um Optionen für das Spiel festzulegen. Prioritäten ergeben sich aus einer Diskussion der verschiedenen Spieler aus der realen Situation des Konflikts im Südchinesischen Meer. Leser können nachvollziehen, wie sie selbst ein solches Spiel-Szenario aufbauen können und gleichzeitig in Erfahrung bringen, wie reale Konflikt-Situationen in Optionen und Szenarien umgesetzt werden können. Sowohl das Spiel als auch der Konflikt im Südchinesischen Meer und die wichtigsten Spieler China, die Philippinen, Vietnam, die USA, Indien und Japan, im Stand Sommer 2018 werden diskutiert.

1.0 Introduction

1.1 Problem set

2018: The Situation at the China Sea has not emerged towards a hot conflict, which was foreseen by many scholars in the past (wrongfully). Other scholars say the reason why such a big conflict in the South China sea hasn't appeared yet, is the 'ASEAN-Way' approach of smoothing things. The more logical reason why is: China hasn't been too aggressive yet, because China was not military capable to keep the US out of the game. However the weak Obama administration (based on their non-actions; see in a later chapter) did not fulfill their guarantees for protection of South East Asian countries, which made Vietnam and the Philippines rethink their relationship with the United States. China used this as an opportunity to establish itself militarily at several islands in the South China Sea; and also by opening an offer to the whole South China Sea neighbors and beyond: The so called 'Blue Silk Road', which would allow South East Asian nations and other participants to negotiate 'conditions' or a 'code of conduct' in the South China Sea, to create peace and stability; under China's conditions.

In the years before we were able to see different small conflict, between different Southeast Asian states, in conflict with China and sometimes between each other. **Oil and gas resources, fishing rights and the right of free navigation** are contentious issues between the different participants in the South China Sea. Also fisherman from outside make the situation difficult, since the fishing population has been reduced by 70-80% since the 1950s. The situation cries for a policeman, who stops illegal fishing – And China is willing to fill this position. Different fishing rules, what is allowed to fish where (for example tortoises, are handled differently in different states), make the situation even more difficult.

A similar conflict is been fought in the **East China Sea** – Here Japan is, compared to South China Sea neighbors, more powerful. Also there, we have more hate between China and Japan, which is a result of the actions by Japan in China (under the occupation); or also known

as the Second Sino-Japanese War (1937-1945). Both 'nations hate each other': China and Japan use the conflict between both nations in the East China Sea for propaganda to keep the focus away of inner problems. There are conquests on a regular basis / captures of civilians in islands territory, who plant their flag on the 'enemy's island'. This creates always a lot of media attention. Also Taiwan is part of this game. Taiwan and China have a historical conflict with each other: After the Qing dynasty ended in 1911, the country (Republic of China) was governed by Sun Yat-sen (孫中山), who was winner of a military uprising in the Wuhan region. This step ended the 2.000 year China system of dynasties. However modern China is still a centralistic system; which historically emerged from the persons who were in power to govern the Yangtse-river. Sun Yat-sen founded the Kuomintang party (中國國民黨 - Zhōngguó Guómíndǎng). He is known as the father of the nation. A rift was coming as the Kuomintang and the Communist Party of China went into civil war (the Communist Party of China supported the Kuomintang until 1927 in the Wuhan region); under the leaderships of Chiang Kai-shek and Mao Zedong. When Hitler decided to end the support for the Kuomintang (weapons deliveries), and the Communist Party got other support from outside, the Kuomintang lost the war and fled to what today is called Taiwan. However Taiwan calls itself the 'Republic of China' and claims the whole Mainland territory and Taiwan as their territory, while Mainland China (which official title is the 'People's Republic of China') claims Taiwan as part of their territory. This conflict will not be dealt with, in this thesis, however it needed to be introduced to get an understanding of the Japanese situation towards China. Further in this paper only the terms China (mainland China) and Taiwan will be used; however Taiwan's claims will not be discussed, since they overlap with China's demands; as part of the historical rift between both 'countries'. Today the Kuomintang Party is a regular party in Taiwan; which governs for long periods, but not nonstop. (Gas & Oil are also issues in the East China Sea – It makes Japan then also a balancing partner in the South China Sea conflict, in an indirect way.)

Historically **China** has not been a **steady / constant Hegemon at the South China Sea**. The Chinese admiral Zheng He (鄭和) was active in the 15th century, with a large fleet and in this time China discovered most of the islands and navigation routes in the South China Sea. To these historical discoveries, China argues on basis of 'historic rights', on which China argues for a so called U-shape line or Nine-Dash-Line as China's territorial demand in the South China Sea. In the 17th and 18th Century, the British Empire and the Qing dynasty came under

confrontation, especially in the First and Second Opium War. Chinese military was completely unprepared for the new powerful British ships, which were supported by new technology (the steam engine). As a result of the First Opium War, for example Hong Kong came under the rule of the British Empire and was only given back to China in 1997. The territory of Macau 'returned' in 1999 to China, which was colonized by Portugal (today Macau is the largest Casino city, measured in gaming – circa 7 times larger than Las Vegas, measured in game-money spend). Some countries at the South China Sea has been colonized by different European nations. China lost the hegemonial rule for many years. Also since the end of the Second World War, China had a very weak economy (under Mao's rule), until the ig Economy Reform and opening of the country came in 1978 by Deng Xiaoping. The government under Mao even avoided sailing in the South China Sea. This gave other players the opportunity to engage in the region. For China, the dominance in the South China Sea is not only an economic or military question, but also an opportunity (to reduce) what Chinese intellectuals describe as historical dishonor or shame. Before China became an economic power like it is today; Japan was for long time the most powerful country (even after the Second World War.) This was another point for China for shame; as many in the nation see it (published literature always state this). In Northeast Asia (China, Taiwan, Japan and Korea) there is the comparison of the goose-swarm. There is a leading goose, and all other countries in the region will have to follow the goose leader. The goose-leadership was clearly dropped from Japan to China. China now hopes, that other nations, as well as the ASEAN-members will recognize China now as this goose-leader. So one reason for being strong at the South China Sea, from an Chinese perspective is the strength itself, which allows for national sentiment and to keep the country together by operating on such sentiments inside China.

Since the 1990s, Chinas economic power and military strength has risen, to a status, in which they can almost compete with countries like the United States of America. The US wants to be seen as global hegemon, but never reached that status anyway; still they are named often the last 'superpower' or 'unipolar power' of today. They became the unipolar 'world-power' after the end of the bipolar world during the Cold War between the Soviet Union and the US. China itself (this can be taken from many speeches of Chinese leaders) does not want to emerge into another bipolar situation (in form of a struggle with the US). To their own words, China does not search for a conflict with the US; however both nations prepare for such an event. The US

actively searched for partners in the South China Sea; however under the Obama administration those strategic goals received a setback; since the US developed another focus during the Bush and later Obama administrations. Donald Trump has changed the viewpoint to a realist viewpoint; from an earlier moral viewpoint of US politics, started by Clinton-Bush-Obama in the previous administrations. One of the first things, Donald Trump decided for, was to enter an economic trade war between the US and China. The problem of the US is, that they do import much more products from China as it is the case vice versa. This trade imbalance has turned into a situation in which China sits on around \$ 3 trillion. With this amount released to the market at once, the US-Dollar could be crushed. China has founded the Asian Infrastructure Investment Bank, which it can use to get rid of US-Dollars by aiding other countries to finance infrastructure projects. This also allows China to develop a carrot & stick policy with neighboring countries. Under China's Silk Road projects in Central Asia, large finance operations already took place, to allow those nations to develop their economy and resources exploitation. The Central Asian situation is believed to be a blueprint for the Blue Silk Road initiative; which however is different to the territory conflicts.

Connection to this thesis: The situation, which scholars believe since 30 years or more, would develop into a full scale war; but hasn't yet; could actually develop into such a situation. The thesis looks at the situation in a game-play kind of analysis.

1.2 Research Question and aim of the thesis

The goal of this thesis is to display the options the players in the South China Sea and external players have.

1.2.1 Research Question

The Research Question: "What are the options and priorities of China, the Philippines, Vietnam and external players such as the US, India and Japan to act in the South China Sea Conflict? "

A Secondary Question: How can this Conflict be displayed by game-theoretic models and will the outcome be displayed similar to what the facts on the ground are?

1.2.2 Aim of the thesis

The Conflict Analysis Group at the University of Waterloo has developed the software 'The decision support system - GMCR II', which has emerged now into a new version GMCR+, which has been developed by Rami A. Kinsara, Oskar Petersons, Keith W. Hipel, and D. Marc Kilgour. With their software, or the previous software, several conflict situations have been researched. Currently the version GMCR+ v.0,4 has been released by Rami A. Kinsara, which dealt with many instability problems of the previous versions. With the software, especially, but not exclusive, scholars at the University of Waterloo, have dealt with analyzing conflicts for conflicts in the past; for conflicts happening in the present or for future conflicts. It can serve as a tool to display options and preferences for several decision-makers, who have unique profiles. Since not all functions are explained by the handbook, they have to be learned from old cases. This is why chapter 2 deals with mostly with practical advice to conduct such a study. Two studies about the Syrian-Iraq dam conflicts, which data is also integrated in the GMCR+ software as example, has been used as an example to explain the functions and theoretical background of the software. The goal here is, that anybody interested in conducting a similar research, can learn in steps how do it; as it was a difficulty for the author of the thesis as well. The thinking process, which went into the research is explained in detail.

Then the game is set up: Decision makers and options are chosen, infeasible states (which doesn't make sense in reality) are eliminated and priorities are given for the players, and outcomes are discussed. The word player is used deliberately, to make clear, this is a game, based on the facts on the ground; but doesn't represent any personal desires. Since the analysis is of future events the term 'players' often fits more than the term 'decision-makers'.

The aim here is to play the conflict as a big-conflict as is (as it displays itself in 2018). The options and best choices of the players will be discussed. For the reader of the thesis, who is interested in the South China Sea conflict, a systematical approach shows the options of different main decision-makers (but not all) in the Spratly and Paracel Islands conflicts. The

countries of Brunei, Indonesia and Malaysia have been taken out of the picture; in favor of a concentration on the players Vietnam and the Philippines, and their game-play with China. (Not with each other.)

1.3 Structure of the paper

This thesis is divided into five chapters.

Chapter 2 has a theoretical and practical approach at the same time, towards Conflict Resolution by support systems. The support system GMCR+ is explained by examples of papers, dealt with similar problems. This provides both for the author and reader as an easier way to understand conflict resolution. Graphs are helping to understand each step of the analysis, which will be done later in chapter 4.

Chapter **2.1** deals with the definitions of conflicts in general as an introduction to the different ways of dealing with it. Chapter **2.2** deals with the setting of graph models and multiple-decision-maker systems. Chapter **2.3** deals in detail how to proceed in conflict resolution analysis with the software GMCR+. Since the handbook of GMCR doesn't allow for understanding all options, another case of the authors & developers of GMCR+ and another author group have been included to explain all options and possibilities by an example. This part is then a mixture of theory and practical example at the same time.

Chapter 3 is an empirical part, which deals with the real-situation at the South China Sea. The reader should get a good impression here, why the conflict is 'as is'. The background of the conflict and its players should be understood, to comprehend the choices at chapter 4, the game.

Chapter **3.1** deals with the historical development of the conflict and chapter **3.2** with the definitions, which are important to understand the conflict at all. Here China's claim is explained as the Nine-Dash-Line demand and definitions and rules, which need to be considered by the UN 'Law of the Sea', the UNCLOS agreement and its definitions, which differentiate islands, from rocks and low-tide elevations and have certain meanings towards

nautical mile zones and rights to gather resources. The conflict between UNCLOS and China's so called 'historical rights' is explained as well. Chapter **3.3** explains what kind of disputes actually are evolving at the South China Sea: Oil & gas, military and economic freedom of navigation and fishing rights. Chapter **3.4** deals with the players, which are chosen for the game of chapter 4. The South China conflict here includes: China, the Philippines, Vietnam and external players such as the USA, India and Japan. Not a full profile of the conflicts with China is given here in form of incidents happened in the past, but more regarding the interests of the players, their intentions and their behavior in general. Chapter 4 should be preparing for understanding the setting of infeasible conditions, options and priorities of the players in the game, but should also deliver an understanding of the real conflict.

Chapter 4 is the analysis of the conflict per GMCR+ conflict resolution. Here chapter **4.1** gives an introduction how the game should be proceeded. Chapter **4.2** explains the players and their options, which is based on the information gathered in chapter 3, together with theoretical approaches of the Chicken Game and an extension of the Prisoner Dilemma. Chapter **4.3** discusses the options, the feasibility-decisions (settings), the priorities and the outcome of the game. This is dealt with in one chapter, since the game has to be altered in such a condition in the first place, that the outcomes show, as they do. The whole process, how the outcome show, is explained in this chapter. Chapter **4.4** discusses the results and the checks & balances, in the game to reduce errors and how the results can be interpreted. Chapter **4.5** serves as a summary and interpretation, but also as an comment on the game-play by GMCR+. Here not only the outcome is discussed, but the whole procedure.

Chapter 5 summarizes in chapter **5.1** the most relevant information concerning the gaming-method, but also regarding the South China Sea conflict itself and makes conclusions in chapter **5.2**, as well as discussing further research and scientific cooperation.

1.4 Methodical approach and choice of theoretical perspective and software solution

The method of this thesis is to approach the theories, which are included in the gaming software GMCR+ to an actual conflict problem in the South China Sea. Before the theoretical viewpoints of conflict resolution are discussed in chapter 2, it has to be explained, why this topic was chosen, why this conflict can be solved by this approach and why this is not a 'negotiation' problem, a 'mediation' problem, but a gaming-situation. Also it has to be explained, why the players do not make group decisions, why there are individual.

Game theory is not able to deal with the full criteria to analyze the conflict, however it gave a good basic idea, to which point the options of the decision-makers can be reduced. The Chicken-game was taken as the most viable option. However it was not possible to display the crash scenario of the Chicken game in the game. (This has been dealt instead by defining priorities and payouts.) Also the Chicken game has been extended to an external player; like we know from a Prison Dilemma scenario, in which they players (the gangsters who either be silent or talk to the police) can be forced by outside powers to react in a certain way (in the prison game that would be the Mafia; in this context a coalition out of the US, India and Japan have been introduced.)

This topic is complex in understanding, which is why examples and analogies guide the reader through the thesis.

1.4.1 Group decisions versus negotiations

All democratic societies use collective decisions as a way for decision-making processes. This area or research is called 'Group Decision and Negotiation (GDN)' in which the goal of collaboration within groups or for individuals in groups is central to the approach. "GDN combines approaches from operations research, computer science, psychology, political economy, systems engineering, social choice theory, game theory, system dynamics, and

many other fields, including Multiple Criteria Decision Analysis (MCDA) ” (Kilgour, Chen, & Hipel, 2010, p. 318). We can differentiate here between the terms of ‘group decision and ‘negotiation’: **Group decisions** are made by at least two parties, who are concerned with a problem; but other parties can be effected as well by the decisions. **Negotiations** are similar, as they see a goal in collaboration; however the decision makers act independently towards that goal. Groups decisions follow a generic process, negotiations follow a specific process. Group decisions and negotiations can rather be **differentiated by: Outcome, process, how many decision makers, common understanding between the participants and how common goals are dealt by the decision makers** (Kilgour, Chen, & Hipel, 2010, p. 318).

In a group decision, the **outcome** is inevitable, while in negotiations a decision-maker (or more) can decide to not come to an agreement at all. While ‘not to act’ can also be a group decision, the group members are ‘forced’ to agree to a group-decision, if they like it or not, the majority (in one form or the other) of group members will make the decision; which means some group-members may stay unsatisfied with the decision. In negotiations, decision-makers only make the decision, they want. The **process** in well-established groups, such as voting, is a method to reach a group-decision, it however doesn’t fit for all participants in the same way. For example if a major player (such as China or the US) have equal voting rights (like Malaysia or Indonesia) in a ‘one state one vote’ system. Voting can also be problematic when states build sub-groups within the bigger group, which could let them vote strategically. In negotiations, the most important factor in the process is persuading the other negotiation partners of a position. The **number of participants** is usually higher in group decisions. Negotiations between two decision-makers are bilateral; group-decisions are mostly multilateral as there have mostly more than two players. **Common ground** is found more often in groups, since it is their purpose to be created to have common interests, but it doesn’t mean that all parties share the same viewpoints. Negotiations have mostly the character, that parties meet for negotiations, because they have opposite interests in the first place. The **type of participation** in negotiations is often represented by professional negotiators, which can be explained by the main goal in negotiations to end better up than the other side of negotiators, while group-decisions are more taken on common ground (Kilgour, Chen, & Hipel, 2010, pp. 318-320).

1.4.2 Cooperation versus conflict – Game theory for the South China Sea

The Game of Chicken is frequently used in 'low-level' conflicts. They use mixed strategies, which are displayed in the following graphic: Here we have aggressive strategies (which are for example China or the US in the South China Sea conflict) or non-aggressive strategies (which are for example the ASEAN member states). This scenario fits for maritime claims, fishing rights, raw materials and navigations rights in the sea. If one decision-maker decides for an option to be aggressive or non-aggressive, the costs or benefits of that option must be determined by the players before they act. The South China Sea conflict has not been hot so far, but the peace is fragile, which is why it is always the question if the players stay cooperative or be non-cooperative (there is permanent change of the situations of single states towards China). Here we do not have a group-decision in ASEAN (it's not a military cooperation organization) member states. For the analysis in this thesis, the problems have to be reduced in its complexity – Game Theory helps to define certain options the players have and understand the ground-structure of the conflict itself. This conflict is one, which is written about since the 1990s in Strategic Books, Neorealist gameplays and discussions and has yet not become hot. There is the future scenario that China and the US will be in conflict about the South China Sea and the Southeast Asian states may side with the US, to contain China. So we can reduce the scenario to the decision-makers to: Act aggressive or act non-aggressive in the single issues or at whole. The countries of Southeast Asia have to be seen as a non-cooperative-group; they cooperate only on economic, cultural and educational issues so far. The political statements of ASEAN as a group might be considered as less as the Queen of England – They are practically not existent (in a strong voice). Many states do not only have a conflict against Chinas territorial claims, but also between each other. Also there could be gains then by behaving aggressive, but it is unlikely the winnings will be more than the potential costs (including a larger military conflict). A change in the current situation could bare large costs. The graph shows the situation in regard of resource exploitation (for example gas & oil). Both players could have an aggressive claim for territory & resources, or a passive claim. If both players stay passive, they can both explore resources; if both are aggressive nobody wins; and if one side is aggressive and the other side passive; the passive side loses to the aggressive player. While the conflict is very complex, the situation between the single

countries can be narrowed down to this; not yet including outside actors, such as the US, Japan or India (Green, 2016, pp. 23-25).

		Country A	
		Passively assert claims	Aggressively assert claims
Country B	Passively assert claims	parallel resource exploitation parallel resource exploitation	gain exclusive territorial rights loss of any resources
	Aggressively assert claims	loss of any resources gain exclusive territorial rights	loss of resources + open conflict loss of resources, + open conflict

Figure 1: Game theory of South China Sea dispute (Green, 2016, p. 24)

The following graph illustrates the benefits and costs of the aggressive or passive approaches. The assumption here is, that benefits and costs are equal for both countries involved in the conflict. If one decision-maker decides for an aggressive approach and the other for a passive approach, the aggressive decision-maker gets 2x (100%) of the resources, while the passive decision-maker gets zero. If both decision-makers come to an understanding, each of them gets 1x. If both decide to be aggressive and start a conflict, both decision-makers make less than 0 (they have higher costs). **The South China Sea conflict is similar to the Game of Chicken.** If two cars go against each other on a road; the one who 'chickens out' and leaves the road may end up at some roadside ditch. The one who stays then on the street wins. But when none of the players choose to give way and choose the roadside ditch, both collide with each other and both cars may be destroyed and passengers hurt. If in the South China Sea

conflict two sided take military actions, both will lose much more than they could have gained by making a deal. The only **problem with this Game of Chicken scenario** is that China and any other game player from Southeast Asia is not equal and China loses only $-Y$ when, the South East Asian state has found a partner to contain China it its aggressive approach (Green, 2016, pp. 25-27).

Country and Behavior

		A	
		Passive	Aggressive
B	Passive	X / X	0 / $2X$
	Aggressive	$2X$ / 0	$-Y^*$ / $-Y^*$

$Y^* > X > 1$

Country and Behavior

		A	
		Passive	Aggressive
B	Passive	1 / 1	0 / 2
	Aggressive	2 / 0	$-Y$ / $-Y$

$Y = Y^*/X > 1$

Figure 2: Game theory of South China Sea dispute (outcome) (Green, 2016, p. 25)

2.0 Conflicts

2.1 Strategic Conflicts

Conflicts asks for a problem which needs to be solved. It can be solved by taken action or by taking no action – But at least a decision has to be made about the problem at hand. What help (individuals) to understand a conflict better, is to reduce the problem, to make it simpler for understanding and what the consequences of decision would be. A ‘**formal conflict model**’, which is based on mathematics, should at best have an approach, which reflects the reality. In such a model all decision-makers have options, what kind of actions can be taken or not be taken. For each player there should also be **preferences for certain** states, which can occur while playing the game-scenario. Moves and countermoves has to be taken under consideration. A move might just be played if a countermove from another player (which should be expected) could make the outcome less preferable. Taking such a possible countermove into consideration, could change the player’s decision in the first place, not to make the first move in the first place. A set or a moment in the decision-making process, which will not be changes anymore by the player, can be called a stable’ situation; at least for that player – it doesn’t have to be stable for all other decision-makers. A **stability-analysis** (in a formal conflict-study) is practically a ‘what-if’ way of thinking, what also individuals are doing for themselves, when thinking a problem through to the end. A state in which all decision-makers have found a viable solution can be called **resolution or equilibrium**. The stability-analysis itself should present the most likely outcomes, or what outcomes might be possible. It can also be used to analyze conflicts which have taken place in the past, to see what options the decision-makers then had; and if they took the most likely option, according to game info. A formal approach to conflict solution, for example with a software das GMRC+, allows also for **follow up analysis**. The Status Quo and the steps towards an equilibrium can be analyzed; it can be experimented with the model, by changing the preferences of players, to see if the results of the game are changed by that (Xu H. , Hipel, Kilgour, & Fang, 2018, pp. 5-6).

Strategic conflicts are defined by Kilgour & Eden (2010) as interactions with at least two or more decision-makers, which act independent and in accordance with their (states) goals. Those conflicts have an interactive character (which also means game theory alone cannot find the answers). Every decision maker in the conflict has a choice of options, how to react to a certain problem or to a set of problems. The choices could have two or three alternatives. For example: Come to an agreement by negotiation & mediation; take an active aggressive approach; take a passive approach. The options the decision makers can take, depend of course on the situation; but for analyzing strategic conflicts, they have to be kept simple. The other decision-makers make their decision also based on (the assumptions) how the other decision-makers make theirs. A decision within such a model with different decision-makers will ultimately lead to: the decision-makers been better off, or been worse off. In those problems the neutral states, who are not been bothered, will not be part of such an analysis in the first place. Strategic conflicts can occur between states, between actors on the national level or even within families or in personal relationships. To analyze conflict, it needs not only methodologies, which are not too complex (so they can't be understood), but also has to take other perspectives into consideration, such as mediators or policy-makers, who interfere in conflicts or deals with them (Kilgour¹ & Eden, 2010, p. 203).

Neumann & Morgenstern (1944) had been the first authors, who were dealing with '**non cooperative game theory**'. **Different game theories** have approached, who deal with conflicts and the possible solutions; but those problems were also addressed in Economics and social science. One characteristic of non-cooperative-game theory is: The model has to be normative; there has to be the assumption that the decision-makers would act rational to a problem. Irrationality cannot be (or can rarely be) included into such models. One example from game theory here would be from Nash (1950), the 'Nash Equilibrium', which is (or which are) points in which the decision-makers can reach a point to find a common solution, which can be a rational decision to all of the decision-makers. It is not an optimal point for an individual player; for example it might be better for one party to act aggressive and win more in the game; but when both parties would decide to be aggressive both would lose. In the Nash Equilibrium they find themselves in a non-mediated rational solution which can be seen as a 'minimal-standard' within the process. Nash's model was easy to be understood by drawing a table; since the emerge of computer science, much more complex models can analyze more

complex decision structures. The difference in strategic gaming is: Here it is possible to have a non-fix order of actions of the decision makers. In game theory the decision are rather static, they have to be clear before the game starts. In strategic games, the moment of when an interaction is done, can make a huge difference. Strategic conflicts treat decisions more realistic – the players have options and preferences, but their preferences can be relative. Options in strategic games are not one-dimensional like: I don't get the Island X, so I will be in war with country B. Strategic games also cannot be too complex, but they allow for more interactions and options (Kilgour1 & Eden, 2010, p. 204).

Another step to become more realistic in the analysis of conflicts, was Nigel's (1971) 'Theory of **metagames** and Political behavior'. In this theory decision makers were already able to make their move at any given time, not preplanned as in Game Theory. Also there is no restriction of cardinal games. The following graph presents the difference of cardinal contra relative games. In cardinal games, preferences are being preserved, and information are not changed. Metagame analysis uses on the one hand the Nash Equilibrium, but also the 'general metarationality' and 'symmetric metarationality'. This system allows for decision making, which leads either to an improvement or to sanctions by other decision makers. The sanction could be answered by a 'countermove' (Kilgour1 & Eden, 2010, p. 204). For Neumann-Morgenstern utilities and Cardinal Preferences, the number of choices only have a 'finite number'. For infinite choices under this system, there have to be rules, which have to be limited in its character. Both in finite and infinite choice, the number of players is however limited too. There are choices of uncertainty, but only by a limited choice, both in Neumann-Morgenstern utilities and Cardinal Preferences. Both can be displayed by an utility functions including preferences of choices (Chichilnisky, 1985, p. 633). "The main distinction between ordinal and cardinal preferences lies in the size of the equivalence classes of their utility representations. Cardinal preferences have smaller equivalence classes than ordinal preferences: the representation of a cardinal preference by a utility function is unique up to (and only up to) positive linear transformations of the real line. For ordinal preferences, however, the representation is unique up to any positive transformation" (Chichilnisky, 1985, pp. 633-634).

A next step was the '**Conflict Analysis**' by Fraser & Hipel (1979, 1984) – It takes the metagame approach and adds 'Sequential Stability'. It is able to include that actors do not start with sanctions, if they would be damaging themselves by such a step. One outcome was proven at least (using the model), that can always be considered as 'stable' for all players. Actions can be taken at the same time by several players simultaneously. Stability analysis becomes then necessary for all decision makers. To cope with this task Fraser & Hipel worked on a 'decision support system (Kilgour1 & Eden, 2010, pp. 204-205).

The **Graph Model for Conflict Resolution**, which is used in this thesis, expands the conflict analysis to many dimensions. Graphics are helpful to be able to understand the complex models. It deals with the stability problem; the decision-makers options are shown graphically. GMCR II and the later Version GMCR+, which is used in this thesis is a program, can deal with stability and post-stability problems. One element for example is Drama Theory, which deals with changes in preferences. The Graph Model allows for more understanding of Strategic Conflict and makes it more transparent to see the motivations of the decision makers (Kilgour1 & Eden, 2010, p. 205).

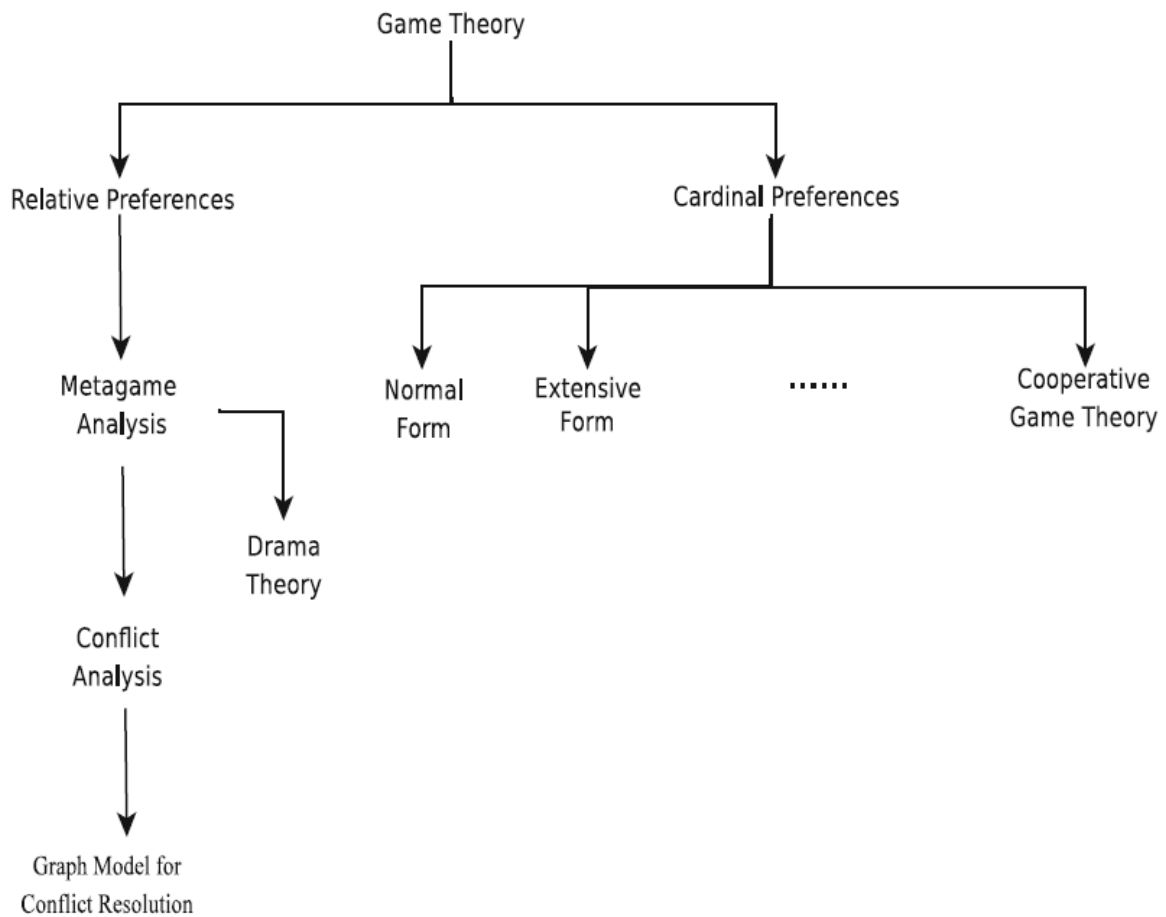


Figure 3: Development of conflict analysis based on Game Theory (Kilgour1 & Eden, 2010, p. 205)

Xu, Kilgour, Hipel & Kemkes (2002) compare the methodologies with each other; as pictured in the following graphic. The comparison is made by four criteria: relative preferences, cardinal preferences, decision to cooperate and flexible order of moves. The first three methodologies, are the result of the work of Neumann & Morgenstern: The normal form, extensive form and cooperative form. The second row are metagame analysis, introduced by Howard (1971), improved and extended by Fraser & Hipel to conflict analysis, as well as GMCR and drama theory, which later emerge to GMCR+. We can see, that only the metagame approach is able to analyze with the options to cooperate and takes into consideration a flexible order of moves (Xu, Kilgour, Hipel, & Kemkes, 2010, pp. 318-319).

Formal methodologies	Relative preference	Cardinal preference	Decision to cooperate	Flexible order of moves
Classical game theory techniques				
Normal form		✓		
Extensive form		✓		
Cooperative form		✓	✓	
Metagame-based methods				
Metagame analysis	✓	✓	✓	✓
Conflict analysis	✓	✓	✓	✓
GMCR	✓	✓	✓	✓
Drama theory	✓	✓	✓	✓
Other approaches				
Fair division techniques		✓		
Voting procedures		✓		
Q-methodology		✓		

Figure 4: Formal methodologies to model and resolve conflict (Xu, Kilgour, Hipel, & Kemkes, 2010, p. 319)

2.2 Graph Model for Conflict Resolution (GMCR)

2.2.1 Basics of the Graph Model: Multiple decision-makers, attitudes and preferences

In the Graph Model for a strategic conflict, all decision-makers need to be specified and set with options and their preferences. The decision makers as well as the set of states are not finite. The **set of states itself is defined by their preferences**. ‘Orientation arcs’ are movement, the decision makers are able to do. The decision makers are able to make coalitions. They have to be taken into account, as the actions of the decision makers depend also on which coalition they think are most feasible for them (Xu, Kilgour, Hipel, & Kemkes, 2010, p. 321).

The graph model has the advantage, that it can deal with **conflict resolution of multiple decision-makers**, even when they have uncertain preferences. The decision makers are allowed to act dynamic to decision-maker’s options and their preferences (strong ore mild).

But the preferences might even be unknown. The graph model allows for ‘modeling, analyzing and understanding strategic conflicts’. The model defines a moment in time, for example 5th August 2018, which is defined as the Status Quo; then the model is run and the result will be called post-stability. The state of status quo will be changed by the game-algorithms and a result will be calculated. Between status quo and the end of the game, there can be several small steps and therefore several ‘states’. The model will calculate from state to state until an equilibrium is found; depending on the moves the players make and how other players answer with countermoves. The end of the game is the state of stability analysis. Three different preferences can be chosen: simple, uncertainty and strong (Xu H. , Hipel, Kilgour, & Chen, 2010, pp. 498-499).

One of the major influences on the results of decision-making is setting the priorities of the options of the players. Compared to game theory this changes the rationality of decisions. Walker, Hipel & Inohara (2012) speak here about ‘**dominating attitudes**’. Here the focus is on the ‘most important attitudes’ of the decision-makers. The process or the end-game is not completely open, because certain decision-makers have certain goals in the first place. The authors give an example about a conflict between an environmentalist and a company which needs to dispose of industrial waste. Their dominating attitudes are clear: The environmentalists would want the industrial players to take care of their waste in an responsible manner, while the main interest of the industrial players is to end the nagging of the environmentalists to get out of negative public opinion. The dominating attitudes can be taken into consideration by GMCR(+) by taking their priorities into consideration. While we can think of real-life examples of bribery, the likelihood of either side backing down for no reason has to be considered and can be excluded or reduced by the model. In a conflict ‘multiple attitudes’ can be present. Prioritization according to dominating-attitudes can help to reduce the problem of decision-making. If a decision-maker backs off on uncertain goals to fulfill others, they most likely face a trade-off. To have clearer given utilities / preferences of the decision-makers more relevant goals can be reached by the decision-makers in the gaming situation (Walker, Hipel, & Inohara, 2012, pp. 316-317).

In a game with **multiple decision-makers**, they may have different attitudes, also amongst each other. One decision-maker can have a certain strong or weak attitude against another

decision-maker; while some decision-makers can have similar interests against one major player. (For example: In the South China Sea conflict all Southeast Asian countries may have a certain interest against the Chinese interests; but for Vietnam this attitude against China to get access for resources can be stronger than Malaysia's attitude against China.) By creating a set of attitudes, decisions will be made more precise in a game. Also the decision-making process is more open towards a solution, since the endgame can be more flexible (Walker, Hipel, & Inohara, 2012, p. 324).

Preferences can be of manifold characteristics. The graph model can display some characteristics. However there is the discussion of expanding the model towards including other preferences of uncertainty, which yet cannot be dealt by GMCR+. Preferences are never 'fully known', since uncertainty in decisions can come from different behavioral factors, psychological factors, power-dimensions and other factors. Preferences can be either of individual character or coalitional character in regard of stability (Xu H. , Hipel, Kilgour, & Fang, 2018, p. 415).

Uncertain preferences are according to (Xu H. , Hipel, Kilgour, & Fang, 2018, p. 415):

- Unknown preferences
- Fuzzy preferences: Fuzzy means, decision-makers have preferences towards certain states (options), but they are not absolute clear. This means the 'stability' of decision-making is not clear.
- Grey preferences: "Permitting preferences to be "grey" is a means to capture uncertainty in preferences consisting of either discrete real numbers, intervals of real numbers, or combinations of them."
- Probabilistic preferences: Taking probabilities into consideration means certain risks can be considered.
- Combination of preferences: These are for example called hybrid preferences in different research papers; but they can also be different preference structures combined.

Research in regard of the graph model can also take into consideration that decision-makers are not rational at all times, but can also be driven by: **Attitudes, emotions or hypergames** (misperceptions). In conflicts there are foes and friends or there is a neutral attitude towards players. If players have positive attitudes about each other, it is more likely, that those can come to a win-win situation. Emotions are much more difficult to calculate, since they happen in 'situations' while a conflict is going on, as fast reactions. They can be taken into consideration by changing the strength of preferences in the graph model. Hypergames are misconceptions / misunderstanding, which are taken into consideration, since in reality not all actors have full information and act rational; they can also act on false or misunderstood information (Xu H. , Hipel, Kilgour, & Fang, 2018, p. 416).

2.2.2 Stability analysis

The equilibrium in a strategic conflict is then reached, when all decision-makers have reached a stable state. Stability is then reached, when a decision makers wouldn't move (under the assumption of rationality) to another solution. The Graph Model has different definitions and methods to reach stability" Nash Stability (Nash), General Metarationality (GMR), Symmetric Metarationality (SMR), Sequential Stability (SEQ), Limited Move Stability (Lh), and Non-Myopic Stability (NM) (Kilgour1 & Eden, 2010, p. 2018).

The following graphic shows the behavior of those stability definitions and methods. It shows how much steps a model can include foresight. The more steps, the more complex is a model. The Nash Equilibrium is for example able to plan only one step in foresight. It has then no disimprovements (disimprovement = a state in which an improvement may turn into an outcome which is worse in reality) , because other decision makers must do their decision at the same moment; they cannot change their decision after they and the other players made the decision. For example: In a chicken game with two cars who drive against each other, either one or both players may decide to chicken out and avoid the crash, or they don't. But they cannot wait until one of the decision makers made their decision, to wait and see what the best response would be. This is possible only if there are more steps of foresight. The other models with more foresights then can 'disimprove', for example by sanctions or by other strategic decisions. The NM model has an unlimited set of foresights, which can be described

as an ideal or ‘ultimate’ way of conflict resolution. For the Graph Model, Nash, GMR and SMR are used by decision makers who lack of knowledge. Decision-makers who gained knowledge (what kind of improvements are possible) use the SEQ model (Kilgour1 & Eden, 2010, p. 209).

Definition	Foresight	Disimprovements	How does focal DM (<i>i</i>) anticipate that other DMs will respond to <i>i</i> 's improvement?
Nash	1	Never	None
GMR	2	Sanctions only	Will sanction <i>i</i> 's improvement at any cost
SMR	3	Sanctions only	Will sanction <i>i</i> 's improvement at any cost
SEQ	2	Never	Will sanction <i>i</i> 's improvement, but only using their own improvements
L_h	$h \geq 1$	Strategic	Symmetric; others optimize for themselves, just like <i>i</i>
NM	∞	Strategic	Symmetric; others optimize for themselves, just like <i>i</i>

Figure 5: Stability definitions in the graph model (Kilgour1 & Eden, 2010, p. 209)

Xu, Hipel, Kilgour & Fang (2018) discuss different extensions of the graph model in regard stability definitions (Xu H. , Hipel, Kilgour, & Fang, 2018, p. 418):

- Limited-move stability: Decision-makers are able to make moves and countermoves in the game until they are no more better off, by moving from the Status Quo; also the Status Quo can already be the best point and the decision-maker wouldn't move at all.
- Non-myopic stability: Decision-makers can move fast and with bound (not in small steps, but in a big step).
- Stackelberg equilibrium: Here we have different actors: Some actors are more powerful than others (for example market leader of national gas stations, who controls the gasoline price). Leaders or most powerful players are called Stackenberg leader and the less powerful players Stackelberg followers. (The name comes from the original author Stackelberg (1934))
- Policy stability: A policy is ‘a plan of actions’ on which basis a players action can be taken into context.
- Generalized metarational stability: “A metarational tree is defined within GMCR, providing a general framework within which rational behavior among DMs can be described for any number of moves”

2.3 Support System GMCR+

2.3.1 About different GMCR versions & development

The GMCR+ version is the third version of the program, which was originally introduced in **1990** as **GMCA or GMCR I** and was followed by **GMCR II in 1999** and **GMCR+ in 2014**. All of those share the common solution concepts of: 'Nash, GMR, SMR and SEQ'. What changed from GMCR I to GMCR II was a higher capacity to deal with 600 states instead of 200 states in two player model or 100 states in a multi-player model [The game played in this thesis would than not be possible under version 2]. GMCR+ is unlimited in this regard, only limited by RAM (the machine memory) and the processor power. Much different is the representation of results, which changes from plain text to table form with GMCR II and different reporting styles such as tables, graphs and insightful texts in the GMCR+ version. Since version II the program is user friendly. The biggest differences however lay in the way the output is presented and interpretation is supported (GMCR+ - SS-Comparison-Table (by Rami Kinsara), 2018).

The following graph shows the different options of input & output capabilities of the different versions as well as post analysis tools, which were mostly introduced with the 2014 version. Since then various subversions have been published to fix error issues or broaden details. The main persons behind GMCR+ are Keith Hipel, Marc Kilgour and Rami Kinsara (University of Waterloo - GMCR+ Website, 2014).

Input Capabilities	Option Form	×	✓	✓
	Preferences Prioritization Input	×	✓	✓
	Graphical User Interface	×	✓	✓
	Infeasible States Removal	×	✓	✓
	Handles Reversibility	×	✓	✓
	Handles Intransitive Preferences	×	×	✓
Output Capabilities	Stability Explanation	×	×	✓
	Categorization of Equilibria	×	×	✓
	Interactive Status Quo Analysis	×	×	✓
	Graph Drawing	×	×	✓
	Interactive Graphs	×	×	✓
	Advanced Coalition Analysis	×	×	✓
Inverse GMCR	Inverse GMCR Capability	×	×	✓
	Post Analysis Capabilities	×	×	✓
	Scenario/Strategy Suggestion	×	×	✓
Design	Modular Design (Expandable to add new advancements)	×	×	✓

* Depending on the machine memory and processing power

Figure 6: GMCR I, II and + comparison (GMCR+ - SS-Comparison-Table (by Rami Kinsara), 2018)

2.3.2 Components of the GMCR + support system and applicability to conflicts

The GMCR+ software has **four main areas**: The utility buttons, which allow for create new games, saving and loading games. Here the programmers have included old researched problems on which papers have been written about. The users can load it to get orientation points for their own research. The navigation bar on top contain all the steps the game is constructed from left to right in logical steps. There is a reference & Info area and an area in which data is put in (Kinsara, 2014, p. 2).

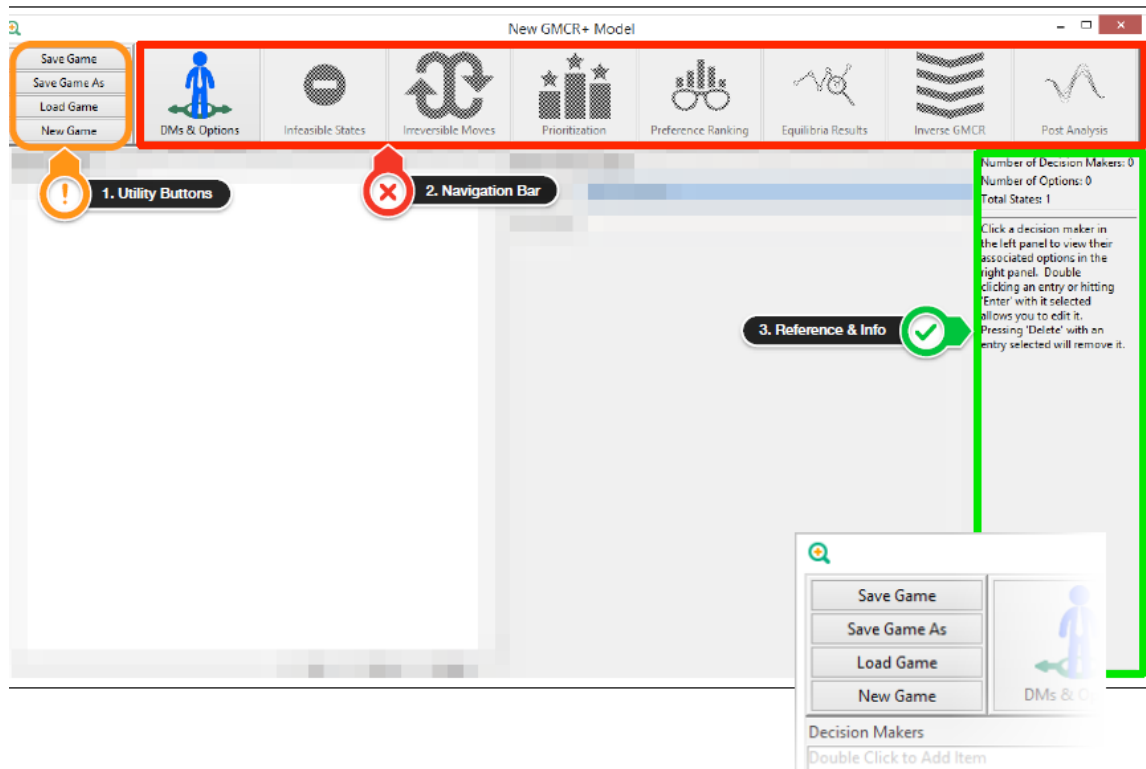


Figure 7: GMCR+ Software screen (Kinsara, 2014, p. 2)

The following chapters will explain the most important functions of GMCR+ by an example of the main developers of GMCR+ themselves. They analyzed a river conflict between Syria and Iraq; which was a real world conflict, and repeated itself several times in history. The **order of analyzing a conflict with GMCR+** is, as the following graph shows. First, the decision-makers and their options have to be defined. Next step is to analyze the possible states, which players might choose in the game. Those states can be specified by giving them preferences, which best suits the reality. Now the model for the conflict has been set. Next would be different possible forms of analysis. First there is a stability analysis, to examine, how stable those states are, which are shown as results after the modeling-phase. Stability-Analysis could be either take place on an individual basis or can be examined by coalition analysis. After those steps have taken part, an equilibrium should be the result. From here one different follow-up analysis can be done; such as a sensitivity analysis or the evolution of a conflict. Either the raw-data from modeling or the analysis-data can be a basis of information for decision-makers, analysts or persons, who are interested in analyzing a conflict in general (Xu H. , Hipel, Kilgour, & Fang, 2018, pp. 6-7).

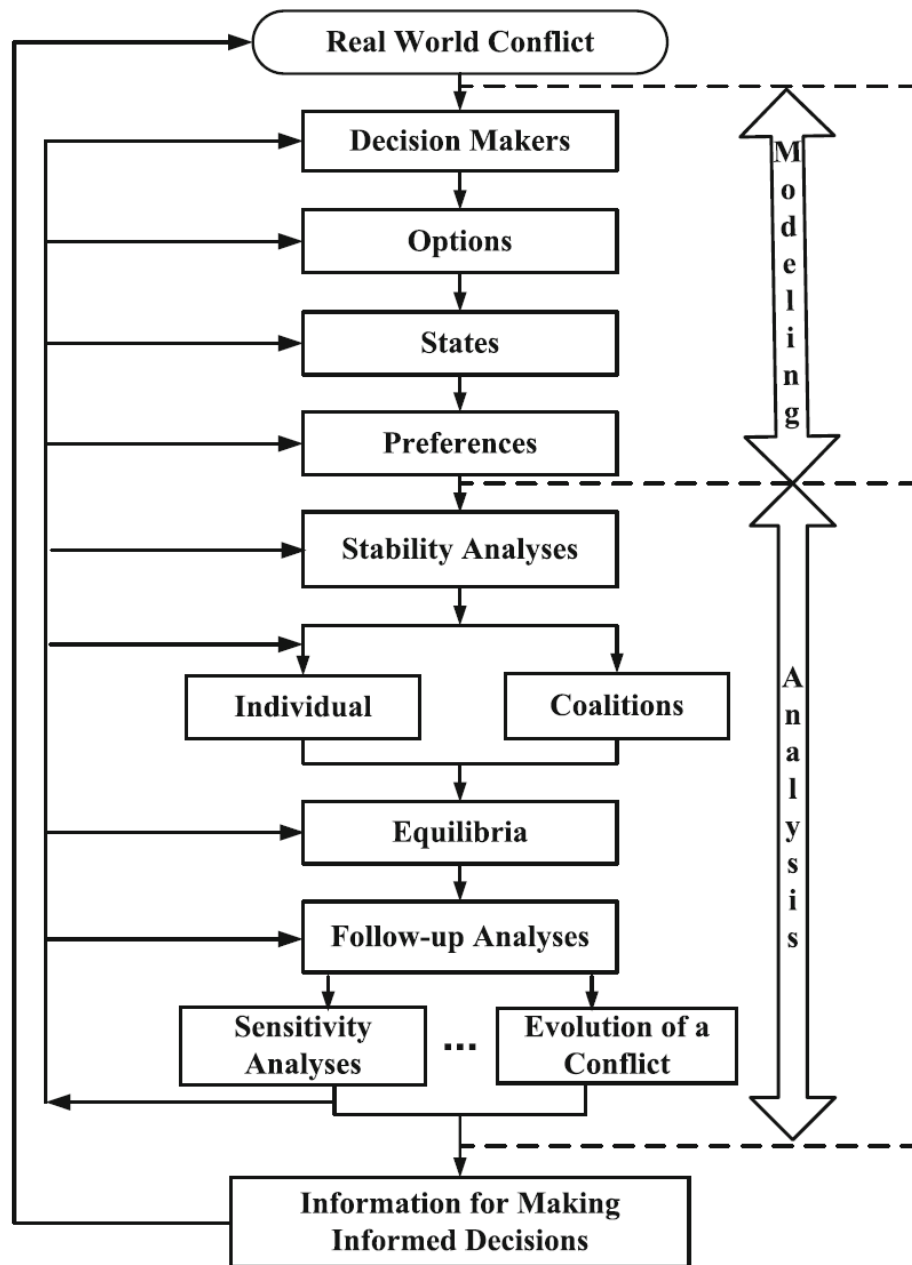


Figure 8: Application of real conflicts with GMCR+ (Xu H. , Hipel, Kilgour, & Fang, 2018, p. 7)

2.3.3 Entering decision makers and options into GMCR+

The first information has to be out in DM & Option: Here new decision makers and options have to be put in. **For demonstration and better understanding: The included scenario between Syria and Iraq has been loaded on the GMC+ Software. It's based on Hipel, Kilgour & Kinsara (2014) and similar to Faris, Al-Mohseen & Hipel (2016), who researched the**

Euphrates conflict, a river which goes downstream from Turkey to Syria and Iraq. The river lays 40% in Turkey, 25% on Syrian territory and 35% on Iraq's territory. While the following graph shows the problem reduced to Syria and Iraq, the researchers looked at all three countries. In GMCR+ the decision-makers Syria and Iraq have then put in as data, with their options. Syria as an upstream country has the options to release water or to escalate the situation, while Iraq, as an downstream country has only the option to attack (Faris, Al-Mohseen, & Hipel, 2016, p. 295); GMCR+ Software example.

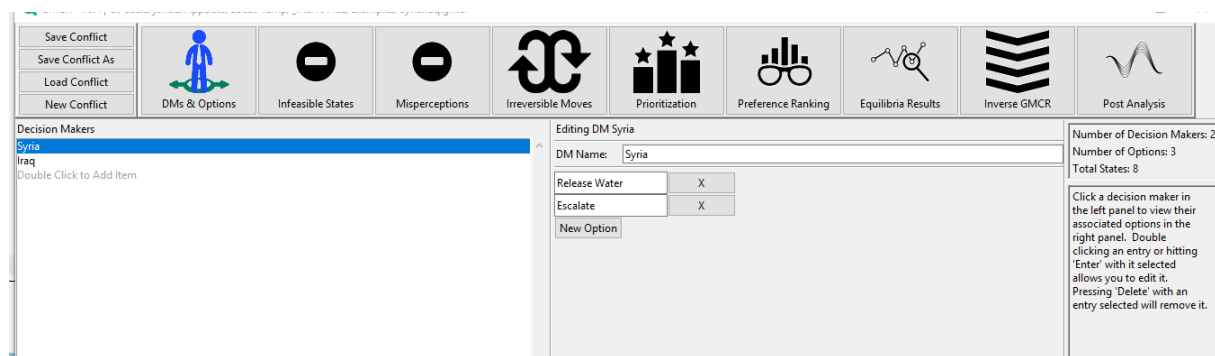


Figure 9: GMCR+ (Decision Makers & Options) (Program Screen Shot)

In their paper Faris, Al-Mohseen & Hipel (2016), did it differently as in the GMCR+ example above. They allowed for four different options for each player, which considers Turkey as the Upstream country and allow them the option to continue (with reducing the water supply), increase the water supply, taking even more water from the river or sign a treaty. Meanwhile Syria and Iraq as Downstream countries only have three options to either accept what Turkey is doing or collaborate with each other against Turkey, or sign a treaty. Syria however has the option itself to reduce the water supply to Iraq, as Iraq is the last downstream country. Now 12 options have been put in the software, which would mean that 4.096 states would exist. The software now differentiates between feasible and not feasible solution. In the following graph we see only the feasible states (Faris, Al-Mohseen, & Hipel, 2016, pp. 297-299).

Table 1. The Decision makers and their options

D Ms	Options
Turkey	1. Continue the current situation. (Continue) 2. Increase the release of water. (release more water) 3. Escalate the situation by carrying out more storage and withdrawals. (escalating) 4. Sign a treaty. (Treaty)
Syria	1. Accept the current situation. (Accept) 2. Increase its share on the water at the expense of Iraq. (Withdraw) 3. Collaborate with Iraq in making an international complaint. (Complain) 4. Sign a treaty.(Treaty)
Iraq	1. Accept the present situation. (Accept) 2. Collaborate with Syria in making an international complaint .(Complain) 3. Use incentives with the other countries and other forms of economic cooperation. (Incentives) 4. Sign a treaty .(Treaty)

Table 2. Feasible states in Euphrates River Conflict.

		OPTIONS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Turkey	1	CONTINUE.	Y	Y	N	N	Y	Y	N	Y	N	N	Y	N	N	Y	Y	N	N	N	N	N	N
	2	RELEASE MORE WATER	N	N	Y	N	N	N	N	N	Y	N	N	Y	N	N	N	Y	N	Y	N	Y	N
	3	ESCALATING	N	N	N	N	N	N	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N
	4	TREATY	N	N	N	Y	N	N	N	N	N	Y	N	N	Y	N	N	N	Y	N	Y	N	Y
Syria	5	ACCEPT	N	N	N	N	Y	N	N	N	N	N	Y	Y	Y	N	N	N	N	N	N	N	N
	6	WITHDR.	N	N	N	N	N	Y	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N
	7	COMPLAIN	Y	N	N	N	N	N	N	N	N	N	N	N	N	Y	N	N	N	N	N	N	N
	8	TREATY	N	Y	Y	Y	N	N	N	Y	Y	Y	N	N	N	N	Y	Y	Y	Y	N	Y	Y
Iraq	9	ACCEPT	Y	Y	Y	Y	N	N	N	N	Y	Y	N	N	N	N	N	N	N	N	N	N	N
	10	COMPLAIN	N	N	N	N	Y	Y	Y	Y	N	N	N	N	N	N	N	N	N	N	N	N	N
	11	INCENTIVES	N	N	N	N	N	N	N	N	Y	Y	N	N	N	N	N	N	N	N	Y	Y	Y
	12	TREATY	N	N	N	N	N	N	N	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

The GMCR+ software does not differentiate itself between feasible and non-feasible states; it generates a list; which then has to be reduced manually. Opening the infeasible button, the list opens and allows for checking those. The button on the left ‘Remove as infeasible Condition’ allows for removing all such conditions from the model. " Remove as Mutually Exclusive Options" makes a list of options, which makes no sense to take at the same time. In our Syrian-Iraq example that would be for example (for a mutually exclusive option) Syria releasing water and escalating the situation at the same time. As shown in the following graph this condition creates two infeasible states (Kinsara, 2014, pp. 4-5). GMCR+ can deal with finite decision-makers and also their options cannot be only manifold, but also finite. With the help of a decision-support system, it is possible to subtract the infeasible states. This differentiation between feasible and infeasible states is called the ‘Option Form’, invented by Nigel Howard (1971) (Xu H. , Hipel, Kilgour, & Fang, 2018, p. 12).

The screenshot shows the GMCR+ software interface with four frames:

- Frame (1):** Contains settings for two players, Syria and Iraq. For Syria, 'Release Water' and 'Escalate' are set to 'Y' (Yes). For Iraq, 'Attack' is set to 'Open' (indicated by a radio button). Below these are buttons for 'Remove as Infeasible Condition' and 'Remove as Mutually Exclusive Options'.
- Frame (2):** A table titled 'Infeasible St' with columns: Infeasible St, # of States D, # of States R. It contains one entry: 'YY-' with values 2 and 2.
- Frame (3):** A section for 'Feasible States' with a 'Format' dropdown menu showing 'Pattern', 'List (YN)', and 'List (ordered)'.
- Frame (4):** Displays state counts: 'Original States: 8', 'States Removed: 2', and 'Feasible States: 6'. It also contains a text box explaining how to enter infeasible states.

Figure 10: GMCR+ software (Infeasible states) (Kinsara, 2014, p. 5)

The article on which the software example of GMCR+ is based, by Hipel, Kilgour & Kinsara (2014), is based on three conflict which occurred in the past in: 1975, 1990 and 1998. The main problem as of Faris, Al-Mohseen & Hipel (2016) is the same in this article. The 2016 work can be seen as an extension (or reduction of Turkey) in this conflict. The analysis can both be used to analyze the future event in an game play; or the researchers could decide to game-play the already existing conflicts. The software example which is demonstrated as an example in the software is based on the historic conflict of 1975 between Syria and Iraq (Hipel, Kilgour, & Kinsara, 2014, pp. 355-359).

In the 1974 dispute (Hipel, Kilgour, & Kinsara, 2014, pp. 355-359) the reality was:

- “Late 1974 The filling of Keban and Thawra dams started
- Early 1975 Iraq complained about the flows in the Euphrates dropping from the normal 920m³/s to an “intolerable” 197m³/s. Iraq requested that the Arab League intervene. However, Syria said it was receiving less than average flow and dropped out of the Arab League. Both countries amassed their troops on the shared borders and the situation escalated
- June 3, 1975 Intervention and mediation efforts by Saudi Arabia are at last successful and war was averted. Agreement details were not announced”

Hipel, Kilgour & Kinsara (2014) have looked at the conflict between Syria and Iraq only. They have classified Syria as the upstream country with either the option of releasing water from the Thawra Dam and let it flow into Iraq or by continuation of building the dam, by practically not taking an action other than they planning. Syria has another option by escalating the situation and directly cutting any ties with Iraq and start military actions or starting military games at the border to create a threatening environment. Iraq has in this game only the option or retaliation militarily by attack (bombing the dam and go into a war with Syria) or to take no action at all against the dam building activity. The authors also took a 'Third Party' into consideration, which have been given the simple option of intervention or no intervention. The third party has been described by the authors as Saudi Arabia + the Soviet Union, which are believed to have similar preferences here. The authors have analyzed the conflict once without the Third Party and at another time with the Third Party invention option (Hipel, Kilgour, & Kinsara, 2014, p. 359).

The following graphic shows Hipel, Kilgour & Kinsara's (2014) model of the water conflict between Syria and Iraq with the options and with the Third Party included. Y means practically: Yes do something; N means either: Not do something (don't take extra action) or maybe don't do something (Hipel, Kilgour, & Kinsara, 2014, p. 360).

DM	Option	Choice	Description
Syria	1. Release water	Y	Syria agrees to halt the filling of Thawra Dam and let the Euphrates flow into Iraq
		N	Syria continues to fill its dam
	2. Escalate	Y	This could be done by cutting relations with Iraq, sending troops to the shared border, closing the air space to Iraqi aircraft, or any combination of these actions
		N	Syria does not undertake any of the escalating options
Iraq	3. Attack	Y	This includes bombing of the dam and going to war with Syria
		N	Iraq does not act and accepts the situation
Third Party	4. Act	Y	This includes mediation and reconciliation between the two countries and monetary support
		N	Do not intervene

Figure 11: Decision-makers and options of the Syria / Iraq dam conflict of 1975 (Hipel, Kilgour, & Kinsara, 2014, p. 360).

The 1975 model of Hipel, Kilgour & Kinsara's (2014) allowed for 6 different states when the Third Party has not been included in the model; and for 12 different states, when the Third Party (intervention or mediation) is part of the game-model. As the authors did, the states can be labelled with numbers, so it can be easily be found later (Hipel, Kilgour, & Kinsara, 2014, p. 361).

Table 3 DMs, options and states for the 1975 conflict without the Third Party

DM	Option	States					
Syria	1. Release water	N	Y	N	N	Y	N
	2. Escalate	N	N	Y	N	N	Y
Iraq	3. Attack	N	N	N	Y	Y	Y
Label		1	2	3	4	5	6

Table 4 DMs, options and states for the 1975 conflict with the Third Party

DM	Option	States											
Syria	1. Release water	N	Y	N	N	Y	N	N	Y	N	N	Y	N
	2. Escalate	N	N	Y	N	N	Y	N	N	Y	N	N	Y
Iraq	3. Attack	N	N	N	Y	Y	Y	N	N	N	Y	Y	Y
Third Party	4. Act	N	N	N	N	N	N	Y	Y	Y	Y	Y	Y
Label		1	2	3	4	5	6	7	8	9	10	11	12

Figure 12: Decicion-makers and staes of the 1975 dam conflict between Syria and Iraq (Hipel, Kilgour, & Kinsara, 2014, p. 361).

2.3.4 Option prioritization

The next step is to define transactions and **define relative preferences**. (For example if Turkey signs a treaty with the other game placers, the game must come to an end, by reaching an equilibrium.) The (real) preferences are always relative, since they are not a result of physics laws, but results by human-decisions, which can be driven by different factors, such as emotion, different value-systems, different action-taking and reactions (countermoves). GMCR+ only needs relative preferences to calculate states from the given feasible states. The ranking of so calculated states can be changes manually (Xu H. , Hipel, Kilgour, & Fang, 2018,

p. 13). This is the most important step and also a **source for errors**, which can change the game significantly. Because usually the preferences cannot be fully known; **assumptions about the preferences have to be made**. Here in the problem of Faris, Al-Mohseen & Hipel (2016), with the Euphrates water solution, Turkey is the most powerful country regarding the river; since it is upstream and can decide to reduce the water supply significantly (Faris, Al-Mohseen, & Hipel, 2016, p. 299).

[A similar situation for example we have with the Nile conflict with Egypt as a Downstream country and Sudan / South Sudan, Ethiopia and Uganda as upstream countries, who can take out water by building dams and using water for plantations – **So this type of conflict is not rare. Similar as the South China Sea conflict it's a conflict about resources**, not only water but also energy, created by dams. What is unique about the Egyptian Nile conflict with upstream countries is for example a leaked video of a meeting with (then) Egyptian President Mursi, who discusses options (using military, using the secret service to kill this and that person etc. or destroy the dam) without knowing the camera is running. The options and preferences were then known in this case; which is rare (Tigrai Online: Egyptian politicians caught plotting how to attack Grand Ethiopian Renaissance Dam, 2013).

In the following graph, irreversible moves have to be defined. The software shows here the options of Syria and Iraq (this model is without Turkey) which have been put in under DMs & Options; and its possible by clicking on the arrow the define either N (which is no or not defined) or Y (which means Yes or a positive choice towards and option) or as in this example both possible outcomes with a double arrow. The arrow show in the direction, in which the move can be made (GMCR+ Software example).

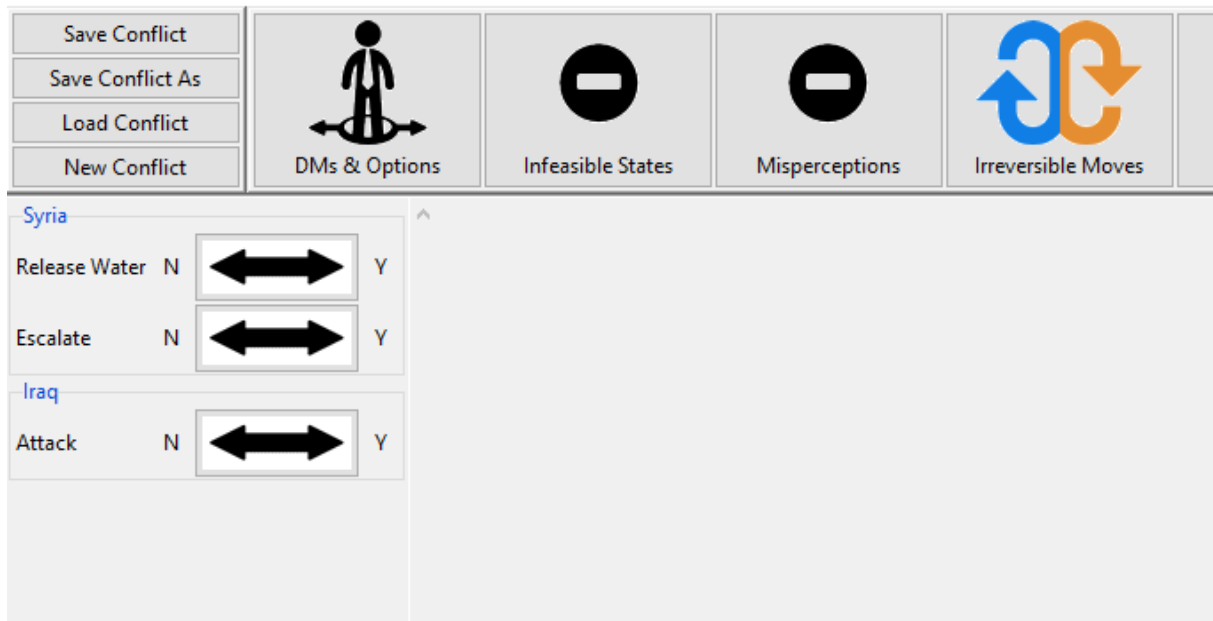


Figure 13: GMCR+ (Defining Irreversible Moves) (GMCR+ Software Example)

The next step is to put in the **Prioritization data**. As the information on the right hand side states: Here a decision-maker has to be chosen by clicking on Edit and changing the preferences for the options, which has been defined under DMs & Options and Irreversible moves. In this example, a preferred state of the outcome was not made; it had been left open. On the right hand side, the preferred conditions can be moved up and down. This has to be done for both Syria and Iraq. The preferences get numbers of outcome – Here: 8,4,2,1 for different options Syria has (GMCR+ software example).

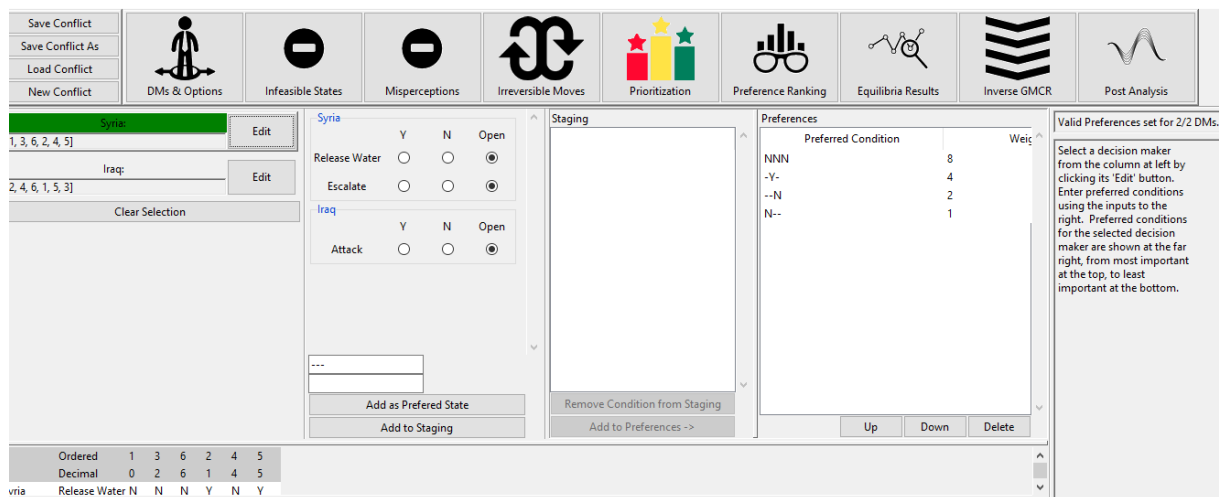


Figure 14 GMCR+ software example (Prioritization) GMCR+ software

The preferences which are shown on the right side are relative preferences in which each decision-maker acts according to its own preferences, without taking care of what the other players want (Faris, Al-Mohseen, & Hipel, 2016, p. 299).

In the case of the Syrian-Iraq water conflict, it makes for example sense to prioritize the option; for example for Syria N is chosen overall, since it would be the best outcome for Syria, if nothing from the Status Quo changes. This option is then selected and added as 'Preferred State'. "The second statement for Syria is to Escalate if DM Iraq Attacks. This information is entered using the logical statement input bar by typing "2 if 3" then you can add it directly as a preferred state. Suppose the statement was 'Don't release water if Iraq attacks', then the logical statement would be "-1 if 3" and so on. If the syntax entered is invalid, you will receive an error message next to the input bar (Kinsara, 2014, p. 6).

Example of Syria and Iraq Water conflict without Third Party (Soviet Union) Intervention

In the following graph of Hipel, Kilgour & Kinsara's (2014), the preferences with the prioritization are shown for both decision makers of the 1975 water conflict between Syria and Iraq. The best option (or most important) is shown first. The most preferred states are shown first, the least preferred down. The ranking is built by the software, but can be changed manually if it doesn't seem likely to the one checking the data. **The first state here is the Status Quo state, which is the state before the game is played; which would mean Syria can**

build the dam without any interference from other game-players. State 5 is the least preferred by Syria, as it would mean that Syria releases water from the dam, but it still attacked by Iraq; it's the worst outcome Syria can have by playing the game. Syria can only prefer the scenarios (states) 1,3 or 6, while Iraq would prefer 2, 4 or 6 (numbers taken from the original options table; only the states 1-6 are taken into regard without the Third Party decision maker) (Hipel, Kilgour, & Kinsara, 2014, p. 362).

DM	P#	Preference information (from most to least important)	Further explanation
Syria	1	Remain at the status quo	Syria continues filling its dam and Iraq accepts the situation without any escalation or intervention
	2	Escalate the situation if Iraq decides to attack	Syria next prefers going to war with Iraq if it is attacked, which is more preferred than releasing water
Iraq	1	Syria releases more flow of the Euphrates River	Iraq most prefers the situation in which Syria stops filling its dam without any escalation
	2	Execute an attack if Syria does not release more water	Iraq's interest in water far outweighs the consequence of going to war

DM	States					
Syria	1	3	6	2	4	5
Iraq	2	4	6	1	5	3
	Most preferred			Least preferred		

Figure 15: Preference prioritization information for the 1975 conflict without the Third Party and ranking of states for the decision makers (Hipel, Kilgour, & Kinsara, 2014, p. 362).

Example of Syria and Iraq Water conflict with Third Party (Soviet Union) Intervention

Hipel, Kilgour & Kinsara's (2014) also calculated a model in which a third party (here Saudi Arabia + Soviet Union) would interfere in the one or other way. This could be either for example mediation, as coordinator or donor in some kind; which could change in this way the decision-maker's options. The Third Party could also act as an Arbitrator and engage in military action itself (which is in the Syrian-Iraq example not the case in the game). We can see that for **Syria the best state would be state 1 (N-N-N-N)**, in which **Syria can build the dam without anybody interfering**. But for **Iraq the best state has now changed to state 8**, which means

that Syria releases the water because of the Interference of the Third Party (N,N,N,Y), without the outbreak of an open conflict; this is also the best choice for the Third Party. The worst scenario for Syria is state 5 (Y-N-Y-N) which is still the same as if no Third Party would be there, which means Syria opens the dam and is still attacked by Syria or state 11 in which the situation is the same but also the Third Party acts (Y-N-Y-Y). State 11 is then also the worst scenario from the viewpoint of the Third Party. For Iraq state 3 (N-Y-N-N) is considered to be the worst, which would be the same as if no Third Party is involved at all; the escalation of the situation, with no interference of the Third party. The second worst scenario for Iraq is also state 5 (which is the worst for Syria) (Hipel, Kilgour, & Kinsara, 2014, p. 363).

DM	P#	Preference information (from most to least important)	Explanation
Syria	1	Remain at the status quo	Syria continues filling its dam and Iraq accepts the situation without any escalation or intervention
	2	Release the flow of the Euphrates if and only if Iraq does not attack and with the mediation of a third Party	This is the new preference information after the intervention of the Third Party
	3	Escalate the situation if Iraq decides to attack	Syria's least preferred situation is to go to war with Iraq
Iraq	1	Syria releases the flow of the Euphrates	Iraq's most preferred situation is that Syria stops the filling of its dam without any escalation and with or without an intervention
	2	Strike an attack if Syria does not release more water	Iraq's interest in water far outweighs the consequence of going to war
Third Party	1	Acts and influences Syria to release the flow of the Euphrates	The mediator's interest is to promote peace in the region and reduce harm for everyone

Table 8 Ranking of states for the DMs in the 1975 conflict with the Third Party

DM	States											
Syria	1	3	8	9	2	7	12	6	10	4	11	5
Iraq	8	2	6	12	4	10	7	5	11	1	9	3
Third Party	8	2	1	7	9	3	4	10	6	12	5	11
	Most preferred										Least preferred	

Figure 16: Preference prioritization information for the 1975 conflict with the Third Party and ranking of states for the decision makers

The next step is more a control option. The program shows here if any errors occurs and allows for manual change the preferences under Preference Ranking. As seen in the following graph, the game is only valid if each states only occurs once for both players. We can see here and order of 1,3,6,2,4,5 for Syria and 2,4,6,1,5,3 for Iraq. While this has to be checked, the ranking itself could be changed manually too (Kinsara, 2014, p. 7).

Preference rankings entered below will be used in analysis.

Syria: [1, 3, 6, 2, 4, 5]
Iraq: [2, 4, 6, 1, 5, 3]

No Errors. Preference rankings are valid.

	Ordered	1	2	3	4	5	6
Decimal	0	1	2	4	5	6	

	Release Water	N	Y	N	N	Y	N
Syria	Escalate	N	N	Y	N	N	Y
Iraq	Attack	N	N	N	Y	Y	Y

	6	3	5	2	1	4
Payoff For: Syria						
Payoff For: Iraq	3	6	1	5	2	4

Use this screen to manually make small adjustments to preference rankings. Any Changes made on this screen override preference prioritization inputs. Preference priorities will not be lost, in case you wish to revert to them later.

Figure 17: GMCR+ software example (Preference Ranking) (GMCR+ software)

2.3.5 Analysis and output display

To analyze the results of the game, 'Equilibria Results' has to be clicked in the GMCR+ software. The payout for all states are shown. With a click on 'filter' the options for each state can be selected. A click on 'Payoff for Syria' for example sorts the results in Syria's favor, which would mean 6,5,4,3,2,1 as payouts for the order of the states 1,3,6,2,4,5. (The preferred states actually sort in that order, because the payouts are believed to be higher). A visualizer can be launched from the program, to show the model as a graph model. On local browser, which opens on command, it can be switched between diagram model and graph model (Kinsara, 2014, pp. 8-11).

Also there are buttons to be clicked for different theoretical approaches to see what states would fulfil their conditions (Kinsara, 2014, p. 9):

- "Nash stands for Nash stability,

- **GMR** for general metarationality,
- **SMR** for symmetric metarationality,
- **SEQ** for sequential stability. Simultaneous stability
- **(SIM)** examines the strategic impact of two or more DMs moving together at the same time from a given state”

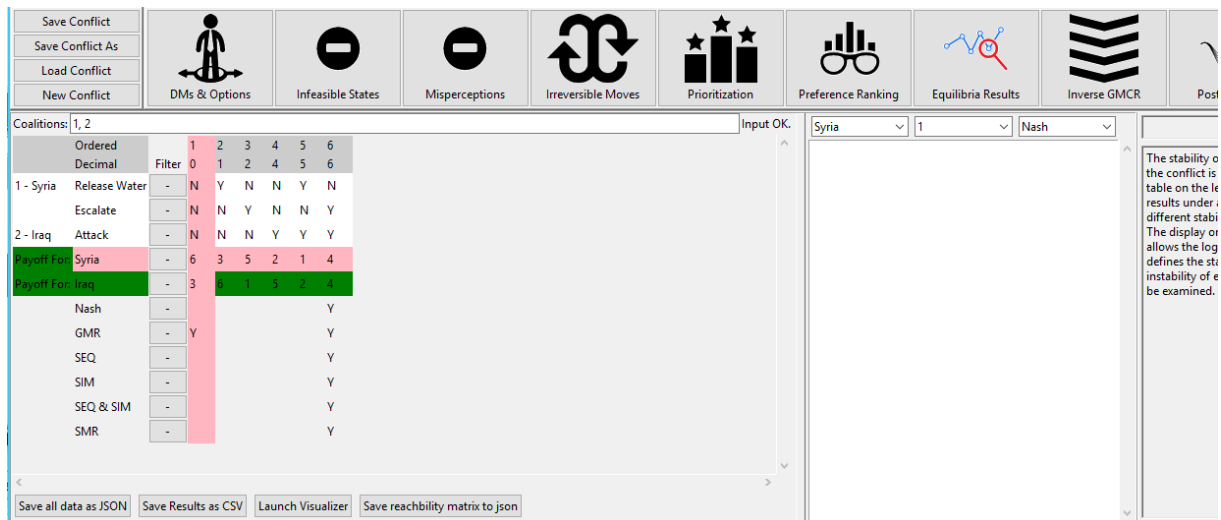


Figure 18: GMCR+ Software (Equilibria results) (GMCR+ Software Example)

2.3.6 Coalition analysis

Stability can be analyzed based on noncooperative player behavior: Here every individual decision-maker makes decisions, which serve their own interests. (They take others players most likely moves and countermoves into consideration.) If in a conflict with many decision-makers, some of them (at least two) share same viewpoints and goals, they may consider to **build an alliance, or a 'coalition'** so to speak. By forming a coalition decision-makers might **aggregate more power (economic, military, capacity, resources etc.)** which makes it more likely for a third decision-maker to back down. Coalition analysis is also about how some partners may join forces, so they can together improve their position against a third party (Xu H. , Hipel, Kilgour, & Fang, 2018, p. 293).

In International Relations, Realism and Neorealism are school of thoughts, which deals with **'power'** as the most important explanation, why countries decide to take certain political

actions or not. One important figure here is Hans Jürgen Morgenthau, who states, that the international system is in general in anarchy, and only the most powerful players will be able to reach their goals (Nohlen & Schultze, 2002, p. 825). John J. Mearsheimer (2014) one of the leading Neorealists of today, believes the most big power conflicts are zero-sum games, in which one player has to loose, so that another player can gain. For example: If player A gets X % of the gas & oil reserves, another player B or C loses the access to the same resources. If they work together to share the resources, at least player A, who might have access to 100% of the resources has to give away some access to the resources. **Big powers, according to Mearsheimer (such as the US, Russia or China) act aggressive against smaller players: Because they can!** Morality is not a category in which Realism thinks; Realism as theory thinks of countries as rational actors, in the regard to win more power. In this regard big powers would only back down, when other big powers threaten them with action. So it's logical for smaller powers to search for a coalition partner to be able to contain other powers, which are bigger than themselves (Mearsheimer, The Tragedy of Great Power Politics, 2014, pp. 34-37).

International Coalitions: While John J. Mearsheimer is known to be one of the leading experts on 'Offensive Neorealism', his colleague Stephen M. Walt is known for being one of the leading experts in '**Defensive Neorealism**'. According to Walt (1987) there are two major strategies, countries with smaller power can pull: Balancing and Bandwagoning. **Balancing** means, a player who faces danger from a bigger power (for example a power which wants to bully the smaller power) builds an alliance with a third power or many other powers to contain the big power, which threatens them. [For example if a country wants to join the NATO to be secure of (then the Soviet Union) Russia. Or in the South or East Chinese Sea conflicts: If one player asks the US to be balancing partner against China as a regional hegemon]. There are advantages and disadvantages for both balancing partners. We speak here not only about direct intervention, but also weapons delivery or technology transfer. A disadvantage for the smaller partner in an alliance for example is the leverage the bigger partner has over the smaller partner. **Bandwagoning** means the smaller country which feels threatened, will join the 'enemy' so to speak, because it seems to be the best way to contain the thread. [In the South China Sea conflict, that would mean, if countries such as Vietnam join the Chinese Blue Silk Road offer, which accepts China as the only regional hegemon, and leaves the US out of this area militarily]. In a bipolar world, such as the Cold War conflict, it was most likely, a

country had to decide, on which side it want to play – The bandwagoning partner does not have to be necessarily a potential ‘enemy’ or ‘foe’. Bandwagoning can happen for several reasons. But there might be reasons, why not to Bandwagon: For example in the Cold War, at some point very early in the 1950s, Chinese politicians decided, they didn’t wanted to be bandwagoning-partner with the Soviet Union; formally that alliance broke then much later (Walt, 1987, pp. 17-21).

2.3.7 Dealing with uncertain preferences (Stability analysis)

Xu, Hipel, Kilgour & Fang (2018) compare the stability analysis to that of a chess game, in regard of the moves and countermoves, which have to be thought through by the decision-makers. By doing the stability analysis the following information are known: The decision-makers “and their options, the feasible states which can occur, and the relative preferences of each DM” (Xu H. , Hipel, Kilgour, & Fang, 2018, p. 16) . A state is stable, when a decision-maker do not prefer to make a further move; a further move maybe offer direct advantages, but the countermove of another player, which has to be expected (because it’s likely) would make the situation worse, than the actual Status Quo the player has reached. Solution concepts, which have been created ask for only the preferences of the decision-makers, but not possible (counter) sanctions of other decision makers. Hipel (1997) created an overview of those concepts, in which only the SEQ stability concept is able to deal with other player’s knowledge preferences (Xu H. , Hipel, Kilgour, & Fang, 2018, p. 18).

Solution concepts	Stability descriptions	Foresight	Knowledge of preferences	Disimprovement	Strategic risk
Nash Stability (R) (Nash 1950, 1951)	Focal DM cannot move unilaterally to a preferred state	Low	Own	Never	Ignores risk
General metarationality (GMR) (Howard 1971)	All focal DM's unilateral improvements are sanctioned by subsequent unilateral moves by others	Medium	Own	By opponents	Avoids risk: conservative
Symmetric metarationality (SMR) (Howard 1971)	All focal DM's unilateral improvements are sanctioned, even after response by the focal DM	Medium	Own	By opponents	Avoids risk: conservative
Sequential stability (SEQ) (Fraser and Hipel 1979, 1984)	All focal DM's unilateral improvements are sanctioned by subsequent unilateral improvements by others	Medium	All	Never	Takes some risks: satisfies

Figure 19: Solution Concept for Conflicts based on Hipel (1997) (Xu H. , Hipel, Kilgour, & Fang, 2018, p. 18)

3.0 Background and Players of the South China Sea Conflict

3.1 Historical development of the South China Sea Conflict

The **origins of the modern conflict** in the South China Sea started when China, Indonesia, Malaysia and the Philippines began to occupy some Islands. Not yet was this a conflict about fishing rights, oil-or gas related or about using water ways; it was merely about territory. Fishing rights as well as oil and gas based claims occurred since the 1990s. Especially between China and Vietnam, the gas-and oil exploitation became a hot issue. Additional to those problems it became an issue for China, that US sailed in 'Chinese waters' and made different deals with ASEAN members to be able to do so (Buszynski, 2012, pp. 36-37). "The [...]relevant events starts with the occupation of the land features. The biggest atoll in the Spratly Islands has been occupied by Taiwan since 1956. The next country to occupy some features in the Spratly Islands was the Philippines in 1970. South Vietnam occupied parts of the Paracel Islands in 1974 but lost its position to China soon afterwar s. Malaysia occupied its first features there in 1983 and continued by occupying another two in 1986" (Huang & Billo, 2015, p. 36).

China's historical claim to the region **goes back to the 14th century** when **Admiral Zhen He** visited various islands between 1405-1433. His mandate then was to find out, what the best water routes were. Mostly trade was banned in the time of the Ming Dynasty (1368-1644). Here European sailors took the chance to build bridgeheads (military stations) in the Indian Ocean, and expanding towards countries in the South China Sea. China was then unable to uphold any claims on the territory. After the Ming dynasty was over, the Qing dynasty (1644-1911) established a thriving trade with Southeast Asian nations in the South China Sea. But also in this period of time, China didn't made any officials claims in the South China Sea (Huang & Billo, 2015, p. 2).

The region of Southeast Asia still has a '**colonial footprint**', which coined itself since the 16th century. Even before their (European colonists) arrival the South China Sea served as trading route for Persia, different Arab 'countries', and for India. Then when European nations came into the regions, each had their own area of influence: 'England' controlled northern Borneo,

'Malaya' (parts of Malaysia), and Hong Kong; France controlled Indo-China (Vietnam, Laos and Cambodia); the Netherlands controlled the East Indies (Brunei, Singapore, East-Timor) and Spain controlled the Philippines. At later points Japan and the US showed also interest in territory (Huang & Billo, 2015, p. 16).

Since 2005 the conflict actually develops more into a real conflict, mostly in regard of oil- and gas exploitation as well as conflicts with fisherman fishing in the wrong territory (with different laws applied to secured animals such as turtles). The conflict may be smaller or larger, including military vessels. Already in 1988, China occupied some rocks, to claim more territory. Clashes between China and Vietnam occurred; conflicts with other nations took place later: 1994 with the Philippines, 1998 with Malaysia and again 1999 with Vietnam. When China joined **UNCLOS** in 1996, there was hope to improvement of relations between China and ASEAN nations; but there has never been a code of conduct (a mutual understanding) of the rules exactly, which led to discontentment (frustration & anger) in ASEAN member countries. ASEAN itself is not strong enough as an organization to negotiate such a conduct. Since 2016, there is a Chinese offer about a code of conduct: The 'Blue Silk Road Concept' (Huang & Billo, 2015, pp. 36-37).

3.2 Definitions

3.2.1 Nine-Dash-Line (U-Shaped Line)

The Nine-Dash-Line has its name, because China makes its South China Sea territory map around nine long dashes; which is even pictured in the newest Chinese passports. Because those lines look also like a U, it's also called the U-Shaped line. This claim of China within this territory makes about 80% of the territory of the South China Sea. In 1947 the Kuomintang government, led by Chiang Kai-shek (which is today in Taiwan, but represented whole China much longer in the United Nations), had originally drawn a 11 dot line, which claimed smaller territories (Cáceres, 2014, p. 112).



Figure 20: 9 Dash Line (The Strait Times: Troubled waters in South China Sea, 2016)

The following map shows the claims of the countries: **China, Vietnam, Malaysia, Brunei, the Philippines and Taiwan**. Taiwan will not be considered as a country of its own (for the purpose of game playing and territory conflict), since Taiwan claims whole Mainland China as territory anyway, and vice versa does China claim Taiwan as their territory, which as both players think should be united to one China. We can see that the **Paracel Islands are conflicted between China and Vietnam, and the Spratly Islands are conflicted by all named players**, at least to some extent. The Nine-Dash-Line can be considered as a maximal claim, which China demands in the South China Sea. With this claim comes fishing rights, hydrocarbon production, and military hegemony. If China realized the whole demand and claims within the Nine-Dash-Line, the demands of the Exclusive Economic Zones of the other states would be nullified or reduced. Anyway: Even without China's Nine-Dash-Line claim, the Exclusive Economic Zones

of the other neighboring countries are overlapping. China is part of the UNCLOS agreement; however states, that the claims within the South China Sea predated UNCLOS and therefore also the Exclusive Economic Zone claims, by the neighboring countries have no meaning for China (The Diplomat - What Does the Nine-Dash Line Actually Mean?, 2016). The reason why the borders are drawn by China in dash-lines, is to have the border more applicable to include archipelagos, which means also to establish 'artificial islands' and installations to upgrade the status of simple 'rock-territory'. By the upgrade, the Paracel Islands can be treated as island, which have under UNCLOS the right for an Economic Exclusive Zone. These 'fact-on-the-ground' plus the 'historical waters' make up two sides of China's claim within the South China Sea (Truong & Knio, 2016, pp. 64-65).



Figure 21: Chinas claims in South China Sea (Wikipedia.org: Picture South China Sea claims map by Voice of America, 2012)

Unofficial maps, which already included a U-Shaped line, existed previously to the 1947 Kuomintang (Republic of China: 1912-1947) map. In the 1920s, the Chinese cartographer Hu Jinjie included 'the Dongsha and Xisha Islands at the time'. In the year 1933, this map was changed and enlarged to the area of the Nansha Islands (which are the names of the Spratly Islands, the Paracel Islands and others), which was then occupied by France (France occupied Indochina as a colony or 'protector'). The line then includes the 7-9 N latitude. This can be regarded as 'the first version'. In 1935 a second version of a map was drawn, which included then the 4 N latitude, which included then the territories of 'Zengmu Ansha (also known as

'James Shoal'). The 'New China's Construction Atlas' is one document, which shows that claims, based on the 1935 decisions (Wu, 2013, p. 79).

The 'Declaration on China's Territorial Sea' in 1958 was yet no clue about the U-shaped line. China signing the 'Law on Territorial Sea and the Contiguous Zone' in 1992, resulted in showing the territorial sea line of 12 nautical miles from the coast. In May 1996, China made a map public in which the coast of the mainland and the Paracel Islands (called Xisha in China) were signed in with the help of 28 dots. By signing the 'Law on Exclusive Economic Zone and Continental Shelf, in 1998, China made claim to territory to which it has 'historic rights' without mentioning exactly what that means. The U-Shaped line or Nine-Dash-Line was only introduced by China in 2009, as China protested against Malaysian and Vietnamese claims. Here China also posted a map with the Nine-Dash-Line to the United Nations (Wu, 2013, pp. 78-80); (United Nations - Document CML/17/2009 - China drawing the Nine-Dash-Line, 2009).

3.2.2 International Law & UNCLOS

International law suggests, that a territory (including islands) which is not claimed and occupied by any country, the status is called '**terra nullius**', which means, anybody could make a claim to the territory by legal progress and actual occupation. There are actually five modes in international law: " occupation, prescription, cession, conquest and accession." By discovery the title 'inchoate' is created; it has to be followed by a real entering and taking possession of the land in a 'reasonable' time. The occupant has to show / display 'territorial sovereignty' the so called 'effectivités' to get a full title under international law. The entitlement to the territory can be lost, if the possession is discontinued by the occupant. In case a possession has a disputed status in regard its named 'prescription'. Only states (countries) can gain such a title, individuals or organizations cannot gain those titles. Historically, this definition is problematic in the South China Sea, since the official claimant was often never made under this formality. China for example claims the Paracel and Spratly Islands for itself, based on fisherman staying on this islands; Vietnam claims the islands, because Vietnamese companies established operations there and King Gia has visited the Paracel islands in the year 1816, but without formally declaring the possession of the islands to the world; the declaration has just been spoken out on the island itself; so neither China

nor Vietnam has met here with the definition international law demands. The (United Nations Conventions of the) **Law of the Sea** or **UNCLOS** was established by a conference of the United Nations in 1982. According to this, the islands do not just count as territory itself, but the maritime zones of the islands comes with it. Islands, which are by definition inhabited by humans and show an 'economic life; allow for maritime zones, while 'low tide elevations' or 'submerged features' (territories which are permanently, in high tide, is under water) do not allow for such titles (Huang & Billo, 2015, pp. 20-21).

In this regard **rocks & islands** need be differentiated, because it has certain different claims. UNCLOS differentiates between the islands, rocks and low-tide elevations. There are three expressions, which have an impact on a legal perspective. **Islands and land have a territorial sea of 12 nautical miles, a contiguous zone of 12 nautical miles and an exclusive economic zone of 200 nautical miles. Rocks and low-tide elevations only create a territorial sea of 12 nautical miles + a contiguous zone of 12 nautical miles** (so in total 24 nautical miles) (Harvard Kennedy School - Belfer Center for Science and International Affairs: Freedom of Navigation in the South China Sea: A Practical Guide, 2017).

But the **difference between islands, rocks and low-tide elevations** lays more in the detail. The term of **territorial sea** is in connection with the term of sovereignty. In this area, a state has the sovereignty and should not be disturbed by foreign interference in any way. UNCLOS however guarantees the passage through those territorial sea for other states. While another country's ship makes a passage, it doesn't have to notify the state in doing so. However some activities are not allowed while transiting (Harvard Kennedy School - Belfer Center for Science and International Affairs: Freedom of Navigation in the South China Sea: A Practical Guide, 2017):

- "threatening/using force against the state
- military exercises
- practicing with weapons
- surveillance operations
- propagandizing against the state
- launching/landing/taking on board aircraft or military devices

- loading/unloading illegal commodities, currencies, or persons
- polluting
- fishing
- research or survey activities
- interfering with the state's communications, or any other facilities/installations"

The area of the **contiguous zone** lays in international waters. The main difference to the territorial sea area is, that the navigation of vessels cannot be limited here, under the condition, that no sovereign territory was under attack in the first place. Other states are under normal conditions allowed to trespass the contiguous zone with military vessels; also military surveillance is allowed here (Harvard Kennedy School - Belfer Center for Science and International Affairs: Freedom of Navigation in the South China Sea: A Practical Guide, 2017).

The maritime zone, which is known as **Exclusive Economic Zone (EEZ)** has an area of **320 kilometers (200 nautical miles)** away from the coastline. The state who owns the coastal line has then claim to the resources in that 320 kilometer long area. Chinas claim however goes far beyond a 320 kilometer area from the coast and is then overlapping with other countries claims. The UNCLOS agreement, to which China is part of, was agreed on in the year 1982, and came into force 1994. China argues, that their claim to the territory predates the UNCLOS agreement (Buszynski, 2012, p. 4). Under UNCLOS it is not permitted to limit navigation in the EEZ. The EEZ and the contiguous zone together are also named 'the high seas' (Harvard Kennedy School - Belfer Center for Science and International Affairs: Freedom of Navigation in the South China Sea: A Practical Guide, 2017).

The following graph displays the Exclusive Economic Zone (EEZ) by UNCLOS with the 200 nautical mile border and China's claim to control the area. The overlapping areas within the EEZ could be solved, by the 'principle of equity' (to share the resources); but China does not agree for such a solution, which is why the countries in the region invite companies from countries like India for Joint Ventures to building productions together [because the assumption is that China wouldn't attack India's fleet] (Truong & Knio, 2016, pp. 67-68).



Figure 22: Difference between UNCLOS Exclusive Economic Zone and China's island claims (Wikipedia.org: South China Sea vector, 2014)

3.3 Disputes in the South China Sea

The more the conflict gets militarized, the more likelier is the possibility of confrontation; this said, we can see the South China Sea getting militarized more and more, by China building artificial islands or countries accompanying fish vessels or exploratory vessels by military vessels. More military presence allows for real conflict scenarios, when the US, India, Japan and other are invited to be balancing partners against China (Green, 2016, pp. 28-30).

3.3.1 General Interests – Oil – Gas – Land – Military – Fishing Rights

3.3.1.1 Oil & Gas

Hydrocarbons in the form of oil and natural gas are believed to be in masses in the South China Sea. Since China is one of the biggest consumers of oil and gas, without having large resources on the mainland, the resources of the South China Sea are highly needed. An estimate in the year 2012 of the 'Chinese National Offshore Oil Company' evaluates the oil reserves as 125 billion barrels and the gas reserves as 500 trillion cubic feet. (That would be around 7% of the world-wide oil reserves estimated in 2012/2013 and circa 10 times more gas reserves as Russia, the country with the so far largest reserves proven (Central Intelligence Agency - The World Fact Book, 2017); (Huang & Billo, 2015, p. 23). Since 2013, China did several test, explorations and estimations since then – And the Chinese estimates differ much from what the US institutes estimates. China sees 2 out of 3,5 million square kilometers in the South China Sea. Of this area "shallow water area comprises 480,000 square kilometers, deep water area comprises 310,000 square kilometers and super deep area make up 1.22 million square kilometers" (China Institute of International Studies: China Sea Oil and Gas Resources, 2015).

The most known actual **estimate** is from **Chinese sources: 293-344 billion barrels oil & 30-72 trillion cubic meters of natural gas**. From **US sources the estimation** is much lower: **16-33 billion barrels oil & 7-14 trillion cubic meters of natural gas**. In 2017 prices, that would mean, with a price range of \$50-100 per barrel oil; that under US estimation the value would be between \$3-8 trillion; while under Chinese estimation the value would be \$25-60 trillion. There is a huge difference in how large the resources are really. However for China it is anyway a strategic resource, as the energy hunger of China is considered to be growing in future (The Journal of Political Risk: China's \$60 Trillion Estimate Of Oil and Gas In The South China Sea: Strategic Implications, 2018).

The **exploitation of maritime oil** cannot be organized by any country, because the financial resources for doing so are huge. The China Institute of International Studies for example prices the exploitation of such an oil field between 4-5 billion Yuan (Renminbi – the Chinese currency), which would be in August 2018 around \$6-7 billion dollars. Before the first oil flows,

a lot of investments have to be made; for international oil companies, to finance and carry out operations, this makes only sense, if the (or a) government supports this. Why hasn't it taken place already? The costs alone for exploitations per barrel, had for decades been higher, than the oil price per barrel; especially to exploit oil in deep sea areas was also not possible technically. Countries like China or India, which have developed their economies since the last decades, never had the funding previously to engage in such operations. Also the security environment, because of the South China Sea (or East China Sea) conflicts have not yet allowed for such exploitation operations. In the 2000s the 'Declaration on the Conduct of Parties in the South China Sea' in 2002 and 'Implementation of the Declaration on the Conduct of Parties in the South China Sea Guidelines' should have improved the security factors. Also in this regard the 'Joint Maritime Seismic Undertaking Tripartite Agreement' between China, Vietnam and the Philippines from 2005, allows for the research of geological resources in an area of 143.000 square kilometers. But there is no agreement about the development and exploitation about those resources. While Vietnam and the Philippines have exploited some resources since the 1970s (in 1978 China had its big economic reform under the leadership of Deng Xiaoping), China started the first large projects in June 2012, when planning in 9 different areas started in depths of 300-400 meters, in total an area of 160 square kilometers (China Institute of International Studies: China Sea Oil and Gas Resources, 2015).

3.3.1.2 Military & Economic Navigation Routes

The South China Sea is one of the most strategic areas for international navigation, because of the shipping lanes, through which the trade between East Asia (China, Korea, Japan), South Asia (India), Europe and Africa goes through. This trade may be estimated with annually \$ 5,3 billion passing through. For any region, freedom of navigation within the South China Sea is most important for imports and exports. As one major power, the US goes against China's reduction of the freedom of free navigation; both for trade vessels and military vessels (Harvard Kennedy School - Belfer Center for Science and International Affairs: Freedom of Navigation in the South China Sea: A Practical Guide, 2017).

“The South China Sea has five straits that act as five gates for vessels coming in and out of the area: the Malacca Strait at the southwest, the Sunda and Lombok-Macassar Straits at the southeast, and the Luzon and Taiwan Straits at the northeast. Travelling from or to the Indian Ocean in the southwest, vessels can pass through the Malacca Strait, follow the sea between Vietnam and the Spratlys, and exit through the Luzon or Taiwan Straits to arrive in the East China Sea or continue to the Pacific Ocean” (Huang & Billo, 2015, p. 24).

The Chinese claim to the area in the U-shaped line in the South China Sea and also the territory China claims in the East China Sea, have also **military purposes**; to deny the US military navigation. **China does not want the US present nearby the coastal region, in which China has the majority of its economic power.** China does not to have a problem with the freedom of navigation of non-military vessels. ASEAN as a community does not pose a threat to China’s military. Truong & Knio (2016) conclude: “ASEAN is facing the hard choice between (a) continuation of the ‘ASEAN Way’, and (b) the development of governance frameworks based on international maritime rules which put a limit on a nation’s (increasing) assertiveness and/or willingness to use force in maintaining its claims. The ‘**ASEAN Way**’ might have been effective in some specific forms of building confidence, but existing asymmetrical relations are such that the need for a firm normative base of (renovated) legal and extra-legal instruments now appears imperative for ensuring fair resolution of disputes and promoting appropriate measures for peaceful co-development” (Truong & Knio, 2016, p. 81).

3.3.1.3 Fishing

The South China Sea is one of the ‘richest’ fishing grounds worldwide. In terms of fishing fleet, the region holds around **55% of all worldwide fishing vessels**. (12% of all fishing vessels in the South China Sea are not regional, but have global heritage.) **In the region** this business **employs around 3,7 million fisherman and the industry** around. It includes several large fishing grounds for international demanded kinds of fish, like Sardines, Tuna, Mackerels and other kinds of fish. Totally, there are around of 3.365 species (Fridtjof Nansens Institute: Fish, not oil, at the heart of the South China Sea conflict, 2018). Compared to other regions, like the Great Barrier Reef or the Caribbean, the South China Sea allows for a much larger diversity in

marine fish; a much more fertile ecosystem – which is a result to the fact, that 125 (major) rivers end in the South China Sea. The large coral reef constructions allow for a large marine world (Bateman & Emmers, 2009, p. 82).

Compared to ending resources of oil & gas, the question of fishing rights are of much longer character. Here we have the same overlapping maritime claims, as in the oil and gas question; with the difference, that no long term investments are necessary to fish – Fishers can just come and go, without a permission, as long as they are not caught. Mostly disputed is the territory of the Spratly Islands, which produce yearly fishing products around \$3,3 billion. The region is claimed by China, Taiwan, the Philippines, Malaysia, Brunei and Vietnam. Especially challenging in kinds of fishing is, that fishing is not local like oil or gas drilling and to control who is allowed fishing where is a much more challenging question in this regard. Since overfishing becomes a problem and compared to the fish-reserves of the 1950s, the stock has declined by 80-90%, which makes it a very competitive situation. However it is not only a question of the economic worth of the fish, but also a question of nutrition, since fishing products are in some countries in the region 20-60% the source of nutrition (Fridtjof Nansens Institute: Fish, not oil, at the heart of the South China Sea conflict, 2018).

The Chinese fishing industry has grown to a large economic factor. While China had a revenue in the fishing industry in 1990 of about \$1,6 billion, this amount has grown to around \$ 4,3 billion in 2009. Especially in the countries of Vietnam, Malaysia and the Philippines, fishing is one of the most important industries. In regard of Protein, fishing is one of the most important goods. Also tourism and fishing tourism is a source for income, which are endangered by an insecure atmosphere (Huang & Billo, 2015, p. 24).

3.3.2 China's South China Sea Politics

Pre 2011

Until 2002, China acted aggressive, especially in the 1990s towards other South East Asian nations, regarding South China Sea conflict issues. In 2002 China signed the 'Declaration of the Conduct of Parties in the SCS (DoC) with ASEAN". However this document was more a declaration of intention, than a contract which would create any legal status. The non-binding

act, was meant to create an atmosphere of goodwill from China's perspective; to allow for further discussions or even a resolution for the conflict in general. China started to cooperate with several members of ASEAN on an economic level to develop the economy (mainly infrastructural projects) in which China took the major part of the pre-financing. This is how tensions between China on the one hand and Vietnam and the Philippines on the other hand became less dangerous (Turcsanyi, 2018, p. 39).

2011-2016

China's president Xi Jinping made a statement in **2015** about the Chinese historic Silk Road [the original Silk Road was built at the Han Dynasty time (206 B.C – 220 A.D), which went through South and Central Asia, the Middle East and Europe. The idea has merged in China since 2013, to rebuild this kind of trade route. However it took China some time to establish the most important tool: Financing the project. So China set up the **Asian Infrastructure Investment Bank (AIIB)** [it's countercurrent with the US-dominated World Bank] which can be considered as **Chinas economic tool to channel conflicts**, before they would take place on a military level. In his speech Xi made clear, that China doesn't favor a military solution in region. Central Asia and Southeast Asia are parts of the areas, which would be under a new rule of conduct. Both areas are very much different and need to be treated as separated issues. In the Central Asian region, China has already military partnerships with many of those nations, together with Russia in the format of the Shanghai Cooperation Organization; mostly to conduct anti-terror operations and secure the borders (Council on Foreign Relations: Building the New Silk Road, 2015). What Xi offers is described by Joseph Nye, an worldwide known political scientist, as soft power. In soft power politics, a country like China, is able to influence other states by 'virtue', which is at least a Confucian principle and shared within Northeast Asia. Important also in this regard, is to develop a good diplomatic relationship and economic ties; which China tries, by financing project with the tool of the Asian Infrastructure Investment Bank (Turcsanyi, 2018, p. 69)

President Xi rejects the viewpoint that conflict like the South China Sea has to be considered a zero-sum game (which Neorealism and rational approaches would consider in terms of resources). **Xi states:** "And Chinese people say that when big rivers have water, the small ones

are filled; and when small rivers have water, the big ones are filled. All these sayings speak to one same truth, that is, **only through win-win cooperation can we make big and sustainable achievements that are beneficial to all. The old mindset of zero-sum game should give way to a new approach of win-win and all-win cooperation.** The interests of others must be accommodated while pursuing one's own interests, and common development must be promoted while seeking one's own development. The vision of win-win cooperation not only applies to the economic field, but also to the political, security, cultural and many other fields. It not only applies to countries within the region, but also to cooperation with countries from outside the region. We should enhance coordination of macroeconomic policies to prevent negative spill-over effects that may arise from economic policy changes in individual economies. We should actively promote reform of global economic governance, uphold an open world economy, and jointly respond to risks and challenges in the world economy" [...] "China has signed treaties of good-neighborliness, friendship and cooperation with eight of its neighbors and is holding discussion to **sign a same treaty with ASEAN. China stands ready to sign such a treaty with all its neighbors** to provide strong support for the development of bilateral relations as well as prosperity and stability in the region" (Xinhuanet: Full text of Chinese President's speech at Boao Forum for Asia - Towards a Community of Common Destiny and A New Future for Asia, 2015).

The **land based Silk Road** (see green route in the following graph), is a concept, which will be achieved by having a train route, which starts at China's East Coast (the economic centers of China are mostly in coastal regions) and will end at Stuttgart Germany / Rotterdam-The Netherlands or Paris-France. It would mean that Chinese goods can be exported by train, which would make transport costs lower and deliveries faster. **The Blue Silk Road** (see blue route in the following graph) starts at China's east coast and goes through the Strait of Malacca (between Singapore and Malaysia), through Indian harbors, African harbors and the Suez Channel (Egypt), Greece harbors (China owns the harbor of Piraeus) and end in Italy (Council on Foreign Relations: Building the New Silk Road, 2015).



Figure 23: (Land Based) Silk Road and Blue Silk Road (Council on Foreign Relations: Building the New Silk Road, 2015)

Meanwhile China is creating a ‘**strategic triangle**’ between the Spratly Islands (Chinese: Nansha); Paracel Islands (Chinese: Xisha), and Scarborough Shoal (Chinese: Huangyan Dao). China built structures here, so it can on the one hand create a larger EEZ territory, as well as territorial sea; on the other hand the installations serve a military purpose; islands are known as ‘unsinkable aircraft carriers’. The US military US Pacific Commander Harry B. Harris Jr. stated in April 2017, that China plans to build on the **Spratly Islands** alone, around 72 aircraft hangars, 10 large aircraft hangars and possibly also will deploy ‘long-range surface-to-air missiles’. On the **Paracel Islands**, which China controls since the Vietnamese War of 1974, a whole city was built on ‘Woody Island’, with port facilities and an administration, 16 air craft hangars (plus 4 larger hangars); also deployed already surface-to-air missiles. China also plans to settle more civilians on the islands. The **Scarborough Shoal** (in conflict with claims of the Philippines) is the third point in this strategic triangle. Here construction building and militarization has yet not started, but known in 2017, such plans already exist, according to the Mayo of Sanshar City in the province of Hainan, which is administratively responsible for the whole islands territories. It is expected, that by building the third point of that military triangle, China will

open an Air Defense Identification Zone, in which it controls all sky activity (The National Institute for Defense Studies Japan, 2018, pp. 28-31).

3.4 Decision-Makers / Profiles

3.4.1 China

Compare Chapter 3.1-3.2, which deals not exclusively with China, but includes the Chinese perspective and interests.

3.4.2 ASEAN

There are several ways to separate Southeast Asia from Northeast Asia. When the media in East Asia is mentioned, then mostly only Northeast Asia is meant, although the term includes Southeast Asia. On the one hand the separation is geographically, on the other hand culturally. Southeast Asia consists of the states: **Brunei, Indonesia, Cambodia, Laos, Malaysia, Myanmar, East Timor, Philippines, Singapore, Thailand and Vietnam**. With the exception of East Timor, all states are members of **ASEAN**. ASEAN is the Association of Southeast Asian Nations (United Nations - Composition of macro geographical (continental) regions, geographical sub-regions, and selected economic and other groupings, 2014).

ASEAN+3

ASEAN +3 was born from the plight of the Southeast Asian states. Because of the financial crisis in 1997, the largest tiger states were forced to their knees (while China gave a helping hand). China, Japan and (South) Korea have been integrated as a dialogue partner in the ASEAN + 3 concept into the Southeast Asian community due to the financial crisis. Since then, people have been talking about overall East Asian integration and economic, political and security cooperation. One is the Chiang Mai Initiative, the FTAs (Free Trade Agreements) with the whole ASEAN and sub regional cooperation (The official Website of the Association of Southeast Asian Nations - ASEAN Community, 2018).

Of the 3 main areas of ASEAN, the security area is the one that has the least support of all. Economic, scientific and other collaborations predominate instead. China does not see other ASEAN members as a military threat, even if they were to forge a closer military alliance. The desire to have a military alliance or at least a security alliance, goes back to the time in which the colonial powers have withdrawn from Southeast Asia. However, even with the SEATO (Southeast Asia Treaty Organization) there was a negative example that the cooperation does not work. The SEATO existed from 1954-1977 under the leadership of the USA; practically similar (at least according to the plan) to NATO. It was founded after the French retreat from NATO in Manila to enforce US influence in the area. (Southeast Asia had only the Philippines and Thailand as members.) Other countries such as Indo-China follow up-states (Cambodia, Laos and the southern part of Vietnam) were not members, but were under US protection.) After the US lost the Vietnam War, the cooperation however ended quickly. The Southeast Asian states were convinced after the overthrow of Indonesian President Sukarno that they could together form a common peace union that was not confrontational (US Office of the Historian: Southeast Asia Treaty Organization (SEATO), 1954, 2018).

In November 1971, ASEAN declared a "zone of peace, freedom and neutrality to be free of any interference from outside powers". Among other things, a nuclear-weapon-free zone was proclaimed in 1995, not even by the stationing by foreign states (such as the USA in Germany). At the beginning of 1976, the Presidents, at that time five Member States, agreed to sign a treaty of friendship and further cooperation. Among other things, respect for sovereignty was mutually agreed upon (which was important in the sense that there were already border disputes between some Southeast Asian states.) It was agreed that the members would remain free from the interference of third states, such as the not calling in other foreign powers to overthrow the government of a country, it was agreed that the member states would not interfere with each other's domestic affairs, that they would settle disputes peacefully. ASEAN states have also joined the International Criminal Court in The Hague and the International Maritime Court in Hamburg, which underlines the peaceful intentions of these states. Later Member States signed these points; but also some non-member countries such as China, India, Korea, Russia, Mongolia and New Zealand, as well as Australia, East Timor and France (Severino, 2008, S. 14-17).

On the issue of the South China Sea, ASEAN member states developed a solidarity between each other over the China problem. Incidentally, the Chinese call this 'South Sea' the Vietnamese 'East Sea'. The problem here is that, among other things, China is claiming territory, which is part of other states of Southeast Asia. Similar to the East China Sea, where there are also clashes between China and Taiwan, Korea and Japan, the territorial claim is based on the membership of smaller islands or even just rocks, which then further shifts the official maritime borders to international law. The reason why China or even other states do this is that there is almost as much gas and oil reserves in this area (maybe more) than in the Arab states. It is also about the fishing rights. China and Southeast Asia, however, hardly get on with this question, which is mainly because China does not want to negotiate, but rather creates facts. In some cases, Southeast Asian solidarity has proved helpful in persuading China to back down. But one of the key points in ASEAN is that states do not interfere with each other's affairs. For example, in the case of Myanmar, there is no real interference from Indonesia or Malaysia by supporting Rohingya rebels in Myanmar. However, ASEAN is convinced that such interference in the internal affairs of a state could lead to the complete collapse of the system and result in sustained civil wars. Such a condition has been predicted for real political reasons for a long time, but has never occurred before. The Southeast Asian states are often very different in their history, culture, religion and also in their forms of government. But the danger of being too heavily influenced by one of the states or Northeast Asia (Japan, Korea, China) seems to make the statesmen of Southeast Asia seem to realize the importance of their non-interference policy. However, ASEAN's strategy is not to seal itself off against China and other major powers, but to use a system of dialogue and partnerships, especially to drive trade. Initially, however, such dialogues were established with Japan, Australia, New Zealand, Canada and the United States in the 1970s. Only in 1996, dialogue partnerships with China, India and Russia were opened. On the occasion, ASEAN opened a regional forum, the ASEAN Regional Forum (ARF), in which China and Russia were also integrated. This is a meeting of foreign ministers who meet once a year to talk about security in the region. Above all, this network primarily deals with unproblematic issues such as landmine clearance, disaster relief and supra-regional threats such as the spread of nuclear weapons and terrorism, regional crime, arms smuggling etc. (Severino, 2008, S. 17-27).

3.4.3 The Philippines

The Philippines have claims which overlap with China, Taiwan and Vietnam, mostly “250 small islands, atolls, cays, shoals, reefs and sandbars, most of which have no indigenous people (i.e. they are uninhabited), and are naturally under water at high tide, some of which are permanently submerged” (Cáceres, 2014, p. 74). Japan and the US are partners of the Philippines to contain China, until President Rodrigo Duterte took office in the Philippines in 2016. A long period of Anti-Terror alliances had taken place between the US and the Philippines (separatists and Abu Sayyaf) about the Muslim Mindanao territories (southern Philippines). China and the Philippines had a long history of conflict about territory. In 2013 the government of the Philippines even went against China at the International Tribunal for the Law of the Sea in Hamburg / Germany, under the Law of the Sea (UNCLOS) agreement, to get a binding resolution. Tensions formed in 2012, when both players start to fight about the ‘Mischief Reef’ a reef based 80 nautical miles from Zambales in the Philippines (which would make it territory as part of the Exclusive Economic Zone of the Philippines) (Cáceres, 2014, pp. 74-76).

Since then **China has built constructions, starting in 2016**, including a harbor, a runway, installing military vessels, as well as anti-aircraft weapons. As seen in the following graph, Mischief Island is no longer an atoll, that is a low-tide elevation, which would allow for a territorial sea, exclusive economic zone by UNCLOS (Center for Strategic and International Studies: Asia Maritime Transparency Initiative: China's New Spratly Island Defenses, 2016).

Ironically, that (Mischief Islands not an island but a low-tide elevation) had been the conclusion by the Permanent Court or Arbitration on 12 July 2016: “a. that **no maritime feature** claimed by China within 200 nautical miles of Mischief Reef or Second Thomas Shoal constitutes a fully entitled island for the purposes of Article 121 of the Convention and therefore that no maritime feature claimed by China within 200 nautical miles of Mischief Reef or Second Thomas Shoal has the capacity **to generate an entitlement to an exclusive economic zone or continental shelf**; b. that **Mischief Reef and Second Thomas Shoal are low-tide elevations** and, as such, generate no entitlement to maritime zones of their own”. The

Court also declares: “ that Mischief Reef and Second Thomas Shoal are within the exclusive economic zone and continental shelf of the Philippines” (Permanent Court of Arbitration: PCA Case Nº 2013-19 In the Matter of South China Sea Arbitration between The Republic of the Philippines and The People's Republic of China, 2016, pp. 471-472). However China doesn't accept the responsibility of the court in general.



Figure 24: Mischief Island (Center for Strategic and International Studies: Asia Maritime Transparency Initiative: China's New Spratly Island Defenses, 2016)

A change in relations, which followed this stalemate of the Mischief Islands, followed in 2016, by the election of Rodrigo Duterte as Philippine president. The relationship between China and the Philippines became more relaxed, while the relations between the Philippines and the US died down. Bilateral talks between Duterte and the Chinese side in 2016, resulted in Chinese aid to the Philippines. While the military conflict draw down, the Philippines didn't gave up sovereignty over the islands group; which allows the Philippines to operating fishing vessels around the Scarborough Shoal. Duterte, who exchanged unpleasanties with US

president Barak Hussein Obama, called for US troops to withdraw them from Mindanao and ending any joint military exercises between the US and the Philippines. Meanwhile the Philippines have not changed their good relations towards Japan, from which the Philippines are getting delivered defensive equipment & technology (The National Institute for Defense Studies Japan, 2017, pp. 134-137).

3.4.4 Vietnam

China and Vietnam had once been partners, in the fight of the Vietcong against French and later US-troops in the Vietnam Wars. Under Chinese President Mao Zedong and Ho Chi Minh, both communist countries had an understanding in the 1940s. After the Vietnam War was lost by the US, China and Vietnam lost their good terms later in 1978-1979, when both players went into (a limited) war, during the Vietnamese invasion into Cambodia, to support the end of the rule of the Khmer Rouge; a regime which were supported by China. Border conflicts and later conflicts because of the Spratly Islands, followed in the decades after. Vietnam is a good example that enemies can become friends, again enemies and friends. While the war between the US and Vietnam was devastating; the US are considered by Vietnam a viable partner for balancing against China (Cáceres, 2014, pp. 105-106).

The biggest conflict today between Vietnam and China is the conflict of the exploitation of oil & gas resources, especially about the ownership of the Spratly Islands, in which Chinese and Vietnamese territory overlap in the Vietnamese Exclusive Economic Zone's (200 nautical miles from the coast away.) 1988 already, both countries clashed violently. The Spratly Islands do not only have economic meaning, but can also be used as a military outpost and surveillance station. The US and Japan have an interest to not let the whole Spratly Islands fall into Chinas hands. For example in the Second World War, the islands 'Taiping Dao', part of the Spratly Islands, has been used as submarine basis for the Japanese navy, from which the Phillipines had been invaded and which was place to heavy fights between Japan and the US. From this strategic base, it was possible to cut of the most shipping routes in the South China Sea at some point in WW2 (Cáceres, 2014, pp. 109-110).

Confrontations became aggressive between China and Vietnam in 2014-2015, when Chinese patrol boats 'boarded Vietnamese fishing boats' at the Paracel Islands. More tense the situation became when the 'China National Offshore Oil Corporation' started drilling activities in waters, which would fall into Vietnamese Exclusive Economic Zone (220 kilometers away from Vietnam's shore). Protests in Vietnam against China's behavior ended in ethnic clashes in which Chinese ethnics were injured. China sent 136 vessels, from which a few rammed into Vietnamese fisher boats. Talks of potentially war situations were out in the media, discussed by politicians. While the situation became better, China began or continued to build up its military force in the territory of the Spratly Islands (The National Institute for Defense Studies Japan, 2015, pp. 136-140).

The US has reassured in May 2018, the US is committed to 'the Indo-Pacific' region 'free and open'. The US administration under Donald Trump has agreed with Vietnam to work together in this regard to 'uphold freedom of navigation and overflight' in the South China Sea. The US and Vietnam have built a cooperation here, under which the US for example delivers patrol boats to Vietnam (Voice of America: US, Vietnam to Cooperate on Freedom of Navigation in Disputed South China Sea, 2018).

3.4.5 USA (external player)

Conflict with China

According to Mearsheimer, there is **generally a conflict between China and the US**. Mearsheimer's assumption is that China's economic growth will continue for the next 15-20 years, and that China will behave in a similar way to what the US will do in the last 50-70 years, that is, on an aggressive course. Mearsheimer assumes that there will not be another state with hegemonic claims besides the US. Europe is falling away because of poor birth rates, South America is comparatively underdeveloped, Russia's power is dwindling and otherwise there are no other powers that could emerge (Mearsheimer, Centre for International Policy Studies uOttawa - Why China Cannot Rise Peacefully, 2012); (Mearsheimer & Hurst, CAN TV - The Rise of Asia?, 2014).

Setting in East Asia and the role the US can take as balancing partner

Mearsheimer further assumes that from a real political point of view **China will first try to become regional power in East Asia**. Korea will not be able to expand its position of power because of the country's continuing division into the south and north. Japan will not be able to keep up with China's growing economic and military power and is already outstripped by them. All other states in Southeast Asia, as well as the ASEAN merger, will not have their own counter-position on their own. In many projects, China is also involved in the economic development of Southeast Asian countries, lending, financing projects and in some cases implementing its own projects. At present, Japan and China are still outbid in economic aid for certain Southeast Asian states (Mearsheimer, Centre for International Policy Studies uOttawa - Why China Cannot Rise Peacefully, 2012); (Mearsheimer & Hurst, CAN TV - The Rise of Asia?, 2014).

Because of navigation routes, the role of the area for trade (imports & exports) in the South China Sea is highly important for the US. One aspect here is also: If China wouldn't be able to 'commandeer' the resources of oil & gas in the South China Sea, their economic and military capacities are threatened from developing, since China's 'hunger' for energy keeps growing each year, and is mostly powered by coal yet (Cáceres, 2014, p. 82). (Then) US Secretary of State Hillary Rodham Clinton, stated, a national interest of the US is, to be able for freedom of navigation in the South China Sea (Yu, 2015, p. 117).

To engage China (go against their claims), the US has its '**Freedom of Navigation Operations**' (FONOPs). The goal of such operations is to challenge China's maritime claims. For example, if China claims a 12 nautical mile zone, on basis of a low-tide formation (with high tide this territory is then under water) – Under UNCLOS this formation has no right to a 12 nautical mile zone – The US sails then within this 12 nautical mile zone, to protest China's claims. There could also be an action, inconsistent with 'innocent passage', for example launching a helicopter from a vessel. Sailing into territorial waters requires also notice and authorization of innocent passage; by not taking those rules into consideration, it's also a way of protest (Harvard Kennedy School - Belfer Center for Science and International Affairs: Freedom of Navigation in the South China Sea: A Practical Guide, 2017).

3.4.6 India (external player)

India is a player, which mostly has economic interest in East Asia and with Southeast Asian nations. India has especially good ties with Vietnam and Cambodia, and sees China as a competitor in the economic sector, but also militarily (there is also a history of Chinese-Indian border conflicts / also the Dalai Lama is seen by China as an separatist, but to some degree supported by India); since China has good ties with Pakistan, which is considered an enemy by India. Vietnam for example invites Indian companies to support in exploring new oil gas fields. As the United States, India supports the principle of 'freedom of navigation' (Buszynski, 2012, p. 143).

Indian works in an alliance network, together with Japan, Australia and the US towards the 'problem' in the East China Sea and South China Sea. Those countries conduct joint-military exercises. This 'quadrilateral cooperation' has however not resulted in a concrete policy; it is more a signal towards China to show, that those countries do not act alone (The National Institute for Defense Studies Japan, 2018, p. 238).

3.4.7 Japan (external player)

Japans conflict with China (directly)

Japan has **no direct stakes in the South China Sea conflict**, but is in conflict with China in the **East China Sea** in the so called **Diaoyu** (Chinese expression) / **Senkaku** (Japanese expression) **Islands**. While we could consider this as an East China Sea problem, both conflicts cannot be fully separated from each other and share similarities, as well as Japans role as an 'external' balancing partner in regard of Southeast Asian countries (Cáceres, 2014, pp. 59-60).

China claims the archipelago, which dates back to the 14th century. China used to fish there during the Ming Dynasty (1368-1644). China has been able to prove, on the basis of historical correspondence from the 16th and 17th centuries, that missionaries have traveled both to the Diaoyu Islands and to the Ryuku Islands. In principle, these islands are attributable to Taiwan.

But because Taiwan is not considered an independent country, but as part of China from the perspective of China. Taiwan in turn claims mainland China, which amounts to claiming that China / Taiwan is claiming the island. From a Chinese perspective, there is also an incident of 1561, where a Chinese officer has protected the island world from Japanese pirates. This is to prove that this area belongs to the 'coastal area', which would be overseen by the Chinese Navy. Nautical charts serve as a record for China on these islands' claims. Territorial change occurs in the Shimonoseki Treaty of 1895, after China lost the Sino-Japanese War of 1894-1895. After that, the archipelagos were affiliated to the Okinawa prefecture. (After the Peace Treaty of San Francisco in 1951 and / or the 1952 Sino-Japanese Peace Treaty.) In the post-war period, it was not clear what status the islands had. This was practically the case from 1894 until the early 1970s, when the islands were given no special consideration (because of their insignificance at that time) (Wei Su, 2005, pp. 47-48).

Japan's position is that there is actually no doubt that the Senkaku Islands belong to Japan and that, therefore, no negotiations are necessary. Japan argues that the status of the islands was not first created by Shimonoseki's treaty in 1895, but that they had been lawfully acquired. During the 1951 Peace Treaty of San Francisco, the Senkaku Islands, along with the Ryukyu Islands, were included as 'Nansei Shoto' in the 'trusteeship system' without China protesting. China first protested when the islands were officially handed over to Japan in 1972. The US had been in charge of this group of islands since the end of World War II, and had not been handed over to Japan in the Treaty of Okinawa until 1972. Japan argues that China has not considered the archipelago as part of Taiwan. A legal clarification who is entitled to the territory is almost impossible, because there are too many discrepancies and unanswered questions. While China has discovered the territory 5000 years before Japan, China had not consistently colonized the territory and had not claimed it after World War II, as it was of no economic importance at that time. Legally, one makes a distinction between uninhabited territory and 'propertyless'. The term 'terra nullius' refers to areas in the law of the sea that can not be assigned to any state. Japan claims that this was the case when the islands were seized in 1895 while China holds against. To date, the Diaoyu Islands are uninhabited. Since 1985, the Japanese at least known that the islands were once populated by China (Kushner, 2013, pp. 108-110).

Japans role as balancing partner against China

Mearsheimer sees the USA in the role of setting up an anti-pole to China, on the side of Japan, Southeast Asia and others. Not only Mearsheimer, but other realists and analysts, assume that the US will change its entire military strategy in such a way that the main conflict in East Asia will take place. The US will also try to come to terms with other partners in East Asia in order to build an opposing position with China, which will be promoted by the respective states themselves. Thus, in spite of the bloody Vietnam War, a long-term military cooperation with China seems possible. Mearsheimer is currently giving lectures on the topic: Why can China not rise peacefully ?, which he answers in such a way that China can not accept an US presence in East Asia. A warlike conflict is therefore very likely, even if this does not necessarily have to be carried out with conventional weapons. Japan plays a central role in the US concept, as Japan is the strongest antipode to China and will be with the US for the foreseeable future (Mearsheimer, Centre for International Policy Studies uOttawa - Why China Cannot Rise Peacefully, 2012); (Mearsheimer & Hurst, CAN TV - The Rise of Asia?, 2014).

Japan & Trump + India & Australia

While Donald Trump had a (negative) sentiment towards Japan, that Japan should pay for the US military stationed in Japan during his election campaign; the tone changed after Trump got inaugurated as president of the United States. Secretary of Defense Mattis and Secretary of State Rex Tillerson even declared, that the Senkaku Islands (East China Sea) would fall under the US-Japan Security Treaty and the US would have an obligation towards Japan to help defend those islands. The US has currently (2017) stationed around 40.000 troops in Japan; to confront China or North Korea, but also to engage in the South China Sea from military installations at Japan (The National Institute for Defense Studies Japan, 2018, pp. 220-223). Additionally: "In these ways, as coordination among the United States, Japan, and Australia and among the United States, Japan, and India, has been strengthened, possibilities for strategic dialogue among the four countries have arisen" (The National Institute for Defense Studies Japan, 2018, p. 238).

3.4.8 Summary & Comment of decision makers and choice for the game

Regional versus international conflict between hegemons

The conflict in the South China Sea is both a regional conflict, but also an international conflict to the extent of a hegemonial conflict between the superpowers USA and China. Especially toward the conflict between the US and China, we seen a strong development in the last years. While Russian hackers have infiltrated the US defense information network, which shows all attack plans of the US on China, potential basis and strategies under the Obama / Clinton administration, the new Trump administration has started a trade war with China in 2018, while China still holds around three trillion US-Dollars, which it could drop. Meanwhile the aggressive course of Donald Trump has led to some compromise on the Chinese side to conflict resolution on the North-Korean problem. According to Donald Trump, North Korea is China's issue to solve; which it partly did by pressuring Kim Jong-Un economically at the Chinese border.

Significance of the South China Sea

The South China Sea and the East China Sea are two strategical regions for China in terms of China's security. At China's East Coast the big production facilities are based, which produce the majority of the export goods. While other regions in China are been build, this is still the center for the economic powerhouse. Besides the economic meaning of the South China Sea in terms of oil, gas & fishing activities, the South China Sea and East China Sea are militarily important for China to defend the country against potential enemies, by which at the moment especially the US is meant.

US-China conflict / unipolar-bipolar-multipolar world

By strategic think-tanks in the US it is believed, that there is the possibility, that the current unilateral world with the US as the only superpower will turn into either a multilateral world, like we have seen in Europe 1815-1848 under the Metternich area, following the Vienna Congress in 1815 and the defeat of Napoleon Bonaparte. A multipolar world is a very unstable situation, with many potential conflicts, which have to be dealt with on permanent basis. (When this situation was not treated anymore by negotiators and mediators, the situation developed into a conflict in Europe from 1848-1914, when the First World War broke out). Or:

We can see another bipolar world (like we have seen during the Cold War between the US and the Soviet Union) with the US and China as the two superpowers. At least for the second option, the bipolar world, both China and the US are preparing, by trying to get South East Asian nations and Japan, Korea, India and other players on their sides. The US offers itself as balancing partner against China, while other states think about bandwagoning with China, to not count as one of their enemies. Korea however is still in an unsolved dispute with its communist northern part, which means they cannot enforce either side; they are stuck with the US military until the situation between South and North Korea has been solved.

Southeast Asian countries – economic & military perspective with China

Southeast Asian countries are economically still underdeveloped. They receive aid and development money from the US, Europe and Japan. China set up a the Asian Infrastructure Investment Bank which competes directly with Japans Asian Development Bank and is also rival to the US led World Bank. The cheque-book is one option for those countries to resolve disputes, other than considering military options. Also the US and China compete in anti-terrorism provision, which would be interesting for Thailand, the Philippines, Malaysia (which has already Arab led IS groups in its woods since 2014-2015) and Indonesia. Those approached goes far beyond the South China Sea issue, but the Strait of Malacca, which is between Singapore and Malaysia, is the most economic important area (trade and oil transports) for navigation (shipping lanes) of vessels worldwide, next to the Suez Canal and Panama Canal.

Current stalemate and development in the South China Sea

In the South China Sea, we have China, which claims territory, which is called the U-shaped line or the Nine-Dash-Line and Vietnam, the Philippines, Malaysia, Indonesia, Brunei (and Taiwan), which claims territory in the South China Sea, mostly according to their Exclusive Economic Zones, which are guaranteed under the UNCLOS agreement; to which China is a signee (but with referring at the same time to pre-dated UNCLOS historical claims). The historic claims of China and the UNCLOS claims (which also overlap between different countries anyway) has led to a stalemate in which neither country had developed its full potential in regard of oil & gas exploitations. Especially in the deep sea, those operations are difficult to conduct. Only in the 2010s the building of production has increased by Chinese

companies. Meanwhile, while a stalemate on the negotiation & mediation table is still the case, China has started in the middle of the 2010s to build military installations, especially at artificial islands. China is believed to build something like a no fly zone for military aircraft in the area between the Paracel Islands (northwest), Spratly Islands (south) and Scarborough Islands (northeast); a so called 'strategic triangle'. China made an offer towards the Southeast Asian nations with the so called 'Blue Silk Road' strategy; which has one main purpose: To keep the US out of the area of the South China Sea forever. This offer is still on the table. Vietnam and the Philippines made positive steps towards this 'regional' solution, while keeping their options with the US and Japan open to some point; also inviting India as an economic partner.

Decision maker's options – Game of Chicken and Balancing Partner

While the conflict about the Paracel Islands, Spratly Islands and Scarborough Islands are different in its details; the biggest momentum of conflict is in the Paracel Islands and Spratly Islands between China & Vietnam and China & the Philippines. For the purpose of the game Vietnam and the Philippines have the strongest stalemate and conflict potential with China; while the situation between China and Malaysia, Brunei and Indonesia has a lower conflict potential. What all those countries have in common game-wise: All countries militaries individually or combined are no match for China's military power and capacities. This means they either accept what China wants or they are game of chicken with China. ASEAN cannot be compared with the European Union; it is a organization muss less connecting state actors.

This leaves China with the options in a game of Chicken: be aggressive / make an agreement. It leaves the other countries with the option: Accept the Status Quo with China and their Blue Silk Road Offer and China's Nine-Dash-Line OR react aggressive (war) with China. In both cases each country can only loose.

Similar to the example of Turkey, Syria and Iraq, who had the Soviet Union and Saudi Arabia as external influencers; external influencers in the South China Sea, such as the US, India and Japan, can change the chicken game China plays. Potential partners are here: The US, India and Japan. Unlikely now, but possible in the future: Russia. (The Anti-Russian course has been

described by neorealists, such as John J. Mearsheimer, as strategic irrational decisions, since the US would need Russia to be partnering against China).

4.0 GMCR + Analysis of the South China Sea

4.1 Steps of the Analysis

The problem has to be reduced in its context to be able to analyze the situation with GMCR+. So the first step is to reduce the options to a minimum, while keeping the options open. First the game has to be considered as such without the interference of external players.

It doesn't make a difference for the matter of the game **if a conflict breaks out because of oil, gas, fishing, freedom of navigation** or even because of other reasons. This is why those options doesn't have to be differentiated; at least not if very similar countries are compared with each other, who are present in the conflict with the large Island groups: The Paracel Islands and the Spratly Islands. **It also doesn't make much difference to differentiate between the Paracel and the Spratly**; the only differentiation, which would make sense: In the Spratly Island conflict, there would also be to some extent Brunei, Malaysia and Indonesia as players. The **main players** in this game are then **China, Vietnam and the Philippines + external players**.

The **game could** actually **be enlarged** to Malaysia, Brunei and Indonesia. However their claims have a smaller extent, compared to Vietnam's claim and the Philippines' claim. We would also maybe need to introduce another option: Take some money from China and be quiet. Or: start covert operation to endanger the Sea Routes. Since the game has already 512 possible states, before removing infeasible states, the decision was made to keep the game simple, which is why the following options were chosen.

Taking the theoretic approach of the '**Game of Chicken**', the direct conflict between China and the other players can be understand much more easy. This leaves 2 options for all players: Be Aggressive or be Passive. But the reality on the ground is more complex; a third option, which doesn't fit the Chicken Game need to be considered: The offer of the Blue Silk Road by China, which is a compromise from the positions of all players, and which is considered a Win / Win

situation. However for China the maximum payout would be reduced to reach that equilibrium.

Diplomatic actions or moral decisions cannot be part of the decision process, however certain solutions can be prioritized.

4.2 Decision Makers and Options

4.2.1 Decision Makers and options

China

Without external Player: Chinas options

Here China has two options according to the game of Chicken + another option:

1. Stay aggressive as Bully (Status Quo) [and occupy more islands] → WIN
2. Be Passive (no reactions to the others' actions) → LOOSE
3. Sign the Blue Silk Road Agreement with a player (this means some kind of compromise)
→ WIN / WIN

China could also have the option to be aggressive in a total war, but the differentiation makes here no sense, regarding the game. If China behaves aggressive and for example the other state stays passive (Chicken game), only China wins. If China stays passive in a Chicken game, while the other player becomes aggressive, the other player wins and China loses.

However this game is not exactly the Chicken Game – Only the first two options have been taken from the model of the Chicken game. With the Blue Silk Road offer, China also allows for an compromise, which is set to be a Win / Win situation for both players who agree on the Blue Silk Road. The assumption here is, that parties would only sign such a treaty, if a win / win situation would be offered.

Philippines / Vietnam

Without external Player: Vietnams options / the Philippines options

The Chicken game offers also two options for Vietnam or the Philippines: Be passive or be aggressive. Both players, who act individually (not like a cooperative or a group) can decide to take the Chinese offer of the Blue Silk Road.

1. Answer with aggression → LOOSE or WIN
2. Be Passive (Status Quo) → LOOSE
3. Take and Sign the Blue Silk Road Agreement China (this means some kind of compromise) → WIN / WIN

If any country answers China's strategy with aggression it depends if China reacts also aggressive or passive. In the Chicken game, Vietnam / the Philippines would lose if it acts passive while China acts aggressive; and Vietnam / the Philippines would win if they act aggressive while China acts passive. Two players would lose, if they both decide to be aggressive; however China would still win. So the endgame is not fully consistent with the Chicken game, since one player can lose more than the other. It makes no difference here, if Vietnam would cooperate with the Philippines to act aggressive against China, since China could take out both individually or as a cooperative (at least this is one assumption here to keep the game simple.)

USA – Japan – India

The external players can theoretically been treated individually, since there is a huge difference between the US, Japan and India. Only the US and India have nuclear weapons at their disposal. In regard of the South China Sea, already the US alone would be a game-changer. So for the matter of the game the US could be treated as an external player or all three players as one big player. The last case makes sense, because it creates even more diplomatic pressure. We could also argue: Since we do not live in a unipolar world, with the

US as the only superpower, but in an emerging multipolar world with many players, having a larger coalition at hand, creates more military but also economic pressure.

4.2.2 Options

The options have been put in the system as seen in the following table. The Aggressive State has been declared as Status Quo for China. However here is no differentiation to which scale China would be aggressive. But by definition, when Vietnam and/or the Philippines answer in an aggressive mode, a war like situation can be assumed.

China		
	Y	N
Be Agressive (As Bully) (Status Quo)	<input type="radio"/>	<input type="radio"/>
Be Passive	<input type="radio"/>	<input type="radio"/>
Blue Silk Road Signing	<input type="radio"/>	<input type="radio"/>
Philippines		
	Y	N
Answer with Agression	<input type="radio"/>	<input type="radio"/>
Be Passive (Status Quo)	<input type="radio"/>	<input type="radio"/>
Take Blue Silk Road Offer	<input type="radio"/>	<input type="radio"/>
Vietnam		
	Y	N
Answer with Agression	<input type="radio"/>	<input type="radio"/>
Be Passive (Status Quo)	<input type="radio"/>	<input type="radio"/>
Take the Blue Silk Road Offer	<input type="radio"/>	<input type="radio"/>

Figure 25: Options table GMCR+ (own model)

other states were excluded, in which the decision makers would have acted in other illogical ways.

	Ordered Decimal	1 80	2 81	3 82	4 100	5 101	6 109	7 128	8 129	9 130	10 136	11 137	12 138	13 144	14 145	15 146	16 260	17 261	18 268	19 269	20 276	21 277	22 292	23 293	24 301	25 325	26 333	27 341	28 365	
China	Be Aggressive (As Bul	N	Y	N	N	Y	Y	N	Y	N	N	Y	N	N	Y	N	N	Y	N	Y	N	Y	N	Y	Y	Y	Y	Y	Y	
	Be Passive	N	N	Y	N	N	N	N	N	Y	N	N	Y	N	N	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	
	Blue Silk Road Signi	N	N	N	Y	Y	Y	N	N	N	N	N	N	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
Philippines	Answer with Aggressio	N	N	N	N	N	Y	N	N	N	Y	Y	Y	N	N	N	N	N	Y	Y	N	N	N	N	N	Y	N	Y	N	Y
	Be Passive (Status	Y	Y	Y	N	N	N	N	N	N	N	N	N	Y	Y	Y	N	N	N	N	Y	Y	N	N	N	N	N	Y	N	
	Take Blue Silk Road	N	N	N	Y	Y	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	Y	Y	N	N	N	Y	
Vietnam	Answer with Aggressio	Y	Y	Y	Y	Y	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	Y	Y	Y
	Be Passive (Status Q	N	N	N	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	
	Take the Blue Silk R	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
Payoff For: China		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
Payoff For: Philippines		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
Payoff For: Vietnam		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	

Figure 27: End table without priorities yet included GMCR+ (own model)

The table is an example and has been changed for the final stage (it is shown at this stage to show that payments are equal before setting priorities). It can be read as follows:

State 100: NNY NNY YNN → Both China and the Philippines sign the Blue Silk Road Contract and Vietnam and China are in an aggression state

State 292: NNY NNY NNY → All players sign the Blue Silk Road Contract

State 6: YNY YNY YNN → Both players are in conflict which China but China and Vietnam decide to sign the Blue Silk Road Contract (out of an aggression state). This seems not logical in the first moment, but this state needs to be viewed as not final, since the status would change by signing.

4.3.2 Decision Makers preferences and outcomes

4.3.2.1 Priority decisions

To set prioritization: If the options of priority entered equally (China has 3 priorities while Vietnam and the Philippines have 3 priorities as well), the payouts will be equal. The most important priority gives the payout of 4, the second priority the payout of 2 and the third

priority a payout of 3. Unfortunately the program doesn't allow to define a negative priority with a negative payout. But the conditions can be chosen as Y or N; so it can be chosen, that a negative, which is defined by N can be chosen as priority (here for example for Vietnam and the Philippines: China does not act aggressive as the most important priority).

China

For China the:

- The best option is, if they can stay aggressive and both Vietnam and the Philippines would stay passive (since China then would have access to all of the resources alone).
- The second best option is to bring all countries to sign the Blue Silk Road Agreement
- The third best option is, if both Vietnam and the Philippines do not act in an aggressive mode.

Philippines and Vietnam

- The most important goals for the Philippines and Vietnam are, that China does not act aggressive. This condition has been chosen as first priority for both countries.
- The second best option are for both countries, that they can act aggressive themselves, while China acts passive.
- The third best option is to take the Blue Silk Road offer.

After the step of given priorities, automatically a table shows for each player the decisions in an order, starting with the best outcome left to the worst outcome on the right side. The following 3 graphs, show the outcome of the game, given the infeasible states and priorities, which have been chosen on basis of chapter 3.

4.3.2.2. Outcomes without external player

Outcome for China

The best outcome for China is state 145: YNN / NYN / NYN, which means China can stay aggressive and Vietnam and the Philippines both stay passive: That's the current Status Quo

situation, taking into account, that external players have not been taken into consideration. China gets here a payout of 5.

A payout with 4 are two states:

- State 292: NNY / NNY / NNY, which means all countries sign the Blue Silk Road Agreement
- State 293: YNY / NNY / NNY: Vietnam and the Philippines sign the Blue Silk Road contract after being forced into it, by China's aggressiveness, while both players stay unaggressive.

Payout with 3 have also two states in which China forces both other players into accepting the Blue Silk Road agreement, by being aggressive and at least one player answered the aggressiveness previously with also being aggressive.

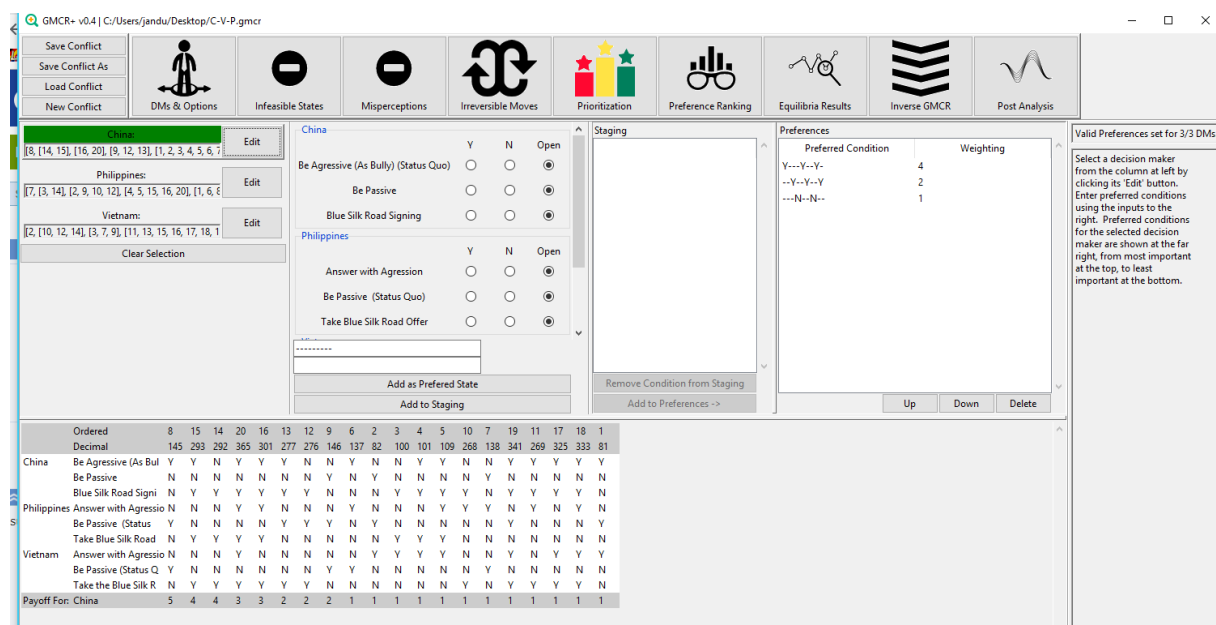


Figure 28: Best Options for China after given priorities (GMCR+ Own case)

Outcome for the Philippines

The best outcome for the Philippines is state 138: NYN / YNN / NYN, which means that the Philippines (and also Vietnam) are not aggressive but passive and the Philippines itself is allowed to act aggressive (and take the most resources). This state gives the Philippines a payout of 5.

Payouts of 4 are those in which China offers the Blue Silk Road Agreement, which are taken by the Philippines. The worst states with payouts of 1-2, are when China acts aggressive.

Ordered	7	3	14	10	9	2	12	4	5	20	15	16	19	11	8	13	6	17	18	1
China	Be Aggressive (As Bul)	N	N	N	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Be Passive	Y	N	N	N	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N
	Blue Silk Road Signi	N	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	N	Y	N	Y	N	Y	N
Philippines	Answer with Aggressio	Y	N	N	Y	N	N	Y	Y	N	Y	N	Y	N	N	Y	N	Y	N	Y
	Be Passive (Status Quo)	N	N	N	N	Y	Y	N	N	N	N	N	Y	N	Y	N	N	N	N	Y
	Take Blue Silk Road	N	Y	Y	N	N	N	Y	Y	Y	Y	N	N	N	N	N	N	N	N	N
Vietnam	Answer with Aggressio	N	Y	N	N	Y	N	Y	Y	N	N	Y	N	N	N	N	N	N	Y	Y
	Be Passive (Status Q)	Y	N	N	N	Y	N	N	N	N	N	N	N	N	Y	N	Y	N	N	N
	Take the Blue Silk R	N	N	Y	Y	N	N	Y	N	Y	Y	Y	Y	N	Y	N	Y	N	Y	N
Payoff For: Philippines		5	4	4	3	3	3	3	2	2	2	2	2	1	1	1	1	1	1	1

Figure 29: Best Options for the Philippines after given priorities (GMCR+ Own case)

Outcome for Vietnam

The best outcome for Vietnam is, when Vietnam itself can act aggressive, while China and the Philippines act passive. In this case Vietnam can gather the most resources without being hindered by the others. Here Vietnam gains a game-payout of 5.

Similar to the Philippines, Vietnam gains a payout of 4, in cases, when China is not aggressive, but the Blue Silk Road Agreement and Vietnam agrees to it. The worst outcome of 1-2 payout, are in the case, that China acts aggressive.

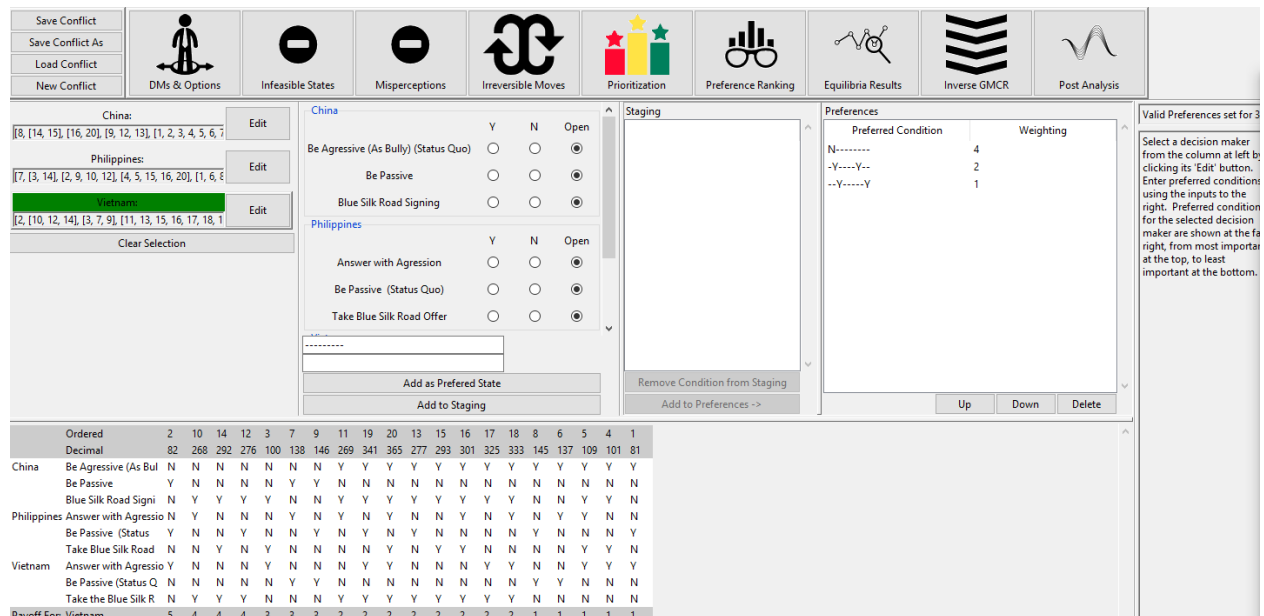


Figure 30: Best Options for Vietnam after given priorities (GMCR+ Own case)

4.3.2.3 Outcomes with external players

Adding the US – India – Japan as an external player, adds the possible state to a possible 2048 states.

The game stays the same as is, but with the following priorities:

China's priority:

- Stay aggressive, while Philippines, Vietnam and US coalition stay passive
- Other states sign Blue Silk Road, US coalition not intervening

- [To compare the results better for every player (according to the payout table) a third priority is introduced in which they can be aggressive, while others don't be aggressive.]

Vietnams/Philippines priorities:

- Answer with aggression (take as many resources) while all other player stay passive, favor US coalition intervention
- Sign Blue Silk Road for everybody; while favoring US intervention (to pressure China in giving more in)
- [To compare the results better for every player (according to the payout table) a third priority is introduced in which they can be aggressive, while others don't be aggressive.]

US – Japan – India coalition priorities:

- China don't offer Silk Road and Philippines and Vietnam don't sign it while US coalition intervenes
- China is passive, while Vietnam and Philippines can be aggressive, and US coalition intervenes (this would mean the US can make China back down completely)
- [To compare the results better for every player (according to the payout table) a third priority is introduced in which they can be aggressive, while others don't be aggressive.]

China's results with external player

- China's best option with a payout of 5 would be the case when: China can be aggressive and all other players stay passive; US coalition does not intervene.
- Second best option: China can get the Philippines and Vietnam to sign the Blue Silk Road agreement, while US coalition does not intervene
- All other options have worsened due to possible US interventions

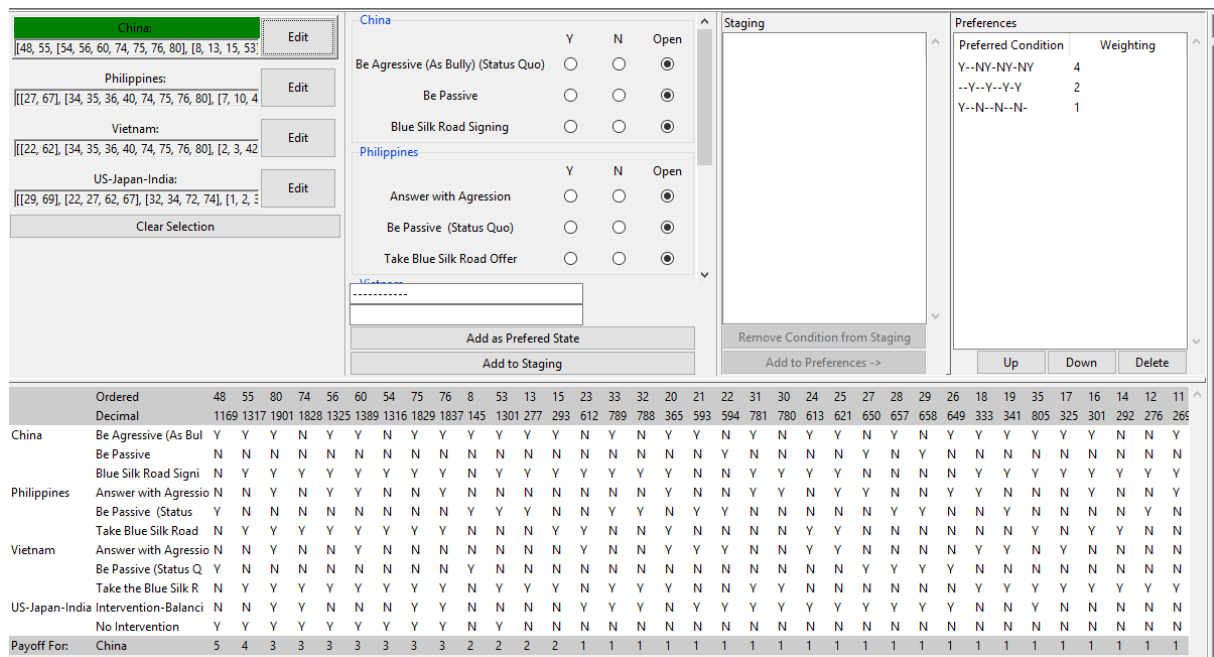


Figure 31: Payout results for China with external player (GMCR+ own case)

The Philippines' results with external player

The payout of the Philippines' best options is reduced by an external player. There are now two best options with an payout of 4:

- Everybody stays passive, but the Philippines stay aggressive and are allowed to take resources this way
- Everybody signs the Blue Silk Road Agreement with US doesn't intervene

The second best options are mostly driven by an US coalition intervention, which guarantees the Philippines a payout of 3. Even by China acting aggressive, these are then still the best results. We could interpreting it as having better results for negotiations with China by having a balancing partner.

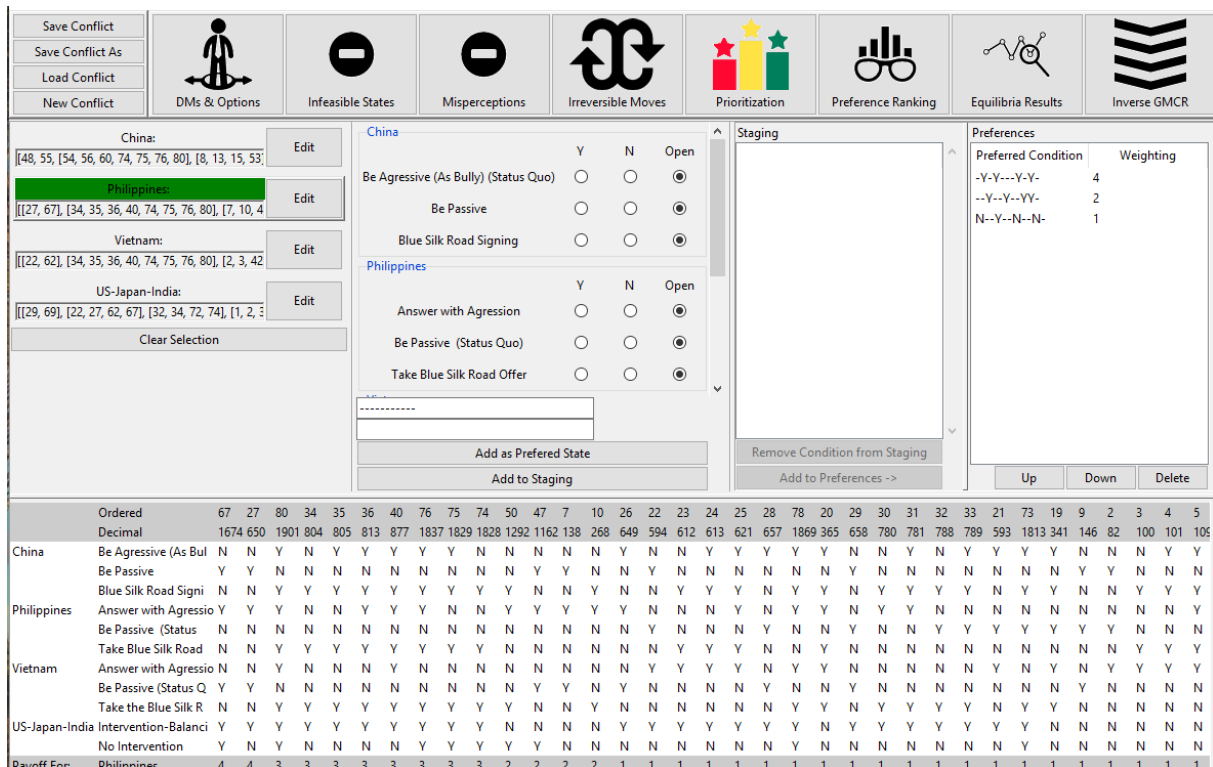


Figure 32: Payout results for the Philippines with external player (GMCR+ own case)

Vietnam's results with external player

The results for Vietnam are similar to those of the Philippines.

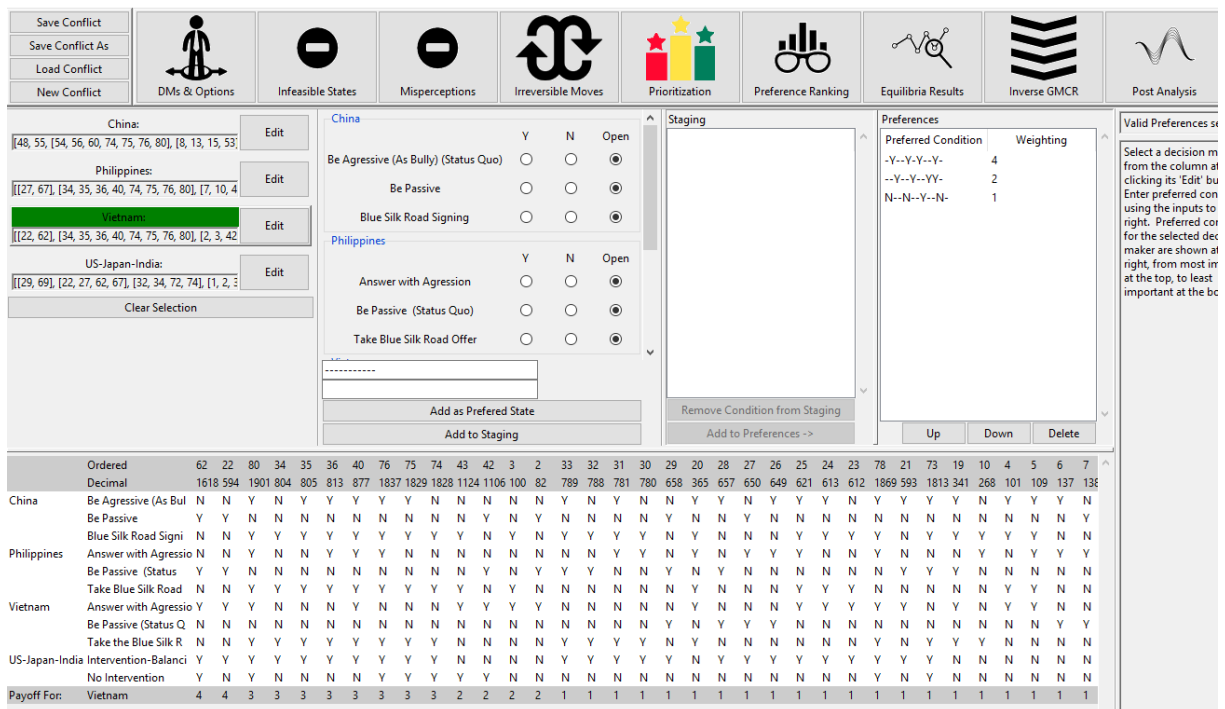


Figure 33: Payout results for Vietnam with external player (GMCR+ own case)

The US-India-Japan coalition results as external player

The US bests results are, when China, Vietnam and the Philippines are passive, while the US intervenes. This scenario was put as a priority – This might be a definition problem by defining the options of them players. It is meant that the US and India can navigate in the South China Sea and made their business, without being bothered by anybody. Clearly they can make any kind of deals in the South China Sea then. The US intervening could mean different things here: Anti-terror operation in the region (IS in Malaysia, Indonesia, South Philippines, South Thailand); cooperating on energy projects, selling weapons etc. Passivity of China brings the US-India-Japan coalition the most payouts. It can be believed: The bigger the coalition is, the better the effect on China's passiveness, however this hypothesis could not be modelled here.

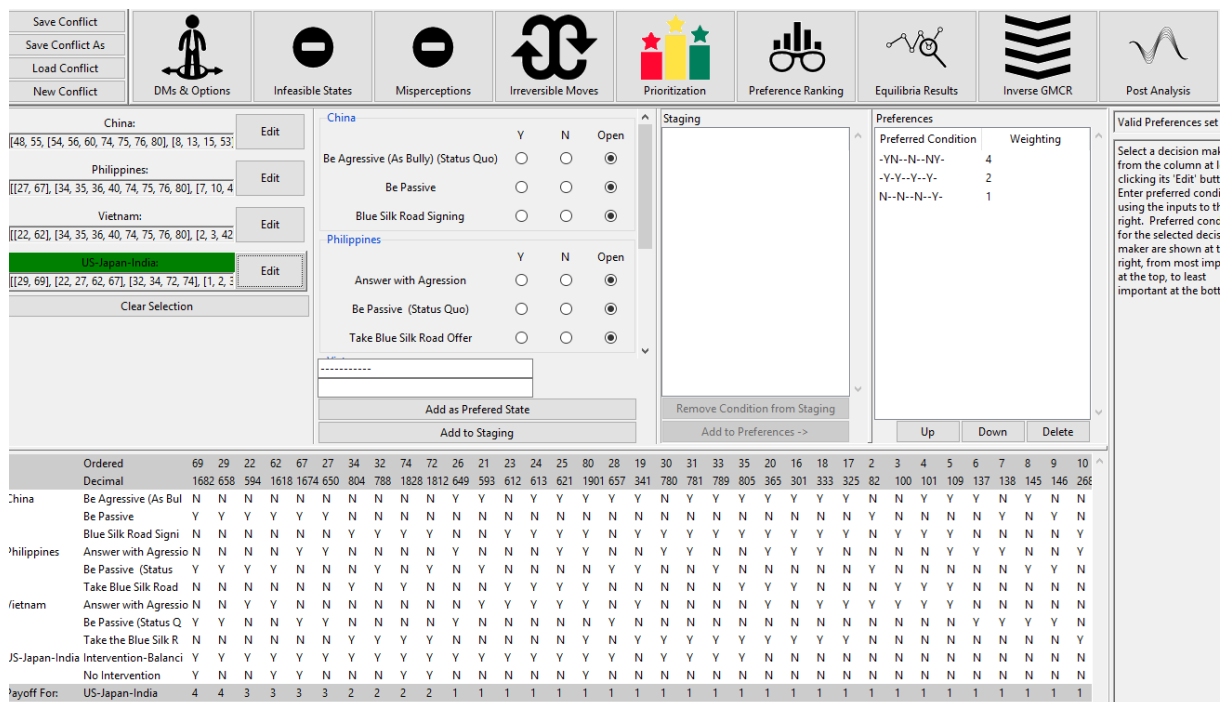


Figure 34: Payout results for US-India-Japan coalition as external player (GMCR+ own case)

4.3.2.4 Outcomes displayed by the graph model

Graph Model without external player shows the best solutions in a stable model. Here for example the best option for China has been marked in the model as case 8 (compare following table; the numbers are ordinal numbers, in this case, state 145 is meant.) The model on the left shows the best cases in which one player can be aggressive while the others stay passive, while in the second model on the right side the Blue Silk Road Agreement is shown, which is much more complex. The cases for the Blue Silk Road are 292 (14), 365 (20), 293 (15) and 301(16).

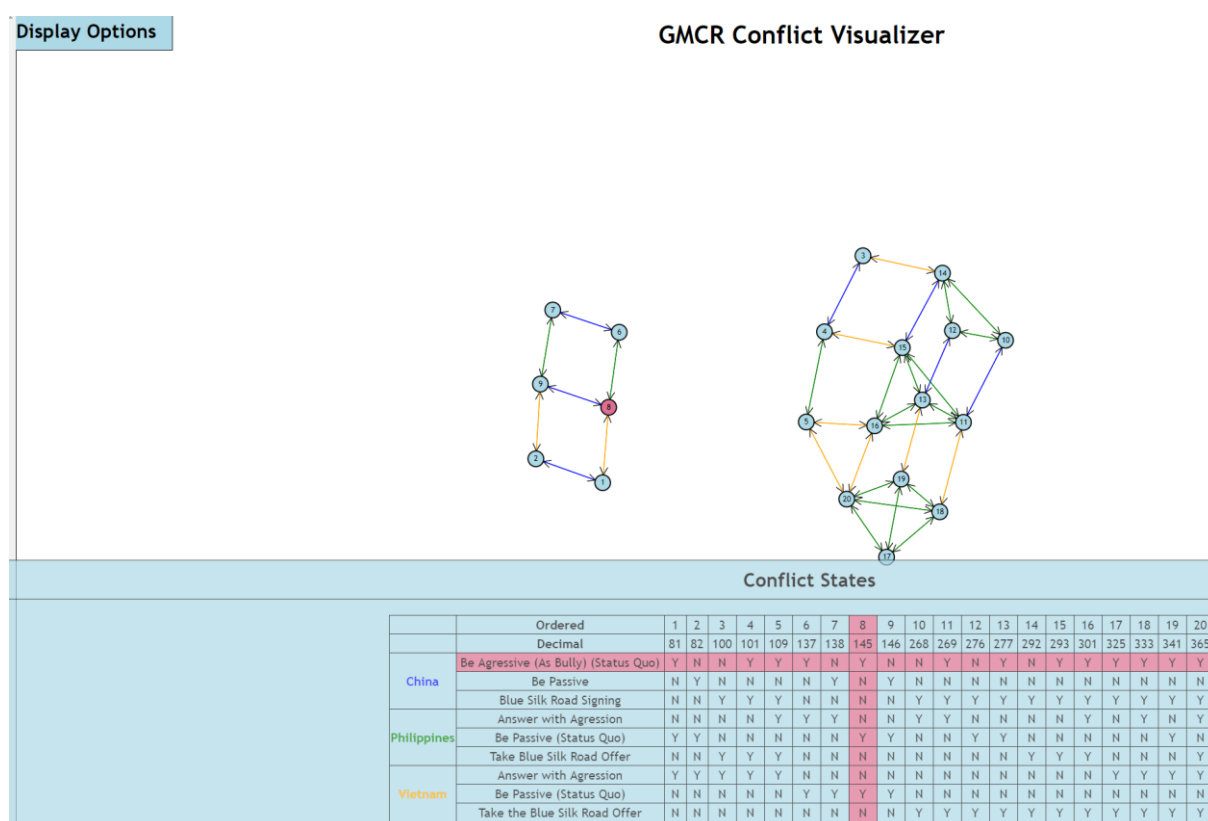


Figure 35: Graph model Outcomes of the Process with GMCR+ (own case)

Coalitions: 1, 2, 3																					Input OK.	
Ordered			8	15	14	20	16	13	12	9	6	2	3	4	5	10	7	19	11	17	18	^
Decimal		Filter	145	293	292	365	301	277	276	146	137	82	100	101	109	268	138	341	269	325	333	
- China	Be Aggressive (As Bul	-	Y	Y	N	Y	Y	Y	N	N	Y	N	N	Y	Y	N	N	Y	Y	Y	Y	
	Be Passive	-	N	N	N	N	N	N	N	Y	N	Y	N	N	N	N	Y	N	N	N	N	
	Blue Silk Road Signi	-	N	Y	Y	Y	Y	Y	Y	N	N	N	Y	Y	Y	Y	N	Y	Y	Y	Y	
- Philippines	Answer with Aggressio	-	N	N	N	Y	Y	N	N	N	Y	N	N	N	Y	Y	Y	N	Y	N	Y	
	Be Passive (Status	-	Y	N	N	N	N	Y	Y	Y	N	Y	N	N	N	N	N	Y	N	N	N	
	Take Blue Silk Road	-	N	Y	Y	Y	Y	N	N	N	N	N	Y	Y	Y	N	N	N	N	N	N	
- Vietnam	Answer with Aggressio	-	N	N	N	Y	N	N	N	N	N	Y	Y	Y	Y	N	N	Y	N	Y	Y	
	Be Passive (Status Q	-	Y	N	N	N	N	N	N	Y	Y	N	N	N	N	N	Y	N	N	N	N	
	Take the Blue Silk R	-	N	Y	Y	Y	Y	Y	Y	N	N	N	N	N	N	N	Y	N	Y	Y	Y	
Payoff For:	China	>	5	4	4	3	3	2	2	2	1	1	1	1	1	1	1	1	1	1	1	
Payoff For:	Philippines	-	1	2	4	2	2	1	3	3	1	3	4	2	2	3	5	1	1	1	1	
Payoff For:	Vietnam	-	1	2	4	2	2	2	4	3	1	5	3	1	1	4	3	2	2	2	2	
	Nash	-	Y	Y	Y	Y	Y				Y	Y					Y					
	GMR	-	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y			Y	Y					
	SEQ	-	Y	Y	Y	Y	Y				Y	Y					Y					
	SIM	-	Y	Y	Y	Y	Y				Y	Y	Y				Y					
	SEQ & SIM	-	Y	Y	Y	Y	Y				Y	Y	Y				Y					
	SMR	-	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y			Y	Y					

Figure 36: Graph model data for Outcomes of the Process with GMCR+ (own case) - State numbers and ordinal numbers

4.4 Stability Analysis – Equilibrium Table

While there are small inconsistencies about the outcomes which are in the middle of the table, the expectations are fulfilled by the GMCR+ analysis.

After entering the data about the decision-makers and their options (each player has 3 options), 512 possible original states were offered by the GMCR+ software. This has been brought down to 20 feasible states. 16 criteria have been entered to delete infeasible conditions by general terms (those deleted the most states). 32 conditions have been entered to delete still illogical conditions, which wouldn't fit the game. Separating the infeasible conditions from the feasible conditions has the most source of error in this program, the more complex the game becomes, since conditions have to be checked and rechecked manually by the YN-tables and list, as well as from regarding the outcomes.

Additionally the equilibrium table allows for checking different states. The following graph shows an example in which aggressive conditions for China, the Philippines and Vietnam have been fulfilled. This means there are three states, which offer a war scenario. With the help of the expectations, these equilibrium table allows for checking for errors in case options are missing, which should show. (Only state 365 shows an equilibrium, according to the theoretic approaches).

Coalitions: 1, 2, 3					
	Ordered		5	18	20
	Decimal	Filter	109	333	365
1 - China	Be Agressive (As Bul	Y	Y	Y	Y
	Be Passive	-	N	N	N
	Blue Silk Road Signi	-	Y	Y	Y
2 - Philippines	Answer with Agressio	Y	Y	Y	Y
	Be Passive (Status	-	N	N	N
	Take Blue Silk Road	-	Y	N	Y
3 - Vietnam	Answer with Agressio	Y	Y	Y	Y
	Be Passive (Status Q	-	N	N	N
	Take the Blue Silk R	-	N	Y	Y
Payoff For:	China	-	1	1	3
Payoff For:	Philippines	-	2	1	2
Payoff For:	Vietnam	-	1	2	2
	Nash	-			Y
	GMR	-			Y
	SEQ	-			Y
	SIM	-			Y
	SEQ & SIM	-			Y
	SMR	-			Y

Figure 37: Equilibrium table of GMCR+ (own case – war scenario)

Another example is the payout table under the condition that all parties join the Blue Silk Road Agreement, which is been offered by China. (Under other circumstances this also allows for analyzing of fitting coalitions.) Her we can see for example, that China gains the highest payout under the Blue Silk Road Agreement. Vietnam and the Philippines gain both the same, which show that no errors have been made in this regard (because it should show this). The table

also allows for showing which theoretical concepts are fulfilled by the states: GMR, SEQ, SIM, SEQ & SIM, and SM. We can see for example that the Blue Silk Road Concept is stable under all theoretical approaches, integrated into the game. The program also shows, that those states from coalition of the first three decision-makers.

Coalitions: 1, 2, 3			14	15	16	20
	Ordered	Filter	292	293	301	365
	Decimal					
1 - China	Be Agressive (As Bul	-	N	Y	Y	Y
	Be Passive	-	N	N	N	N
	Blue Silk Road Signi	Y	Y	Y	Y	Y
2 - Philippines	Answer with Agressio	-	N	N	Y	Y
	Be Passive (Status	-	N	N	N	N
	Take Blue Silk Road	Y	Y	Y	Y	Y
3 - Vietnam	Answer with Agressio	-	N	N	N	Y
	Be Passive (Status Q	-	N	N	N	N
	Take the Blue Silk R	Y	Y	Y	Y	Y
Payoff For:	China	-	4	4	3	3
Payoff For:	Philippines	-	4	2	2	2
Payoff For:	Vietnam	-	4	2	2	2
	Nash	-	Y	Y	Y	Y
	GMR	-	Y	Y	Y	Y
	SEQ	-	Y	Y	Y	Y
	SIM	-	Y	Y	Y	Y
	SEQ & SIM	-	Y	Y	Y	Y
	SMR	-	Y	Y	Y	Y

Figure 38: Equilibrium table of GMCR+ (own case- Blue Silk Road scenario)

Another example is the Blue Silk Road agreement, while an US led coalition works as balancing partner for Vietnam and the Philippines towards China. The Blue Silk Road agreement is clearly not the best option for the US. This also shows that options and priorities have been used in the right direction to show this result. Because if South East Asian nations sign the agreement, they lose a bit and can create a maximum payout of 4, more realistically a payout of 3; contrary to the payouts of 5 and 4, without the agreement.

Something was not integrated in the system however: Minus points in case China gets aggressive. That's a weakness in this model; but would be part of the Chicken Game laid out in the methodology part of the introduction to this thesis . If this options would have been

integrated in the model the one or other way it would have given US fully intervention or China Blue Silk Road the most points, while no intervention could have shown serious minus points for both Vietnam and Philippines, without a US intervention.






Save Conflict																		
Save Conflict As																		
Load Conflict																		
New Conflict																		
		DMs & Options	Infeasible States	Misperceptions	Irreversible Moves	Prioritization												
Coalitions: 1, 2, 3																		
	Ordered Decimal	Filter	34 804	74 1828	80 1901	35 805	20 365	16 301	14 292	15 293	36 813	40 877	60 1389	75 1829	76 1837	56 1325	55 1317	54 1316
1 - China	Be Agressive (As Bul	-	N	N	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	N
	Be Passive	-	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
	Blue Silk Road Signi	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
2 - Philippines	Answer with Agressio	-	N	N	Y	N	Y	Y	N	N	Y	Y	Y	N	Y	Y	N	N
	Be Passive (Status	-	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
	Take Blue Silk Road	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
3 - Vietnam	Answer with Agressio	-	N	N	Y	N	Y	N	N	N	N	Y	Y	N	N	N	N	N
	Be Passive (Status Q	-	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
	Take the Blue Silk R	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
4 - US-Japan-India	Intervention-Balanci	-	Y	Y	Y	Y	N	N	N	N	Y	Y	N	Y	Y	N	N	N
	No Intervention	-	N	Y	Y	N	N	N	N	N	N	N	Y	Y	Y	Y	Y	Y
Payoff For:	China	-	1	3	3	1	1	1	1	2	1	1	3	3	3	3	4	3
Payoff For:	Philippines	-	3	3	3	3	1	1	1	1	3	3	1	3	3	1	1	1
Payoff For:	Vietnam	-	3	3	3	3	1	1	1	1	3	3	1	3	3	1	1	1
Payoff For:	US-Japan-India	>	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Nash	-	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y	Y	Y	Y	Y
	GMR	-	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	SEQ	-	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y	Y	Y	Y	Y
	SIM	-	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	SEQ & SIM	-	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	SMR	-	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

Figure 39: Equilibrium table of GMCR+ (own case- Blue Silk Road scenario - Viewpoint if the US led coalition)

4.5 Discussion of the model and the results

The GMCR+ software allows for many options of game-playing, much beyond the most rational game systems. Actually irritability can be implemented into the game, while some rational decisions could be excluded from the game. This also means the results can be influenced or even biased by declaring infeasibility definitions and prioritization-options. The

game can be altered. This is why all assumptions, which have been taken into this game has been explained. The equilibrium table, manually checking each state and checking the logic of each end state manually are options to check the stability and to decide when outcomes makes sense or not. It is also necessary to have a basic knowledge of the conflict itself. Myself as a student of East Asian studies (and International Business Administration); East Asian literature and news have been followed for some years. Strategic Game Play with real persons have shown the real difficulties. Many of those interventions and tit for tat or moves and countermoves cannot be integrated in the model, as it would become too complex. But Setting priorities as well as their order, allows already for displaying the real situation.

The game here went as far as to show the options the participants China, Vietnam, the Philippines have; also under the circumstances, when a third player here a coalition of the US, India and Japan, comes into the game, as a balancing partner for Vietnam and the Philippines against China. It was possible to integrate this solution in the game.

It is possible to enter an unending decision makers into the program; however by only having those 4 players in the game and their options, the game already creates 2.048 states – here an elimination process of infeasible states have been made until 80 states were left. The number of states in the game without the US coalition had 512 states to begin with, which were eliminated down to 20 possible states. During the process many mistakes have been made, by declaring infeasible states; which have then been corrected manually. This is a time consuming process, with many possibilities to increase errors in the system. For the China-Philippines-Vietnam game, every state which end up in the endgame has been checked manually, and rechecked. For the game with the balancing partner US-Japan-India, not all infeasible states have been removed. It was most interesting here to discover, if the results changes and what options the players would favor most. (Or better to see, if this situation can be created game-wise).

The graph model even jumps on those strongest results: Best solution for any state if it can be aggressive and resource looking, while the other players stay passive or to introduce the Blue Silk Road option.

The weakness of the current game is, that war scenarios couldn't be differentiated (small or big aggression and destruction). (Actually the scenarios could be differentiated, but then the game would have become too complex to deal with it at this level.) In this case minus scenarios should be introduced, to show that states can occur in when 0 or minus scenarios of payouts are possible. The solution here was create instead by taking some priorities into consideration in which other countries would fear an aggressive Scenario of China. However between a full scale war option and tensions (aggressions) could not be differentiated. 'Aggression' in the game also means, that it includes the scenario of China's Status Quo in the South China Sea, in which it can behave like a bully and take island after island. For Vietnam and the Philippines 'aggressions' means also to react with a military aggression towards China or to take islands as resources, go fishing in the other territories and do not regard the territorial status under UNCLOS, which the other players would have as nautical mile zones territories.

5.0 Summary and Conclusion

5.1 Summary

How the research question was answered

The thesis took historic developments under consideration, as well as the today's interests of the decision-makers (often referred as 'players') in the South China Sea conflict.

The **Research Question** was: "What are the options and priorities of China, the Philippines, Vietnam and external players such as the US, India and Japan to act in the South China Sea Conflict? "

The **Secondary Question**: How can this Conflict be displayed by game-theoretic models and will the outcome be displayed similar to what the facts on the ground are?

The research question has been answered by displaying options and priorities in chapter 4 in the GMCR+ game. So the research questions have been answered by applying the software to the conflict problem. While the options and specifications were made under assumptions, they were still based on the real decision makers' profiled, based on the understanding of those players, which had been introduced in chapter 3. The South China Sea Conflict is a real conflict, which emerged first in the 1970s, but developed stronger in the 2000s and 2010s. The goal of this thesis was not to show, who will win and who will lose, but rather to display the options and priorities of the decision makers.

First the methodology part of the thesis in the introduction explained, why this approach and program has been taken, and why it is not a negotiation or mediation problem. The conflict resolution which has been taken here for the South China Sea problematic, has a general approach and doesn't have to be reduced to a specific problem. However, as case, the conflicts between China and the Philippines and Vietnam have been selected as an example, as the conflict could occur in the Spratly Islands and the Parcel Islands. The problem originally was

planned to include other players such as Brunei, Malaysia and Indonesia as well, but for the sake of less complexity, those decision-makers were removed from the problem. However a 'third' decision-maker has been introduced in a second step of the game, to represent the coalition of the US-India-Japan.

From Chapter 2, we were able to learn, that there are multiple-approaches and theories, which can deal with decision-makers conflict situations in which negotiations and mediation efforts play no or a small role. The proposal here is not, that negotiators or mediators have no role to play in the real world, but that their decision-making process will be based on a foundation, which first has to be created, to show what options and priorities the players actually have. This process is recreated through using the GMCR+ software, which allows for the application of different theoretical approaches and methods. So not a single theory or a method, but a mix of many have been used to answer the research question. However the choice of the decision-makers (their options) have been based on the Chicken-Game and to some extent to a external solution of the Prisoner Dilemma (by introducing external players, who can serve as game-changers.)

The results are showing, that two solutions would be favored: Either that any of the players would be able to gather the resources and act aggressive in this regard, while the other participants back down. Realistic this case would only be, if one of the countries would have the US and others as balancing partners. The other solution would be, that all countries would sign the Blue Silk Road contract with China; which was assumed in the game as a win-win situation. From China's viewpoint, aggressive behavior and gathering all sources, without being bothered by others was the best solution, but also if China could act aggressive, and forcing the other players into a Blue Silk Road contract, by having rather only win conditions for China. In this regard it was possible to define the Blue Silk Road positive or negative, by defining different payouts in the game, for different situations.

The South China Sea and the application of the problem with game-play

The game was able to show the most expected outcomes in regard of the South China Sea problem. The results show what solutions each game-player would favor. Here we can, for example say about China, that it would favor either a solution of the Status Quo, which would be taking islands, without larger protests by other decision-makers in the region and exclude interference from outside players, such as the US, India or Japan. Or the second best option, China has in the region, is the 'code of conduct' China itself published / introduced by the so called 'Blue Silk Road' plan; which would give China the leadership in the region, recognized by all parties, which would be signatories to it, what basically keeps the US out of the region and give some concessions towards the resources in the area. However: There is not a detailed plan for doing so; the assumption in this thesis, in each step of the process, was that such an agreement would be a win-win situation for all signing states, contrary to the Status Quo situation, as it shows now. (The Blue-Silk Road if negotiated as such, could also be a burden for Southeast Asian States in reality). The US have been in reality a not convincing balancing partner for different Southeast Asian nations, which is why this plan of China could become reality. The question here is, if the new US-administration under Donald Trump, could become a game-changer for countries based as the South China Sea. Hints are there / the word is out: Donald Trump will treat the Middle East, as a less strategic problem for US hegemony, but will turn his eyes on the situation in the South China Sea and East China Sea or East-Asia in general, with a stronger focus. (As in Middle of 2018; it seems President Trump still has inner US problems to solve before regarding any strategy towards East-Asia; but we see a begin with the US-China trade war as of 2018.)

GMCR+

The decision-supporting system of conflict analysis program GMCR+ has been used for Conflict Resolution. Since the handbook of GMCR is not very detailed, older cases had been used as learning the different steps of the program. Here a case of Hipel, Kilgour & Kinsara (2014), has been used, which deals with a conflict between Syria and Iraq on controlling the Euphrates River through a dam by Syria as the upstream country and Faris, Al-Mohseen & Hipel (2016) which deals with the same problem generally, with Turkey and Syria as upstream-river countries to Iraq. While the situation is completely, the decision-making process of: Act aggressive or act passive, is similar to the South China sea problem. Also Green (2016) led to

the viewpoint, that the Game of Chicken is similar in the construct to the decision-making process. This together with a Third-Party problem, creates the methodology, used in this thesis. Because of the complexity, chapter 2, doesn't only include theoretical discussions, but show the problem with the example of Syria and Iraq based on Hipel, Kilgour & Kinsara (2014). The authors have also included this paper in the GMCR+ as an example, which makes it possible to recreate the steps, which have to be done, by playing first their scenario – Before developing and applying the own problem set to GMCR+.

Background of the South China Sea conflict

Besides the technicalities, chapter 3 discusses the background of the South China Sea conflict by different dimensions and also introduced the different players, which were part of the gaming scenario. Here the goal was not to explain all the moves and conflicts, which happened in the past, but show also by what intentions and goals the decision-makers are actually driven. Since many assumptions have to be made in the process of declaring infeasible-states and declaring what player has what priority; it seems very important to understand the real-actors. The South China Sea conflict, has a historical dimension, which really drives certain players. Also the dimension of interest towards the resources in the South China Sea has manifold criteria which can be regarded (but not taken into so much details in the game itself). Here large resources in form of oil and natural gas lay in the sea and deep-sea of the South China Sea. While the assumptions are highly different, how much oil and natural gas may be located at the South China Sea, there are some (Chinese) assumptions about \$ 60 trillion on the table; which cannot be ignored by the neighboring countries, which wants its share. Fishing rights however can be far more important, since fisherman's jobs are already make for a large part of some economies and the nutrition for Southeast Asian nations. There is however room for negotiations with China, since one issue is much more important for China: For China's security they don't want to allow freedom of navigation in the South China Sea for US military vessels; but for this goal, they need the ASEAN countries on their side. The oil & gas question is for China not only a economic one, but a security question as well. China's growing hunger for energy, cannot be enlarged by having more coal as energy source; gas & oil are rare within China itself; it has to be delivered by Russia, or being imported by Saudi Arabia and other countries, which are politically highly unstable. China has not engaged in any worldwide conflicts in the past decades; 2017-2018 war the first contribution, as China send

special troops to Syria to contain the danger of back coming Uyghur fighters to the Western region Xinjiang (after the defeat of the Islamic State [IS]). Besides that, China has never engaged in the Middle East to insure oil security. Compared to the US, which is currently even self-sufficient on oil & gas in 2018, China is heavily dependent on oil & gas deliveries. In case of a resolution in the South China Sea in this regard, payments, instead of sharing oil & gas resources, would then be most likely. The game however was not able to differentiate between different kinds of resources; Vietnam and the Philippines were chosen as examples, since those countries have a high stake in all of the areas: Oil, gas, fishing rights and freedom of navigation, to which both of the countries cannot just 'back-down' and let it go.

5.2 Conclusion

The Gaming Software GMCR+

The current South China Sea conflict has shown as a good 'playfield' for conflict resolution programs, such as GMCR+, which shows the strength and weaknesses of the method. The strength are in the different possible options, the characteristics of the players, which could be altered by changing their preferences and priorities. The weakness is, that those altering have to be done very carefully, since the complex issues invite for errors, mistakes and misconceptions. Not all functions in the gaming-software are self-explaining, which is why not all functions have been used in this game. Many options can be learned by the papers by the Conflict Analysis Group at the University of Waterloo; here is room for improvement in the handbook of the software. Also setting infeasible conditions (options which shouldn't be chosen because they don't reflect reality), could be more user friendly – after having set those conditions once, it is not easy to check and control them later. It might be necessary to start all over again, if errors in the end table / equilibrium table might be discovered. After using this method for some hours it might come easier to deal with YYN-NNY-YYY-NNY-YYN connotations, however if there are more than 20 options like it, it can still be very confusing.

To check the results, is difficult for persons, who have not been involved in the process, as long as not all options taken and priorities are explained. In this thesis, this is been done as best as possible, however it wouldn't also be possible to explain all the infeasibility conditions,

which had to be set, to get only viable solutions. At some point, there might even be small mistakes, like the one payout options Vietnam has more than the Philippines, which is illogical from the knowledge, that both countries have the same priorities and should have the exact same payouts. Anyway all other major solutions are as expected and can be shown by the software. However in a destruction game; it would be more helpful if negative payouts could be set too. Here the solution was, to give the best options the highest payouts, which allows for an order of the best solutions by each player.

The South China Sea conflict

Negotiations and discussions are ongoing since more than a decade, about a Conduct of Operation / Code of Conduct by the different players, to not go into a hot conflict. Balancing partners, like the US have been chosen here and then by different players; however also the US was not fully willing in the past to keep their agreements on this regard. Especially under the Obama administration in the White House, Southeast Asian partners have backed down from regarding the US as a reliable partner. Not all of the conflicts have been described in detail in this thesis, because it doesn't matter for the game of conflict resolution; they were looked at anyway, to get a good understanding of how conflicts have been solved in the past. The Status Quo can best be described at: China is doing whatever they want – At least that had been the case under the Obama administration [it is yet too early to say how it changed during the Trump administration]. China has heavily engaged in militarizing small islands or even upgrading rocks, which doesn't allow for being regarded as islands under the UNCLOS-agreement, as islands, towards islands now after construction work. China is willing to fulfill the UNCLOS descriptions of 'islands', which allow for an Exclusive Economic Zone of 200 nautical miles (or 320 kilometers), by even settling people at these forsaken uninhabited 'rock-islands' or low tide elevations which become high-tide elevations with some unnatural sand-ejections, by Chinese construction teams. Despite the current islands problems, there can be even new natural islands, which appear due to volcano activity –

While there is a run to get to this place first by many players, those formations can also disappear later.

One of the reasons why the conflict hasn't emerged in the past, as many scholars have already suggested in the 1980s-2000s, is, that China wasn't able for long time to gather resources from

the deep-sea, while keeping the costs of such operations reasonable. Until the World Trade Center attack happened in September 2001, and the following Afghanistan and Iraq wars, the oil price had a level previous to this even of no more than \$5 per barrel oil. Under this conditions, to start deep sea operations to gather oil, which might cost more than \$30-40 per barrel oil, wouldn't have made much sense anyway. Since the oil price in 2007-2008, reached a level of around \$140 per barrel, and since then has been around \$30-90; it makes now much more sense for deep-sea oil drilling and getting to natural gas. After the oil price-rise we could clearly see more activity and risky operations of the players in the region to gather oil & gas. Also other balancing partners, such as India, is interested to engage more in economic activities in the region.

Silk Road & Blue (Maritime) Silk Road

Since this situation brought a new potential for tensions, with a higher likeliness of creating a conflict, the dynamics to get conflict resolution also became higher. Since ASEAN is still not in a position to have any effect (ASEAN members take the experience of the European Union as a negative experience and wait until they do the next step in their relations) on conflict resolution. Also the US under Bush and Obama was more bound and stuck in the Middle East, and didn't act as a strong balancing partner: China took this opportunity to develop a solution on their own. China's large US-Dollar reserves, which grow from \$2 trillion to now even more than \$3 trillion; China gained the momentum to be able to solve the South China Sea through money. They set up a new bank, the Asian Infrastructure Investment Bank (www.aiib.org), which is in competition with the World Bank (www.worldbank.org) (under US-control) and the Japanese led Asian Development Bank (www.adb.org). The new Chinese bank can finance large infrastructure projects, which it already does; and can be used as a carrot (in a carrot and stick game), to be able to convince partners of a possible win-win situation to be on the good side with China. China already does that under the (land based) Silk Road Strategy in Central Asia. The Silk Road is believed to be a blueprint for the Blue Silk Road. Here China opens up a large trading network, which reaches from China to Western-Europe. All participants can enjoy infrastructure investments by China, to reach that goal: Shipbuilding, harbor improvement, railroad improvement, energy projects, resource development and others.

Further Research

It seems to be easy to get any literature on how the South China Sea conflicts breaks out, but rather less on how the dispute could be solved by peaceful terms. The literature in political science seems to concentrate either on how the conflict should break out (Neorealism) or on how the conflict should not break out by having better economic ties (Economic Interdependence), but conflict resolution is no considered option in political science (maybe not at all). Since studying International Business Administration and East Asian Studies (with the focus on China and Chinese as a language) it was a wish to engage in this direction of conflict resolution in a real conflict. While having limited resources myself, conflict resolution should be considered as a multi-discipline task, not being left for mathematical solutions or business decisions. This thesis goes as far as to show a way options and priorities can be display; however the current functionalities can still be improved.

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