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## Conference Paper

# Towards systematic understanding of institutional interests in current agenda items at the world radiocommunication conference

22nd European Regional Conference of the International Telecommunications Society (ITS): "Innovative ICT Applications - Emerging Regulatory, Economic and Policy Issues", Budapest, Hungary, 18th-21st September, 2011

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22<sup>nd</sup> European Regional ITS Conference  
Budapest, 18-21 September, 2011

**Nattawut ARD-PARU**  
**Towards systematic understanding of institutional interests in current  
agenda items at the World Radiocommunication Conference**

**Abstract**

The World Radiocommunication Conference (WRC) serves as a forum to negotiate, review, and revise the Radio Regulations (RR), an international treaty and one of the most difficult regulations for radiocommunication services. RR is complex since it includes intergovernmental issues in relation to regulation covering technical, legal and societal aspects. A large number of parties are interested and involved in revising RR and creating supranational instruments for optimal management of the spectrum. As a consequence, it can be difficult for one involved stakeholder to see its own position and other relevant issues directly influencing them in relation to the whole work of WRC and its sub-processes. A systematic analysis of the main decision-making process would contribute to better understanding of the role of WRC and positions of the involved parties.

The aim of the paper is to contribute to better understanding of the role of the WRC with a focus on the current agenda items. Agenda items are specified issues from RR that need to be handled at an actual conference. The point of departure is using the institutional analysis and development (IAD) framework [see Ostrom (2011)] to gain a suitable institutional overview of the main decision-making process and its sub-processes. The IAD framework has the capacity to explain jointly produced outcomes, such as negotiating an international treaty depending on multiple inputs and different priority levels. Also, it can be used to enhance the understanding of WRC matters in order to improve the decision-making process by focusing on the main interactions and involved parties in relation to the possible outcomes of the WRC. The paper is based on data obtained from historical documents, content analysis, literature review, observations, and interviews. The results of this paper illustrate the benefits of the IAD framework in the context of the WRC, especially for the process of agenda setting and study cycles. The practical implications are important for policy makers, for example, since it highlights critical actors, events, and interactions aligned with the main activities of WRC. A stakeholder will better understand its own position and its possibility for control, both in relation to the overall process and the sub-processes important for agenda items in which it has an interest. It will gain understanding not only of the overall role of WRC, but also of its own possibilities to intervene during the process of revision of RR so that it could protect its interests – e.g., with more proper contribution in the suitable forums with the expected outcome.

**JEL codes: Y40**

**Keywords:** *Radio Regulations (RR), institutional analysis and development (IAD) framework, World Radiocommunication Conference (WRC), WRC agenda items, decision situation*

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# **Towards systematic understanding of institutional interests in current agenda items at the World Radiocommunication Conference**

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The paper is based on data obtained from historical documents, content analysis, literature review, observations, and interviews. The results of this paper illustrate the benefits of the IAD framework in the context of the WRC, especially for the process of agenda setting and study cycles. The practical implications are important for policy makers, for example, since it highlights critical actors, events, and interactions aligned with the main activities of WRC. A stakeholder will better understand its own position and its possibility for control, both in relation to the overall process and the sub-processes important for agenda items in which it has an interest. It will gain understanding not only of the overall role of WRC, but also of its own possibilities to intervene during the process of revision of RR so that it could protect its interests – e.g., with more proper contribution in the suitable forums with the expected outcome.

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## 1. Introduction<sup>1</sup>

Spectrum is a scarce resource, unstoppable at the border of each country, and many parties would like to use it for their interests, especially wireless operators such as mobile satellite and broadcasting operators. In order to balance their interests and keep harmful interference manageable, the International Telecommunication Union (ITU) – the United Nations specialized agency for information and communication technologies – has been founded to manage the use of spectrum at the world level via Radio Regulations (RR), an international treaty and one of the most difficult regulations for radiocommunication services. However, new wireless applications, technologies or services emerge and need to use spectrum, engendering conflicts of interest between existing users and newcomers.

The World Radiocommunication Conference (WRC) serves as a forum to negotiate, review, and revise the RR if necessary. Every three to four years, the WRC is convened with constructed agenda items to review and revise the RR. Member States of the ITU have to use the RR as international and national guidelines to manage the use of spectrum within a country and between countries. RR is complex since it includes intergovernmental issues in relation to regulation covering technical, legal, and societal aspects in order to govern the use of spectrum. A large number of parties are interested and involved in revising RR and creating supranational instruments for optimal management of the spectrum. As a consequence, it can be difficult for one involved stakeholder to see its own position and other relevant issues directly influencing it in relation to the whole work of WRC and its sub-processes. A systematic understanding of the main decision-making process would contribute to better understanding of the role of WRC and positions of the involved parties.

The aim of this paper is to contribute to better understanding of the role of the WRC with a focus on the treatment associated with the current agenda items. Agenda items are specified issues from RR that need to be reviewed at an actual conference. The IAD framework has the capacity to explain jointly produced outcomes, such as negotiating an international treaty depending on multiple inputs. It can be used to enhance the understanding of WRC matters in order to improve the decision-making processes by highlighting the main interactions and involved parties in relation to the possible outcomes of the WRC.

The paper is based on data obtained from historical documents, content analysis, and literature review. Moreover, direct observations and interviews of relevant meetings and participants [Radiocommunication Assembly (RA), Conference Preparatory Meeting (CPM) for WRC, Study Group (SG), Working Party (WP), and regional preparatory conferences for WRC – e.g., Asia-Pacific Telecommunity conference preparatory meeting for WRC (APG) and CEPT conference preparatory meeting for WRC (CPG)] also have been used.

The structure of this paper is as follows: Section 2 illustrates main issues contributing to the complexity of the WRC, which also motivates several involved parties to seek methods and tools for understanding main processes for WRC, especially with a focus on the interested parties and their positions. This section also presents basic concepts used in the IAD framework (Ostrom, 2011) and its usefulness for producing abstract descriptions of complex processes where different institutional interests and activities have to be considered for development and democratic decision-making processes. Section 3 describes the methodology. The following three sections comprise descriptions and analysis of the IAD framework for WRC-12 agenda setting (Section 4), and further examination of this for particular agenda items – i.e. 1.19 and 1.22 (Section 5) – and for examining a particular

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<sup>1</sup>The full list of abbreviations can be found at the end of this paper.

country – i.e. Thailand – and its main telecommunication policymaking actor's (The National Broadcasting and Telecommunications Commission, NBTC) position (Section 6). The benefit of using the IAD framework is discussed in Section 7. Finally, the paper concludes with the summary of results (Section 8).

Since WRC-12 will be held on 23 January – 17 February 2012, an obvious limitation right now (July 2011) is that the results cannot be tested now. However, the main contribution – to provide a synthesis of the main influencing parts together with an overview of the whole international decision-making situation in WRC – is a first step towards sustainable processes. The data collection – i.e. the observations and interviews – may not be representative for all involved actors and their interests; however, it incorporates main actors, events, and interactions associated with the decision-making process and concrete issues reflecting Thailand's position on agenda items 1.19 and 1.22 of WRC-12.

## **2. Background<sup>2</sup>**

This section illustrates the need to understand main processes during the complex WRC, especially with a focus on the interested parties and their positions. This section also presents basic concepts used in the IAD framework (Ostrom, 2011) and their usefulness for producing abstract descriptions of complex processes where different institutional interests and activities have to be considered for development and democratic decision-making processes.

### **2.1 WRC structure – interested parties and positions**

It takes eight years or two WRCs to establish WRC agenda items according to the ITU Convention. For example, the setting-up process for the agenda items for the conference that is due to take place in 2012, WRC-12, started in 2000. Moreover, after the WRC agenda items have been finalized, there is a four-year period to study and prepare for each WRC agenda item or one WRC study period. In the case of WRC-12, there is an eight-year period to set up the agenda items and four years to study and prepare the results for WRC-12.

In order to protect their interests, many stakeholders and interest groups are interested in participating in these agenda items by attending conferences arranged by ITU. The conferences range from working parties (WP), study groups (SG), and conference preparatory meetings for the WRC (CPM), to regional preparatory meetings, such as the Asia-Pacific Telecommunity conference preparatory group for the WRC (APG).

The WRC is an international conference arranged by the Radiocommunication Sector (ITU-R)<sup>3</sup>. The WRC's function is to revise the Radio Regulations. It can deal with any question on a worldwide basis. Moreover, the WRC can instruct work for the Radio Regulations Board (RRB)<sup>4</sup> and the Radiocommunication Bureau (BR)<sup>5</sup>, and identify studies for the RA<sup>6</sup> and the radiocommunication study group (SG)<sup>7</sup>. Generally, the agenda of the WRC should be set up four to six years in advance

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<sup>2</sup>This information is based on the International Telecommunication Union (ITU) websites, Constitution and Convention [Collection of the basic texts of the International Telecommunication Union adopted by the Plenipotentiary Conference (2007a)], but it is written in the author's own words.

<sup>3</sup>ITU comprises the Plenipotentiary Conference or PP, the Council or CC, world conferences on international telecommunications or WRC/RRC, the Radiocommunication Sector (ITU-R), the Telecommunication Standardization Sector (ITU-T), the Telecommunication Development Sector (ITU-D), and the General Secretariat.

<sup>4</sup>RRB has a duty to approve the Rules and Procedures in accordance with Radio Regulations. These Rules and Procedures are used by director of BR to register frequency assignment from Member States. Moreover, RRB considers reports of harmful interference from BR upon request from administrations and reviews BR decisions regarding frequency assignment.

<sup>5</sup>BR works as the secretary of ITU-R headed by the director elected director by PP. BR director organizes and coordinates the work of ITU-R and serves as executive secretary of RRB and also prepares and submits draft Rules and Procedures for approval.

<sup>6</sup>RA provides the necessary technical matters for WRC by considering the reports of study groups, modifying or rejecting the recommendations in those reports and the reports of the Radiocommunication Advisory Group.

<sup>7</sup>SG are set up by RA to study questions adopted by RA and also identified by WRC regarding the use of spectrum in both terrestrial and space services, characteristics and performance of radio systems, operation of radio stations, and distress and safety matters. The study does

and be approved by the Council two years before the WRC. The WRC normally convenes every three to four years in order to review and revise the RR, which is the international treaty. Member States of the ITU have to use the RR as an international guideline to manage the use of spectrum within a country and between countries in order to minimize harmful interferences.

The reason the RR needs to be revised is the rapid growth of radiocommunication technology, which has changed over time. Naturally, the RR cannot be changed every day. This means that the issues in the WRC or the agenda items have to be prepared in advance according to Convention No. 118<sup>8</sup>. Normally, the list of WRC agenda items has a maximum of 25 specified issues and 8 permanent issues.

ITU is the oldest United Nations organization, dating back 145 years to 1865. The following figure shows the relevance between the WRC and ITU as a structure of ITU.

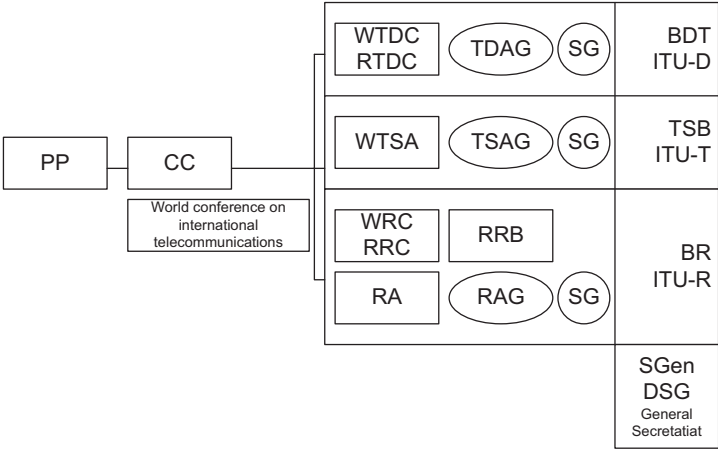


Figure 1. Structure of ITU

There are a large number of parties that are interested and involved in revising the RR in the WRC process. Only participants have ITU memberships (Member States, Sector Members, Associates and Academia) in different capacities – e.g., having the right to vote and observer status. Stakeholders in the telecommunication industry can be categorized into three levels: constitutional, collective-choice and operational. [Table 7 of (Ard-paru, 2010, p. 23)]. At the constitutional level, there is the regulator, administrator, or authority in each country making decisions on the high level of regulations, including RR. At the collective-choice level, there are the operators, providers, or standard-setting units that have to create technology according to the regulation (constitutional choice level). At the operational level, the users have choices to select devices and use them.

**2.2. The IAD framework**

The Institutional Analysis and Development (IAD) framework permits analysts to understand whole processes and behaviors in order to make comparisons and evaluations and understand collective actions within democratic processes (Ard-paru, 2010; Koontz, 2003). It was developed and improved continuously by Ostrom from 1982 to 2011 (Kiser & Ostrom, 1982; Ostrom, 2005, 2007, 2011) to provide a systematic framework to deal with the decision-making process, including the decision-makers and decision situations. It enhances different levels, or worlds of actions, for the decision-

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not generally involve economic questions, only comparing technical or operational alternatives; however, economic factors may be take into account.

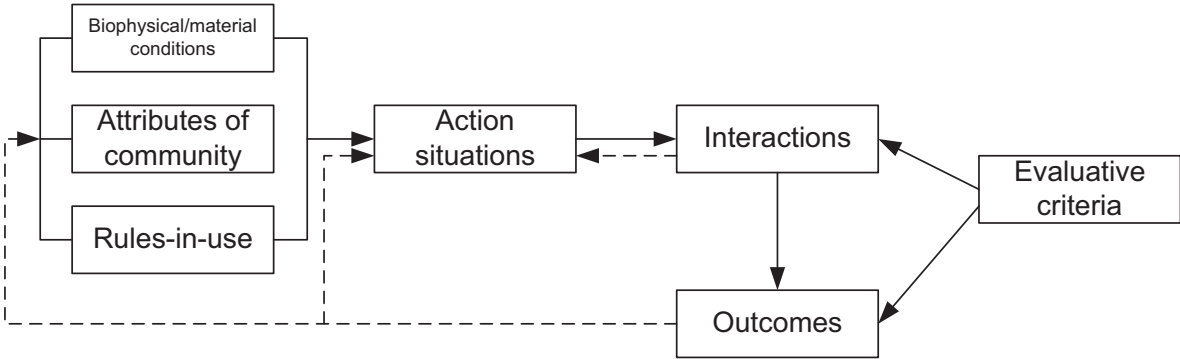
<sup>8</sup>The general scope of WRC agenda setting should be established four to six years in advance, and the final agenda shall be established by the Council preferably two years before the conference, with the concurrence of a majority of the Member States, subject to the provisions of No. 47 of this Convention. These two versions of the agenda shall be established on the basis of the recommendations of the World Radiocommunication Conference, in accordance with No. 126 of this Convention. [Convention (2007b), No. 118]



making process – i.e., operational, collective-choice, constitutional, and metaconstitutional situations – and explains the relationship between institutional arrangements and the individual in terms of the transformation of rules into individual behavior.

A direct benefit of IAD is distinguishing exogenous variables and an internal action situation at each situation level. The exogenous variables include the biophysical/material condition, the attributes of community, and rules-in-use. The internal action situation structure comprises boundary, position, choice, payoff, information, aggregation, and scope rules. These help in understanding actors and possible and necessary interactions needed for certain outcomes.

Institutional arrangements are rules used by individuals to determine who and what are included in decision situations, how information is structured, what actions can be taken and in what sequence, and how individual actions will be aggregated into a collective decision (Kiser & Ostrom, 1982, p. 179). In other words, this framework explains phenomena attributed to the aggregation of individual actions that individuals decide to take or strategies (plans of action) based on situations and the individual. The situation depends on rules, events, and the community. This framework also captures the dynamic situation by feedback from the phenomena that influence the community, situation, and individuals. Each world of action has five working parts in an institutional structure: the decision-maker or individual, the community, the event (or goods and services), the institutional arrangement, and the decision situation. The results of the institutional structure are individual actions or strategies and the aggregation of individual actions. The three worlds of action are updated in the IAD framework by Ostrom (2005), (2007), and (2011).



**Figure 2.** A framework for an institutional analysis<sup>9</sup>

The IAD framework provides exogenous variables and an internal action situation at each situation level. The exogenous variables include biophysical/material conditions, attributes of community, and rules-in-use. The internal action situation structure comprises boundary, position, choice, payoff, information, aggregation, and scope rules. The following figure illustrates the relationship between rules-in-use and internal action situation by Ostrom (2011).

<sup>9</sup>Source: Ostrom (2011, p. 10), Figure 1

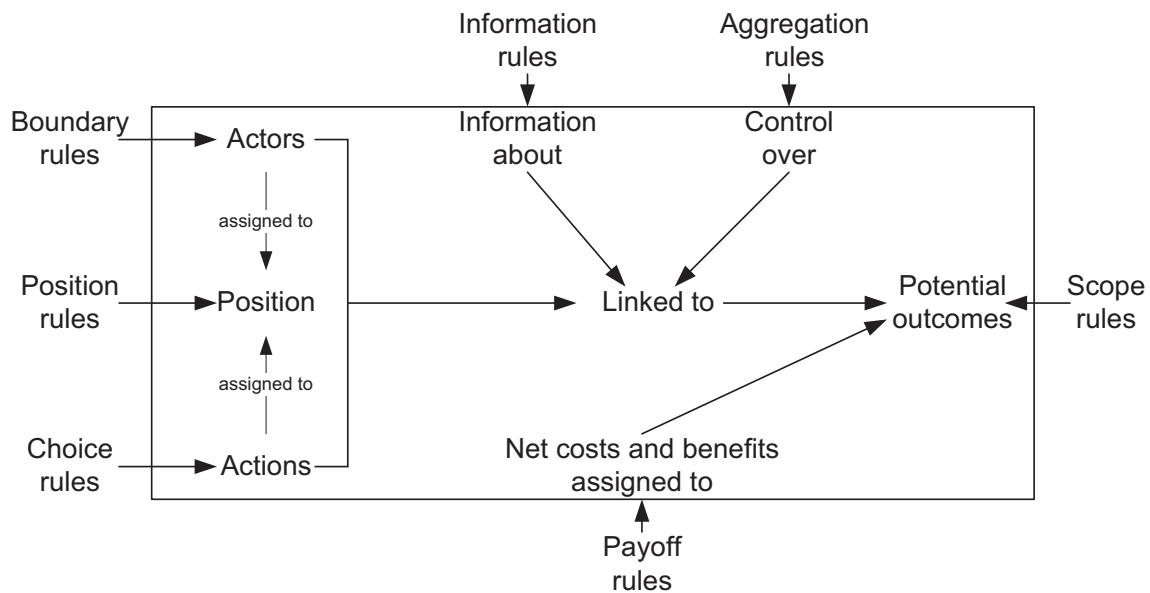


Figure 3. A rules-in-use and action situation<sup>10</sup>

### 2.3 The benefits of IAD framework

The IAD framework provides an overview of analysis in term of the list of question concerned (Ostrom, 2011); however, it does not provide the solution to a problem. The detailed study for solving problems has to be done by researchers themselves. Moreover, the IAD framework has the capacity to explain a jointly produced outcome, such as negotiating an international treaty. The international treaty is the multi-country agreement that each administration has to follow. The negotiations between countries have to be conducted according to their international and national rules in order to attain the international treaty. When negotiating the international treaty, each administration has to take into consideration the interrelationships with others, including their actions and responses, before making its decision to take action or implement a strategy. The IAD framework helps to organize systematically what the issues are, where the forum or conference is taking place, which relevant rules are considered, who can vote or make decisions, what choices they have, what the consequences of each choice are, and what information is available. Each administration takes the contributions of others into consideration and decides on its own choice of action at the end.

The IAD framework has been used in several studies. Schlager and Ostrom (1992) uses the IAD framework to explain the property right of common-pool resources in the Maine lobster industry. Most of the IAD research focuses on common-pool, natural resources such as forest, ground basin water, and the fishery industry (Ostrom, 2007) and recently for service management (Spohrer, Piciocchi, & Bassano, 2011). However, the IAD framework also proved useful for sustainable spectrum commons (Wang, 2009) and explained bundle rights to use frequency in the telecommunication industry (Ardparu, 2010). It has the capacity to explain jointly produced outcomes, such as negotiating an international treaty depending on multiple inputs (Ostrom, 2005).

### 3. Method

The paper uses history, content analysis, and literature review as its main method. The author has personal experience from working at the Post and Telegraph Department, the Office of the National Telecommunication Commission, and the Office of the National Broadcasting and Telecommunication Commission in preparing, studying, and attending WRC-03 and WRC-07 as part

<sup>10</sup>Source: Ostrom (2011, p. 20), Figure 3



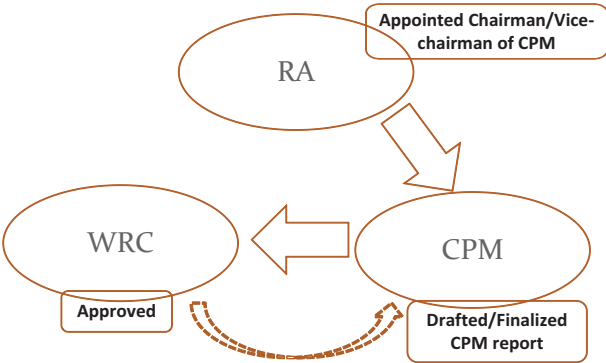
of Thailand’s preparatory team for the WRC. Moreover, direct observations and interviews of relevant meetings and participants have been used, and they enhance understanding of the IAD framework in the WRC environment.

The experience from WRC-03 and WRC-07 provides access to the ITU archive to explore WRC activities in terms of document analysis. The focus is on the WRC-12 agenda items. The ITU archives contain all the meeting documents. Personal experience of participating in the WRC helped to pinpoint the relevant meeting documents. As for the WRC-12 agenda items, the history started with the Radiocommunication Assembly 2000 (RA2000). The relevant meetings are RA-2000, CPM-02-1 and 2, RA-03, WRC-03, CPM-06-1 and 2, RA-07, WRC-07, the Council 2008 (CC-2008), CPM-11-1 and 2, WP1B, WP1A, SG1, RA-12, and WRC-12. There are two WRCs to set up and one to study and prepare the WRC-12 agenda items.

**4. Examining WRC agenda setting**

This section describes and analyses the IAD framework for WRC-12 agenda setting. This section also presents the process of WRC agenda setting, variables and the relationship of the IAD framework to WRC-12 agenda setting.

In order to find the origin of WRC agenda setting, the reverse-engineering concept has been implemented, thinking backwards in terms of input and output, including drafted and finalized documents. The final WRC-12 agenda items have been approved by CC2008 as output. The input to CC2008 concerning the WRC-12 agenda items came from WRC-07, CPM-06, WRC-03, CPM-02, and WRC-2000. Moreover, the RA-03 and RA-2000 appointed the chairman and vice-chairman of the CPM drafting WRC-12 agenda items. The relevant meetings work as the places for making decisions – i.e., attributes of community in the IAD framework. The Member States and Sector Members contributed an input document to the relevant meetings for the WRC-12 agenda items. These contributions increased the choice of actions at the meeting. The following figure illustrates the relationship between WRC, CPM, and RA in order to set up the WRC-12 agenda items.



**Figure 4.** The relationship between and functionality of WRC, CPM and RA for the WRC agenda setting

The attributes of community indicate the location of the decision-making process. This reflects the place of opportunity at which to submit a contribution to the relevant meetings. The contributions regarding the WRC-12 agenda items contained the possible specified agenda items in order to make choices of action possible for the meetings. The following table shows the number of issues and contributions regarding the WRC-12 agenda setting.

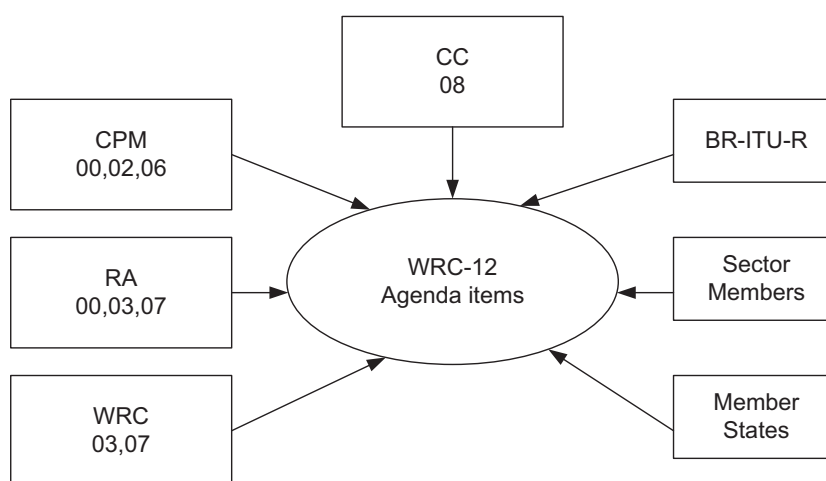
**Table 1.**Number of issues and contributions to the WRC-12 agenda setting

WRC-12 agenda	WRC-2000	CPM-02-1	CPM-02-2	WRC-03	CPM-06-1	CPM-07-2	WRC-07
Number of Issues	2	2	2	2+13=7	7	7	7+80=24
Number of Contributions	0	0	0	10	0	2	26

The above table shows the attributes of community, where decision-making takes place in terms of the opportunity to submit contributions. In the first CPM, the main duty is usually to organize the agenda items and distribute work to the SG, so there was no contribution with regard to the WRC-12 agenda items. Two issues spilled over from the WRC-2000. The contributions were entered in WRC-03, CPM-07-2, and WRC-07. There were a number of contributions to WRC-07, because that was the last conference to finalize the WRC-12 agenda items. The previous conferences had the same opportunity to add issues to the WRC-12 agenda items but their success was not guaranteed in the last stage of finalizing WRC-07. The continuity of attending the conferences and actively participating therefore protects their interests in terms of the agenda item. The IAD applicability will be discussed in detail in the next section.

#### 4.1 Variables from the IAD framework applied to WRC-12 agenda setting process

In order to use the IAD framework to systematically understand the process of the WRC agenda setting, the exogenous or external variables and internal decision situation have to be identified. The following figure illustrates the relevant matters regarding the WRC-12 agenda setting, including stakeholders and conferences.



**Figure 5.** Relevant meeting and parties for WRC-12 agenda items

The IAD framework helps to organize the stakeholder and conferences systematically in terms of the decision-maker and the decision situation into exogenous variables and an internal action situation as follows.

*Exogenous variables: biophysical/material conditions, attributes of community, and rules-in-use*

*Biophysical/material conditions*

The biophysical conditions or attributes of events describe the type of goods. In WRC-12, the relevant goods are the spectrum. The spectrum can vary between public goods, private goods, and common-pool goods, depending on the assignment approach (Ard-paru, 2010, pp. 4-5). In the WRC, however,

the centre of the discussion focuses on allocation of service, not assignment, including the characteristics of the use of the spectrum. Thus, at the WRC level, the spectrum should be public or common-pool goods.

#### *Attributes of community*

The attributes of community describe the location of the decision-making. In this case, there are several meetings and conferences that make decisions regarding the WRC-12 agenda items. It started with RA-2000, CPM-02-1 and 2, RA-03, WRC-03, CPM-06-1 and 2, RA-07, WRC-07, and CC-2008. At each meeting or conference, the participants were allowed to make decisions that were relevant to the WRC-12 agenda items.

#### *Rules-in-use and the internal action situation*

The rules-in-use provide an institutional arrangement in a decision-making situation, including boundary, position, choices, payoff, information, aggregation, and scope rules. The detailed discussion follows below with a connection to the internal action situations. These rules help to explain the action arena or action situation.

Inside the action situations, there is an internal structure of action situations that are closely related to the rules-in-use. The relationship between the rules-in-use and the action situation directly affects the outcome of the decision-making situation. At each meeting or conference, there are explanations for the rules-in-use and the action situation as follows.

*Boundary rules:* who can participate as an actor in this meeting or conference? There are two main categories: Member States and Sector Members. Member States are allowed to send their delegates on behalf of the administration. Sector Members can attend in an observer capacity. Member States can also have delegates from the Sector Members.

*Position rules:* what are the roles in the meetings? There are two main categories: chairman and members at the meetings. Moreover, each administrator or Member State can have several roles – i.e., head of delegation, delegate, observer, and supervisor. In the meeting, each administration has one vote. Only representatives from administrations or Member States have a right to vote. Sector Members have no right to vote.

*Choice rules:* what choice of actions are allowed in the meetings? Each administrator can propose his/her contributions to the document format, including suppression, modification, addition, and no change. Moreover, during the meeting, the delegate has the additional choice of intervention by asking for pending issues to be put in square brackets in the text to seek further clarification or information. The decision varies on issues in the agenda items. For example, if the administrator wants to push the agenda items forward, then no change may be suitable in one situation, but there may be an addition in another.

*Payoff rules:* what are the costs and benefits of each action? Before selecting actions or series of actions (strategy), the costs and benefits of each choice of action and the consequences have to be considered. Sometimes it becomes a trade-off situation. The evaluative criteria should also be considered in order to measure the costs and benefits.

*Information rules:* what information is available? What is confidential and what is public? In the meeting, all contributions, written or verbal, should be available to all participants. Some in-depth or

confidential information may be kept secret and only be made available to specific groups, however, such as the head of a delegation.

*Aggregation rules:* what level of control is needed to choose actions at the meeting? The chairman of the meetings works as the control key that allows one action at a time. The actions allowed at the meeting include suppression, modification, addition, no change to a contribution or document, and postponement of an issue. For example, if there is a limit on time to consider the debatable issue, the chairman may propose reconsideration at the next meeting and put all the text in square brackets.

Moreover, the aggregation rules mean that the aggregated action or result works as output from one meeting and input to another meeting – e.g., the output of CPM-06 is input to WRC-07. There are many steps before CPM-06. For the WRC-12 agenda setting, the CPM-02 chapter rapporteur was drafted by consolidating the relevant contributions. This draft worked as input to WRC-03. At WRC-03, Committee 7 was set up to prepare the work for the WRC-03 plenary session. The drafting group chairman prepared the draft WRC-12 agenda items by consolidating the relevant contributions and discussion within the drafting group. The output from the drafting group was the input to the plenary session of WRC-03. The output from WRC-03 was the input to CPM-06.

*Scope rules:* what are the possible outcomes? In the meetings, the possible outcomes are considered on the basis of the contributions to the RR, which can be applied with modification, addition, suppression, and no change.

*Interaction (action and strategy)*

The decision-makers are all participants in the meeting who have amended, revised, and approved the text. Moreover, the person who drafted the text, including or excluding the contribution and discussion during the drafting period, can also be a decision-maker. Thus, there are two levels of decision-makers at each meeting or conference: drafted and approved. First, the person drafts the text by gathering the contribution, discussing it in the drafting group, and finalizing the text. Second, the person amends, revises, and approves the text.

*Levels or worlds of action*

The above discussion regarding exogenous variables and an internal action situation provides an explanation of the WRC agenda setting using the IAD framework. The WRC agenda setting aims to revise the RR, which is the international treaty. Each administration has to use both international and domestic regulations as guidelines. The level of action for the WRC agenda setting is therefore considered in the constitutional layer, which can be divided into relevant conferences.

The rules-in-use and internal action situation vary from the attribute of community, where the decision-making takes place. In the ITU environment, four of the rules-in-use are similar: the boundary, position, choice, and scope rules. The different contributions and discussions in relevant conferences render information, payoff and aggregation rules, which vary from conference to conference in terms of consideration issues. These issues directly influence the choices of action for the decision-maker. For each attribute of community, there is therefore a unique action situation, depending to some extent on the different contexts. The possibility of a predictable pattern of an action situation should be expected, however, if there is not much difference in context.

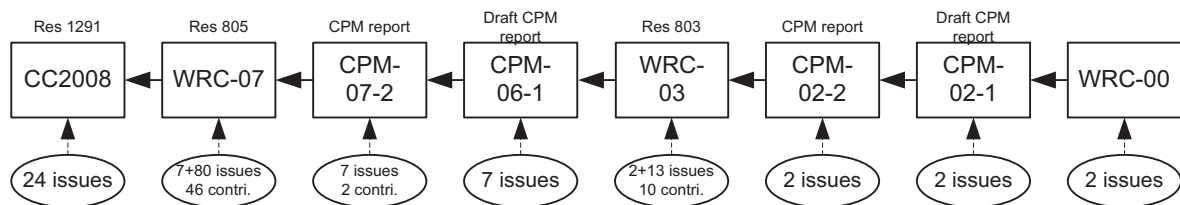
Each conference represents the attribute of community and renders different action situations. The detailed discussions of issues within the various conferences show the action situation in terms of interaction between stakeholders. The contribution contains issues affecting the WRC-12 agenda items

and represents choices for the decision-maker, and discussion within the conference (written and verbal) serve as information rules influencing the decision-making process. Details of the issues in the various conferences for the WRC-12 agenda setting are provided in the next section.

#### 4.2 Relations from the IAD framework applied to WRC-12 agenda setting

The attribute of community of RA-2000 and RA-2003 appointed the chairman and vice-chairman of the CPM for drafting the WRC-12 agenda items; there was no issue concerning the WRC-12 agenda items at these meetings. Moreover, the attribute of community of CPM-02-1 and CPM-06-1 only organized and distributed the work in terms of chapters in the CPM report; there was no issue concerning the WRC-12 agenda items at these meeting. The draft CPM report composed by the CPM chapter rapporteur was available before the CPM-02-2 and CPM-07-2, however. Thus, the consideration issues concerning the WRC-12 agenda items concentrated on WRC-07, CPM-07-2, WRC-03, and WRC-2000.

Using the concept of reverse engineering, one step backward at a time to find the input and output relationship between the attribute of community or conferences, the following figure illustrates the input and output relationship of the WRC-12 agenda items.



**Figure 6.** Input and output relationship between the attributes of community for the WRC-12 agenda items

The solid arrow indicates that the indicated attribute of community is an input to another. The dashed arrow shows the number of issues and contributions in the attribute of community or conferences. The text above indicates the document containing the WRC-12 agenda items.

The above figure illustrates the attribute of community indicating forum or conferences as an opportunity to submit contribution and participate in the meetings. The following table shows a list of stakeholders who submitted contributions to relevant conferences. There are seven conferences providing opportunities to set up WRC-12 agenda items. The last conference, WRC-07, is the crucial conference to finalize the WRC-12 agenda items.

Those contributions increase the number of choices for the decision-maker to select. To select make a choice, the benefits, consequences and expected outcomes have to be analyzed. This information has a direct influence on the decision-making process. In order to explain the link of contributions to the internal action situation of the IAD framework, the issues relevant to spectrum commons are selected.

The agenda items regarding spectrum commons were proposed in WRC-07 by ARB for both software-defined radio (SDR) and cognitive radio systems (CRS) and emission of short-range devices (SRD). The ARB is a group of Arab countries that have no manufacturer base. They are consumers using SDR, CRS and SRD. It seems strange that these countries are pushing forward these agenda items. Moreover, there was one contribution from EUR to propose studying the use of CRS worldwide. In the case of EUR, there are many countries that have manufacturer and technology development bases. The benefit of pushing this agenda forward is to expand the market globally.

**Table 2.** Number of issues, contributions and stakeholders involved in the WRC-12 agenda setting

WRC-12 agenda	WRC-2000	CPM-02-1	CPM-02-2	WRC-03	CPM-06-1	CPM-07-2	WRC-07
Number of Issues	2	2	2	2+13=7	7	7	7+80=24
Number of Contributions	0	0	0	10	0	3	26
ITU	0	0	0	0	0	2	0
Administration	0	0	0	AUS MEX UKR USA CAN KOR	0	0	UKR CAN/CHL/CTR/DOM/S LV/USA/GTM/URG CAN/USA (3) ISR CHN FIN CUB INS RUS USA (7) CAN
Regional meeting	0	0	0	ASP EUR ARB IAP	0	APT	IAP (2) ARB (2) ASP EUR RCC

In the WRC-07, there was one drafting group to set up WRC-12 agenda items: Ad hoc plenary 7.2. It used the plenary session of WRC-07 to formulate WRC-12 agenda items. It rarely happens in WRC meetings because the committee 7 had no time to consider this issue.

The draft WRC-12 agenda items combined two proposals from ARB and EUR regarding SDR and CRS together with one remaining proposal of SRD emission pushed forward to be approved by the 13<sup>th</sup> plenary session as first and second reading. Normally, WRC documents have two steps of approval: first and second reading. In the case of WRC-12, there was limited time: thus the chairman of WRC-07 proposed having first and second readings at the same time. During the 13<sup>th</sup> plenary session, two agenda items – i.e., SDR and CRS and emission of SRD – were protected by ARB and EUR to include in WRC-12 agenda items. Some issues of agenda items were left out during drafting by Ad hoc plenary 7.2 and the 13<sup>th</sup> plenary session due to negotiations inside the meeting.

## 5. Examining agenda items 1.19 and 1.22 of WRC-12

This section presents the IAD framework for agenda items 1.19 and 1.22 of WRC-12. This section also provides the process of studying the WRC cycle for agenda items 1.19 and 1.22 of WRC-12 and the variables and relationships for the IAD framework applied to agenda items 1.19 and 1.22 of WRC-12.

In WRC-12 agenda items, there is no agenda item directly related to spectrum commons allocation. There are, however, two relevant agenda items: enabling technology (SDR and CRS) for spectrum commons (agenda item 1.19) and emission of short-range devices (agenda item 1.22). From Resolution 805 (WRC-12) – Agenda for the 2011 World Radiocommunication Conference, the text of agenda items 1.9 and 1.22 is as follows:

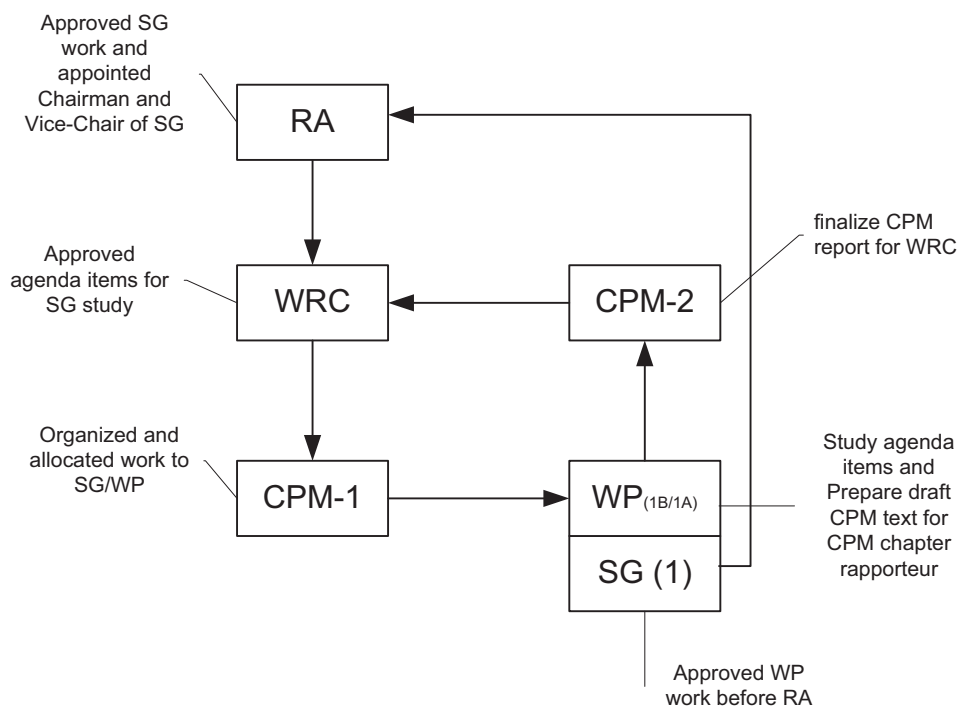
“1.19 to consider regulatory measures and their relevance, in order to enable the introduction of software-defined radio and cognitive radio systems, based on the results of ITU-R studies, in accordance with Resolution 956 (WRC-07);



1.22 to examine the effect of emissions from short-range devices on radiocommunication services, in accordance with Resolution 953 (WRC-07).”

These two agenda items use spectrum as a medium to communicate. The use of spectrum in these two agenda items is non-exclusive. That means no one has permanent exclusive right to use frequency or spectrum commons. Most of frequencies using spectrum commons are industrial, scientific, and medical (ISM) band locating in footnote 5.138 and 5.150 of Article 5, RR. The devices operating in this band mostly are short-range devices such as Wi-Fi and Bluetooth-enabled devices in computers or smart phones, radiofrequency identification (RFID) tags, and cordless telephones. These Wi-Fi and Bluetooth-enabled devices are applications of SDR and CRS technologies enabling changes in frequency and modulation type by software and acquisition of knowledge from its transmission to create dynamics and autonomous adjusted operating parameter, respectively.

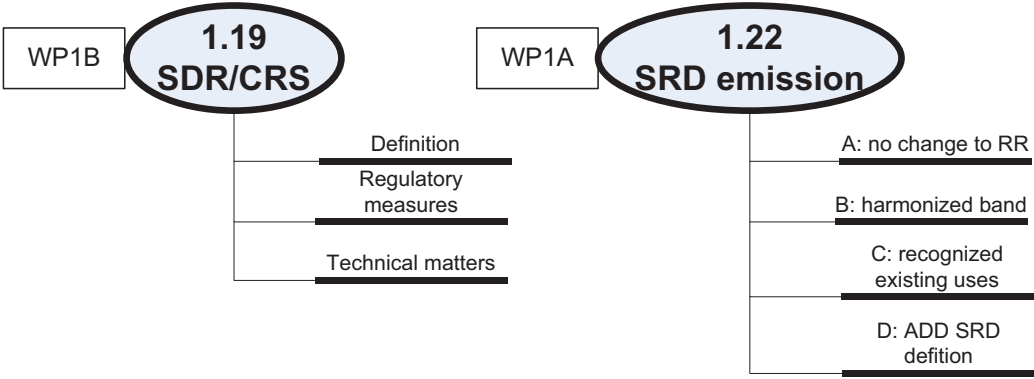
Generally, studying agenda items for the next WRC, the RA appointed the chairman and vice-chairman of SG, including CPM, to prepare the CPM report for WRC. The WRC study cycle begins. After WRC finalizes the agenda items, CPM organizes and distributes the work to the relevant SG, especially WP under SG if applicable. Each SG has several WPs, depending on the study issues. Chairman The chairman of WP, with coordination of BR, arranges the WP meeting in order to study and prepare draft CPM text to CPM chapter rapporteur. CPM chapter rapporteur combines the relevant documents into a draft CPM report for the second CPM. The second CPM finalizes the CPM report for WRC. The following figure shows the study circle of WRC and its relevant meetings with their main duties.



**Figure 7.** Study circle of WRC work

Regarding agenda items 1.19 and 1.22 of WRC-12, CPM-11-1 has been allocated study work to WP1B and WP1A, respectively. Each WP has four years concurrently for its study and prepares the draft CPM text. Each agenda item has different issues to consider based on the input document to the

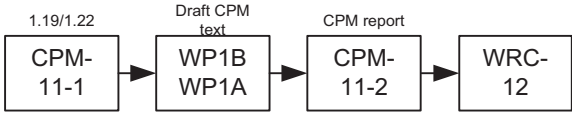
meeting. The following figure shows the main issues under agenda items 1.19 and 1.22 of WRC-12 and the responsible WP.



**Figure 8.** Issues inside agenda items 1.19 and 1.22 of WRC-12

The consideration issues of agenda item 1.19 are definition of SDR and CRS, the relevant regulatory measures of the use of SDR and CRS and the technical matters of SDR and CRS. The consideration issues of agenda 1.22 are 1) the existing RR can handle the use of SRD emission so there is no need to change RR; 2) propose WRC resolution to harmonize the frequency band for SRD to reduce harmful interference, 3) propose the new footnote for SRD by recognizing the existing uses of SRD; and 4) propose the new definition of SRD in Article 1 of RR.

The relevant attribute of community for the WRC study cycle or drafting the CPM report is illustrated in the following figure.



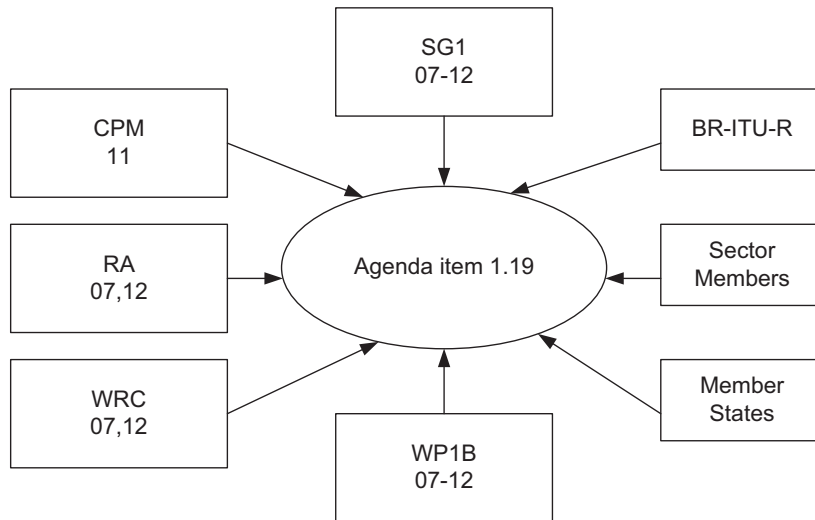
**Figure 9.** Input and output relationship between the attributes of community for the agenda items 1.19 and 1.22 of WRC-12

The attribute of community for WRC study cycle of agenda items 1.19 and 1.22 are CPM-11-1, WP1B, WP1A, CPM-11-2 and WRC-07. The output of WRC-07 is an input to CPM-11-1. The output of WP1B and WP1A contribute draft CPM text as input for CPM-11-2. Finally, the output of CPM-11-2 or CPM report is input to WRC-12. These conferences give an opportunity to submit contribution and participate in order to formulate the option to review and revise RR of agenda items 1.19 and 1.22. The next section provides the detailed consideration regarding agenda item 1.19 and 1.22, respectively, in terms of applicability of the IAD framework and consideration issues.

**5.1 Agenda item 1.19 of WRC-12**

**5.1.1 Variables from the IAD framework applied to agenda item 1.19 of WRC-12**

Regarding agenda items 1.19 of WRC-12, there are many relevant things to consider, including who can contribute to this agenda item, which forum they can attend, who is allowed to participate and what issues they discuss. Figure 10 shows the relevant matters regarding agenda items 1.19 of WRC-12.



**Figure 10.** Relevant meeting and parties for agenda item 1.19 of WRC-12

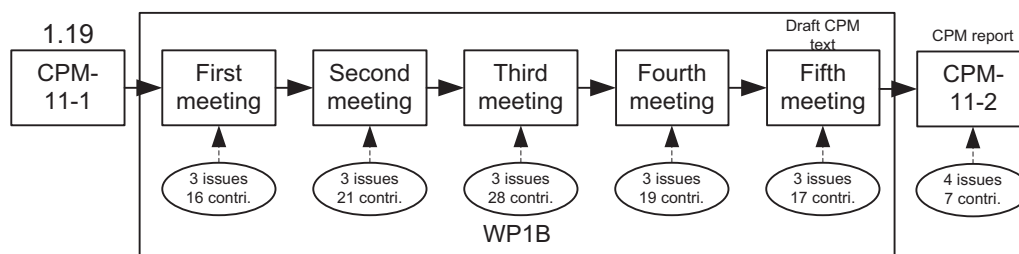
The study object of agenda item 1.19 of WRC-12 is still spectrum. However, much of the focus is on spectrum commons as common-pool goods (the biophysical condition). The point of discussion is whether the use of SDR and CRS requires revision of the current RR, which occurs at the constitutional level.

The IAD framework explains the rules-in-use providing institutional arrangements in decision-making situations including boundary, position, choices, payoff, information, aggregation and scope rules. Agenda item 1.19 of WRC-12 is in part of the WRC environment. Thus the rules-in-use of agenda item 1.19 of WRC-12 is the same as WRC agenda items.

The differences are the attributes of community as they relate to the meeting of agenda items 1.19 of WRC-12, the amount of contributions, and participants. Agenda item 1.19 of WRC-12 has smaller contributions and participants than WRC-12 agenda items.

### 5.1.2 Relationships from the IAD framework applied to agenda items 1.19 of WRC-12

Inside the WP1B, there were five meetings to study and draft CPM text on agenda item 1.19 of WRC-12. The output of first meeting is an input to another (See Figure 11). The five meetings inside WP1B also represent the attribute of community where the decision-making process takes place. These show the opportunity to submit contributions and participate in meetings on agenda item 1.19 of WRC-12.



**Figure 11.** Input and output relationships between the attributes of community for the agenda item 1.19 of WRC-12

Stakeholders submit the contribution to protect their interest in WP1B (see Table 3). The contributions increase the choice of actions in the decision-making process and influence the expected outcomes. Once

there is a new contribution, the benefit, consequence and expected outcome have to be analyzed in order to communicate within the parties concerned and also decide whether to change or keep the same position.

In order to connect the IAD framework and contributions from stakeholders, three issues on agenda item 1.19 of WRC-12 are provided: definition of SDR and CRS, the relevant regulatory measures governing the use of SDR and CRS, and the technical matters of SDR and CRS.

Inside the ITU SG/WP community, there are several of SG/WPs conducting the study on SDR and CRS. The chairman of WP1B used the liaison statement to communicate between SG/WP in order to update the study as input information on agenda item 1.19 of WRC-12. Most information involves technical matters of SDR and CRS.

The use of SDR and CRS creates some concerns about existing service, especially passive service such as satellite downlink service and broadcasting receiver. There are a number of concerns regarding interferences from the use of SDR and CRS if there is a sharing between services. This creates a conflict of interest between existing and new service.

**Table 3.** Number of issues and contributions to agenda item 1.19 of WRC-12

<b>WRC-12 agenda</b>	<b>CPM-11-1</b>	<b>WP1B-1</b>	<b>WP1B-2</b>	<b>WP1B-3</b>	<b>WP1B-4</b>	<b>WP1B-5</b>	<b>CPM-11-2</b>
Number of Issues	0	3	3	3	3	3	4
Number of Contributions	0	16	21	28	19	17	7
ITU	0	9	9	7	3	3	3
Administration	0	UAE (3) USA (3)	KOR, FIN (2) USA D UAE CAN	IND USA (4) KOR CAN (2) I D (2) LUX FIN/HOL FIN (2)	RUS USA KOR CAN UAE I J FIN FIN/HOL HOL D D/FIN/HOL	RUS USA D I S CAN D/F/HOL/I /S EGY FIN FIN/HOL	CHN FIN
Regional meeting	0	0	0	0	0	0	APT
Sector member	0	BS	BS (4) Telco	BS (4) Telco Sat	BS (3) Sat	IUCAF BS (2) Sat	BS (1)

SDR and CRS are technologies, not services; however, there is no definition of them. The development of definitions for SDR and CRS is necessary. The argument came from contributions on the part of both administration and private companies. The discussion concentrated on the fact that SDR and CRS are technologies, not services. There is no need to have new regulation for the use of SDR and CRS. The current RR can govern the use of these technologies. The use of SDR and CRS shall not cause harmful interference to existing services.

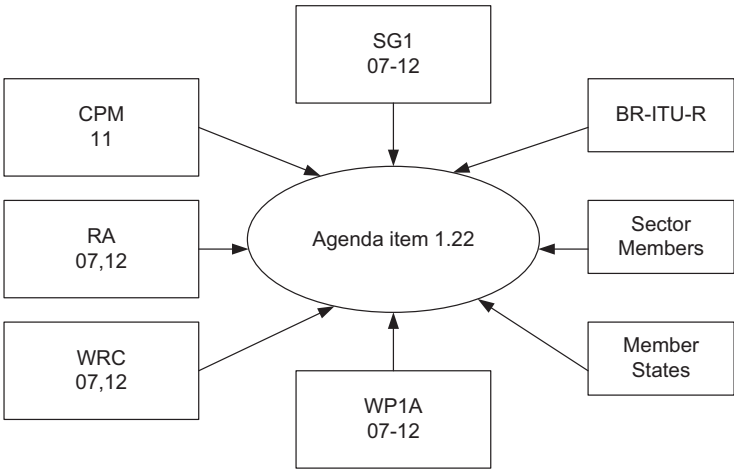
After finalizing the definition of SDR and CRS at the third meeting, the definition solves the regulatory measure at the same time. Since they are not services, there is no need to revise RR for the use of SDR and CRS. Only SDR is mature technology and has several uses in other services such as

mobile, fixed-satellite service. Moreover, the relevant ITU-R report and recommendation provides the technical characteristics and guidelines for SDR use. On the other hand, CRS is not mature technology and needs further study for its use. Two options are proposed for CRS further study: ITU-R resolution and WRC resolution. The difference is the rank of resolution; WRC resolution is higher than ITU-R resolution.

**5.2 Agenda item 1.22 of WRC-12**

**5.2.1 Variables from the IAD framework applied to agenda item 1.22 of WRC-12**

In the case of agenda items 1.22 of WRC-12, there are many relevant things to consider, including who can contribute agenda items, which forum they can attend to review and revise, and who is allowed to participate. The following figure shows the relevant matters regarding agenda items 1.22 of WRC-12.



**Figure 12.** Relevant meeting and parties for agenda item 1.22 of WRC-12

The study object of agenda item 1.22 of WRC-12 is still spectrum. However, much of the focus is on characteristics of SRD, including the emission of SRD and the use of SRD on a non-interference and non-protection basis. SRD accesses spectrum on a non-exclusive basis as spectrum commons that is common-pool goods (the biophysical condition). The study of agenda item 1.22 of WRC-12 is aimed at providing a better way to treat emissions from SRD to radiocommunication services by four methods, as explained in Figure 8.

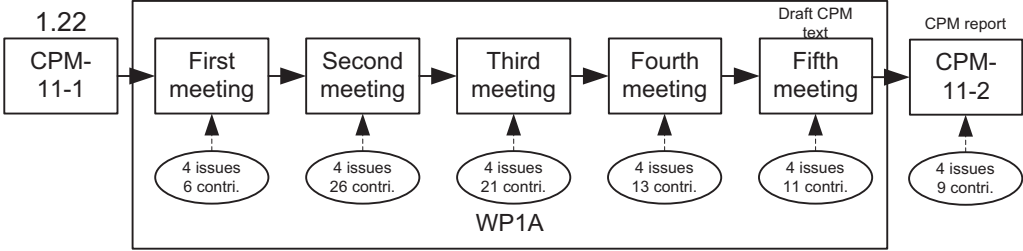
The IAD framework explains the rules-in-use providing institutional arrangements in decision-making situations including boundary, position, choices, payoff, information, aggregation and scope rules. Agenda item 1.22 of WRC-12 is in part of the WRC environment. Thus the rules-in-use of agenda item 1.22 of WRC-12 is the same as the WRC agenda items.

The differences are the attributes of community as they relate to the meeting of agenda items 1.22 of WRC-12, the amount of contributions, and participants. Agenda item 1.22 of WRC-12 has smaller contributions and participants than the WRC-12 agenda items.

**5.2.2 Relations from the IAD framework applied to agenda items 1.22 of WRC-12**

WP1A has five meetings to study and draft CPM text on agenda item 1.22 of WRC-12. The output of the first meeting is an input to another (See Figure 13). The five meetings inside WP1B also represent

the attribute of community where decision-making takes place. These show the opportunity to submit contributions and participate in meetings on agenda item 1.22



**Figure 13.** Input and output relationships between the attributes of community for the agenda items 1.22 of WRC-12

Stakeholders submit the contribution to protect their interests in WP1B (see Table 4). The contributions increase the choice of actions in the decision-making process and influence the expected outcomes. Once there is a new contribution, the benefit, consequence and expected outcome have to be analyzed in order to communicate within the parties concerned and also decide whether to change or keep the same position.

In order to connect the IAD framework and contributions from stakeholders, four issues on agenda item 1.22 of WRC-12 are provided: 1) the existing RR can handle the use of SRD emission so there is no need to change RR; 2) propose WRC resolution to harmonize the frequency band for SRD to reduce harmful interference; 3) propose the new footnote for SRD by recognizing the existing uses of SRD; and 4) propose the new definition of SRD in Article 1 of RR.

**Table 4.** Number of issues and contributions to agenda item 1.22 of WRC-12

WRC-12 agenda	CPM-11-1	WP1B-1	WP1B-2	WP1B-3	WP1B-4	WP1B-5	CPM-11-2
Number of Issues	0	4	4	4	4	4	4
Number of Contributions	0	6	26	22	13	11	9
ITU	0	4	13	9	5	5	3
Administration	0	CAN	CHN (2) UAE CAN (3) B USA	CHN UAE KOR SYR CAN (2) F/D/G	CAN (2) HOL SYR	CAN F IND EGY UAE	CAN B ARS/BHR/ UAE/JOR/ LBN/TUN
Sector member	0	BS	BS (4) Telco	Sat, Telco BS (4)	BS (2) Sat	Sat	BS (3)

Inside the ITU SG/WP community, there are several SG/WPs conducting the study of emissions of SRD in terms of the minimum requirement to protect existing services. The chairman of WP1A used the liaison statement to communicate between SG/WP in order to update the study as input information on agenda item 1.22 of WRC-12. Most information involves protection requirements in terms of technical characteristics of existing services to other services.

The first issue is about the use of SRD itself. Some administrations, such as USA and EUR, express their opinion that the use of SRD can be treated as national matters because the use of SRD is local. There is no need to change RR for the use of SRD, and there is sufficient study from ITU for the use of SRD.



However, the second issue, the circulation of SRD, transcends national concerns, making it an international matter. Most of SRD in many countries is incorporated in unlicensed devices that can be transported around the world. If one country allows the use of SRD in a specified frequency that is not allowed in others, the problem of interferences from and to this specific SRD happen suddenly. One possible way of solving this problem, the harmonized frequency band for the use of SRD worldwide, is introduced in terms of WRC resolution. The harmonized frequency band benefits the manufacturer by expanding markets worldwide. Countries with a manufacturer SRD base, such as KOR, CHN, and J, prefer this option.

The third issue addresses sharing the use of SRD and existing service in cases when emissions of SRD might interfere with existing service, especially passive services such as satellite downlink service and broadcasting service. There are a number of compatibility studies, including field tests or trials between satellite receivers and the emission of RFID. The studies reveal there is interference from RFID emission to the satellite receivers. Therefore, the recognized limited harmonized frequency band, emission level and other technical characteristics of SRD are added to an RR footnote in Article 5 similar to 5.150 to keep the interference manageable. This solution creates a new footnote for the use of SRD in RR.

The last issue is an extension of the third issue that involves adding the definition of SRD in Article 1 in RR. This might raise concern over the use of SRD as a radiocommunication service to some extent. It might ultimately be developed further in terms of level of protection.

The discussion is incomplete until the WRC-12 meets to finalize these issues. It is possible that a mixture of the four possible options might be adopted in order to compromise among stakeholder interests.

## **6. Thailand's position on agenda items 1.19 and 1.22 of WRC-12**

This section is an example of how to use the IAD framework in the case of Thailand regarding agenda items 1.19 and 1.22. First, the IAD framework element has been identified. The decision-making process includes the decision-maker and decision situation in the context of Thailand. The exogenous variables are biophysical/material condition, attribute of community and rules-in-use. The internal action situation includes boundary, position, choice, payoff, information, aggregation and scope rules.

Biophysical/material condition: Agenda items 1.19 and 1.22 relevant to the use of SDR, CRS and emission of SRD. The spectrum for agenda items 1.19 and 1.22 is spectrum common, non-exclusive use. The existence of these uses is contained in the ISM band. However, the new use may possibly be any frequency and has the potential to interfere with existing service, especially passive service such as satellite downlink. The point of discussion is whether the new uses can share spectrum with existing ones or will need a separate block of frequency. And if sharing is possible, what conditions of use will apply to minimize harmful interference with existing service.

Attribute of community: These two issues have been discussed at many levels of meetings. In Thailand, concern has been expressed by the existing satellite operator in order to protect its interests. The person who is in-charge gathered the relevant information, studied agenda items, and formulated the draft position of the company based on its interests for submission to the Thai administration. At the Thai preparation stage, the administration gathers information from all stakeholders to formulate the Thai position on these agenda items. That position reflects Thai interests.

In order to formulate the Thai position, the CPM report provides choices of action on each agenda item. However, due to limited resources – staff, time, and money – Thailand did not directly participate in drafting the CPM report, but took part in the regional preparatory meeting (APG) instead.

APG is the regional preparatory meeting in the Asia-Pacific region. Normally, APG arranges five meetings in preparation for WRC. For WRC-12, APG met four times between 2008 and 2010. The last APG meeting took place in August 2011. APG sent the common proposal on agenda item 1.19 as an input document for CPM-11-2 in February 2011 and Thailand was part of this proposal.

Before the third APG, there was no CPM report. The draft CPM report was available on August 5, 2010. The preliminary views on agenda item 1.22 were proposed at the third APG in order to voice concern over the effect of SRD emissions on existing service.

Rules-in-use and internal decision situation: During the APG meeting, the participants registered with the APT secretariat either on behalf of their administrations or as observers. Each administration comprises a head of the delegation and a delegate. The head of delegation is authorized to act on behalf of the administration. The delegate can be an administration staff member, regulator, relevant companies and advisors. Only the administration has a right to vote in the meeting (boundary and position rules).

The input document or oral proposals during the meeting constitute choices of action (choice rules). Each choice of action has its benefit and consequence of action (payoff rules). Aggregation rules apply to the level of control in making decisions. Available information (public or confidential) during the meeting represents information rules.

In order to make a decision on these WRC-12 agenda items, the plenary session of APG has divided into six working parties (WP) for preparatory work. Agenda items 1.19 and 1.22 are located in WP6 and WP3, respectively. Inside WP, the chairman of WP designated the drafting chair on each agenda item in order to draft the APT common proposal for WRC-12. The formal negotiation begins. However, the discussion inside, outside, and during meetings was informally conducted.

At the plenary session, the final approval of the APT common proposal for WRC-12 has been acted upon agenda by agenda. The formal document representing the APT common proposal has been signed by each administration after the fifth APG.

Regarding preparation for the Thailand position on agenda items 1.19 and 1.22, the document in the previous meetings is examined to assess the possibility of choices, benefits, consequences and expected outcome from each position based on Thailand's context. For example, with respect to agenda item 1.22, Thailand has existing satellite downlink service to protect so the method that ensures there is no harmful interference to existing service is preferred. Moreover, its position works as important background in forming allies, taking into account the position of other administrations and rationale of selection. This information influences the choice of action and level of control in Thailand's position. The information from previous meetings and latest position of other administrations indicates the negotiation options that Thailand should keep or change positions in order to make a choice. If the allies and oppositions are clearly identified, the negotiation or lobbying exchanges information and persuades others, if applicable, to support Thailand position. Negotiation techniques are crucial – i.e., having many options to play around with, such as trading, exchanging, or supporting positions on different agenda items in order to protect the national interest. The negotiation or exchanging of information continues from the drafting of agenda items until final plenary of WRC.

Therefore, the IAD framework helps to sort out the decision-making process in APG systematically. It helps to understand the complexity of agenda items in the APG meeting and also improves understanding of Thailand's position on these two agenda items.

## **7. Discussion**

The main benefit of the IAD framework is the ability to sort out the complexity of WRC systematically to better understand the WRC process and agenda items in order to address key questions in the decision-making process. The process of WRC-12 agenda setting includes WRC-2000, CPM-02, WRC-03, CPM-06, and WRC-07. These conferences represent the attributes of community where the decision-making process takes place and present an opportunity to make contributions and participate in pushing forward the agenda items. Moreover, it shows the level of input and output of each forum where intervention can take place and also indicates the crucial final conferences for approving or finalizing agenda items. In the case of WRC-12 agenda items, the output of WRC-2000 is an input to CPM-02. The output of CPM-02 is input to WRC-03. The output of WRC-03 is an input to CPM-06. The output of CPM-06 is an input to WRC-07. In the case of agenda items 1.19 and 1.22, the input of CPM-11-1 is an input to WP1B and WP1A. The output of WP1B and WP1A as draft CPM text is the input for CPM-11-2. The output of CPM-11-2 as the CPM report is an input for WRC-12. Because of limited resources – i.e., manpower, budget, and time – the selection of forums in which to participate and continual active participation inside meetings are significant tasks.

Gaining a better understanding of issues relating to agenda items helps to negotiate whether to keep or change position in action situations. The paper showed how using the IAD framework helps to understand the position of both allies and opposition on relevant agenda items in terms of choice of action, consequences, level of control, and expected outcome. Negotiation or lobbying by exchanging information, promoting one's position, and trading between agenda items influences the course of action that can be taken to protect the national interest. Using the IAD framework also helps to better understand WRC agenda setting and to study agenda items to improve the decision-making process by identifying the pattern or process of WRC agenda setting. The pattern of the process will be repeated in terms of structure but different in context of issues, depending on agenda items. Stakeholders can use the process pattern to utilize their resources efficiently.

## **8. Conclusion**

This paper applies the institutional analysis and development (IAD) framework to enhance a systematic understanding of the decision-making process and thereby the action situation, the pattern of the outcome, and the prediction of the interaction and the possible outcome. We showed the benefit of examining actors, events and interactions inside the WRC by four levels of consideration – i.e., the operational, collective-choice, constitutional, and metaconstitutional situations – and of examining exogenous variables and internal action situations for each level.

The WRC agenda setting process takes two WRC cycles or eight years. The process started from the attribute of community of RA2000, CPM-02-1 and 2, RA-03, WRC-03, CPM-06-1 and 2, RA-07, WRC-07, or CC-2008. The RA appointed the chairman and vice-chairman of the CPM. The first CPM organized and distributed work to the CPM chapter rapporteur and the relevant study group. The attributes of community provided an opportunity for the administration or stakeholders to intervene in the decision-making process by submitting a contribution and participating in conferences in order to increase the choice of actions in their interest. The paper focused on agenda items 1.19 and 1.22 of WRC-12 in order to concentrate on spectrum commons issues. Narrowing down the discussion to agenda items 1.19 and 1.22 of WRC-12 makes it easier to understand the interaction inside the events

and the consequences of making decisions. Thailand's position on WRC-12 serves as an example of how the IAD framework can be used to analyze the interaction and consequences of agenda items 1.19 and 1.22 and better understand these two agenda items.

Applying the IAD framework to the WRC helps administrations and other relevant, interested parties to enhance their understanding of the WRC process systematically in order to improve their decision-making process – i.e., selecting the right action at the right time with predictable outcomes or consequences.

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## List of abbreviations

ADD	Addition
AM(R)S	Aeronautical mobile (route) service
AMS(R)S	Aeronautical mobile-satellite (route) service
APG	Asia-Pacific Telecommunity conference preparatory group for WRC
APP	Appendix
APT	Asia-Pacific Telecommunity
ARB	Arab group
ARS	Amateur service
ASP	Asia-Pacific common proposal

AUS	Australia
BDT	Telecommunication Development Bureau
BR	Radiocommunication Bureau
BS	Broadcasting union or company
BSS	Broadcasting-satellite service
CAN	Canada
CC	The Council
CEPT	European Conference of Postal and Telecommunications Administrations
CHL	Chile
CHN	People's Republic of China
CITEL	Inter-American Telecommunication Commission
COM	Committee
CPM	Conference Preparatory Meeting
CRS	Cognitive radio system
CTR	Costa Rica
CUB	Cuba
DOM	Dominican Republic
DSG	Deputy Secretary-General
DT	Temporary document
EESS	Earth-exploration satellite service
ENG	Electronic news gathering
EUR	European common proposal
F	France
FIFA	Fédération Internationale de Football Association
FIN	Finland
FSS	Fixed-satellite service
GMDSS	Global Maritime Distress and Safety System
GSO	Geo-stationary orbit
GTM	Guatemala
HAP	High altitude platform
HOL	Netherlands
IAD	Institutional analysis and development
IAP	Inter-American common proposal
ICAO	International Civil Aviation Organization
IMT-2000	International mobile telecommunication - 2000
INS	Indonesia
Int	International
IRN	Iran
ISR	Israel
ITU	International Telecommunication Union
ITU-D	Telecommunication Development Sector
ITU-R	Radiocommunication Sector
ITU-T	Telecommunication Standardization Sector
IUCAF	Inter-Union Commission on Frequency Allocation for Radio Astronomy and Space Science
J	Japan
KOR	Republic of Korea
LBN	Lebanon
MetAids	Meteorological aids services
MetSat	Meteorological-satellite service
MEX	Mexico
MF/HF	Medium frequency/high frequency
MOD	Modification
MS	Mobile service
MSS	Mobile-satellite service
PP	Plenipotentiary conference

RA	Radiocommunication Assembly
RAG	Radiocommunication Advisory Group
RAS	Radio astronomy service
RCC	Russian Federation
RDSS	Radiodetermination-satellite service
Res	Resolution
Reg	Region
RLS	Radiolocation service
RR	Radio Regulations
RRB	Radio Regulations Board
RSS	Russia
S	Sweden
Sat	Satellite company
SDR	Software defined-radio
SLV	El Salvador
SG	Study Group
SGen	Secretary-General
SRD	Short-range devices
SRS	Space research service
SUP	Suppression or deletion
SYR	Syria
TDAG	Telecommunication Development Advisory Group
Telco	Telecom company
TSAG	Telecommunication Standardization Advisory Group
TSB	Telecommunication Standardization Bureau
UAS	Unmanned aircraft/aeronautical/aerial system
UKR	Ukraine
URG	Uruguay
USA	United States of America
Wi-Fi	Wireless fidelity
WMO	World Meteorological Organization
WP	Working Party
WRC	World Radiocommunication Conference
WRC/RRC	World/Regional Radiocommunication Conference
WTDC/RTDC	World/Regional Telecommunication Development Conference
WTSA	World Telecommunication Standardization Assemblies