**Inventory & Measurement Cross-Cutting Group Meeting**

**SRUC, Edinburgh, United Kingdom**

17-20 December 2013

**Meeting Report**

**OVERVIEW**

The third meeting of the Inventory & Measurement (I&M) Cross-Cutting Group took place from 17-20 December 2013 at Scotland’s Rural College (SRUC), Edinburgh, United Kingdom. It followed on from the UK Agricultural Greenhouse Gas (GHG) Research Cross-Platform meeting which Inventory and Measurement (I&M) Cross-Cutting Group meeting delegates were invited to attend to learn about UK GHG research.

The I&M Group meeting was attended by representatives from four Alliance member countries (the Netherlands, Spain, Thailand and the United Kingdom) and UK scientists from SRUC, CEH, ADAS UK Ltd and Bangor University. See Appendix 1 for a complete participants list. The meeting was chaired by the Netherlands (Dr Jan Verhagen, Wageningen UR) as Co-Chair of the I&M Group. Co-Chair Brian McConkey was unable to attend due to illness. Meeting participants extended their best wishes to Brian.

This report is a summary of key discussions, action points and outcomes from the meeting. Presentations are available separately as PDFs. A summary of the Groups work areas is provided in Appendix 2.

**MEETING OUTCOMES**

The meeting achieved the following outcomes:

* Update on the latest Council meeting.
* Updates on the Research Groups of the Alliance and overview of the Alliance.
* Presentation by ADAS UK Ltd on the earth observation work area.
* Presentation by SRUC on sustainable intensification.
* Detailed discussion on the four key work areas.
* Next steps for the Group and discussion about future meetings, and how to encourage better attendance.

**SUMMARY OF DISCUSSIONS**

**UPDATE ON BEHALF OF THE SECRETARIAT INCLUDING SUMMARY OF THE LATEST COUNCIL MEETING**

The Co-Chair presented an update on Alliance activities on behalf of the Alliance Secretariat, who were unable to attend this meeting. The presentation provided a general overview of the Alliance, an update on current activities underway in the Alliance including a refresh of Research Group and member country pages on the Alliance website, and a summary of the last Council Meeting. All participants were encouraged to check that the activities they participate in are included on the Alliance website and promoted on their country webpage outlining support for the Alliance. The presentation also noted that it is the responsibility of Research Group participants to communicate opportunities and outcomes resulting from Research Group meetings to Council representatives.

There are now 40 member countries in the Alliance; new members that have joined since July 2013 are Belgium, Bolivia, Ecuador, Honduras, Nicaragua, Panama and Sri Lanka. Some of these new member countries have yet to identify participants for each of the Research Groups and the Secretariat asks members with contacts or colleagues in these new Alliance countries to introduce these contacts to the aims of the Alliance and suggest activities they could be interested in joining.

**Key Outcomes from the Council Meeting**

* Uruguay took on the role of Council Chair.
* The Netherlands was confirmed as Vice-Chair of the Alliance Council.
* A discussion on mobilisation of resources with all members agreeing to:
  + Highlight / promote the Alliance in related activities and events.
  + Integrate the Alliance into national agricultural research programs.
  + Member countries should identify opportunities and activities to include in the Research Group workplans.
* Research Groups were requested to provide a list of partnerships/collaborations underway.
* The Council agreed that adaptation and mitigation synergies within the Alliance need increased promotion, Research Groups and their representatives are requested to:
  + Identify/develop mitigation projects or activities that have synergies with adaptation.
  + Include synergies between mitigation and adaptation in reporting to the Council.
  + Create specific networks to promote synergies between mitigation and adaptation.

**Alliance membership and organisation**

The I&M Group discussed membership in the Alliance noting that not all members are active participants in the Groups. Joining the Alliance does not necessarily mean that countries become more active in the Alliance, or have the resources to participate. Researchers need to be responsible for reporting back to their governments as well as their institutes and colleagues, through their Alliance Council representatives and country coordinators. Actively reporting on opportunities and outcomes within the research group is one way that members can attract more resources and interest in the Alliance.

As activities in the Research and Cross-Cutting Groups increase it becomes more likely that two Groups will discuss similar projects and activities, Co-Chairs hold regular teleconferences to identify these activities and discuss how the activities can be managed. There is no reason that members from two different research groups cannot work together on the same project, Groups may wish to develop a shared activity or network.

The I&M Group discussed opportunities for the Alliance to participate in other initiatives such as the EU Joint Programming Initiative on Food Security, Agriculture and Climate Change (FACCE-JPI) multi partner call on agricultural GHG research, and funding opportunities through Climate Smart Agriculture. The Alliance aims to develop these types of relationships and maximise opportunities to share knowledge and resources.

**MITIGATION AND ADAPTATION SYNERGIES**

The Group had an open discussion about mitigation and adaptation synergies. The Co-Chair asked the group for ideas on how to address this in each of the work areas.

During the discussion that followed the Group agreed that they did not need a separate network on adaptation. Adaptation needs to be linked to the ongoing activities. It is not an issue that should be separated out, but can be best addressed when embedded in other programmes. The Group discussed the synergies offered with each of the work areas currently underway:

* The remote sensing activity (work area 3) offers the potential to track mitigation e.g. remote sensing of soil moisture could be related to whether farmers need to irrigate. Synergies of adaptation and mitigation could be highlighted in the project write up.
* It was agreed that the soil organic carbon (SOC) best practice guidance (work area 7) was about measurement methodologies and standardisation of techniques rather than looking at adaptation (or mitigation).
* Ghana is actively progressing methods to evaluate the economic value of GHG mitigation (work area 11) and the Group agreed that revenues of mitigation options immediately reflect on adaptation. Related work underway in member countries that could support this project include:
* SRUC is identifying blockages to adoption of low-cost mitigation actions as identified by Marginal Abatement Cost Curves (MACC); the work has links with the AnimalChange programme.
* There is also some work in the UK Climate Change Risk Assessment (CCRA) and the ClimateXChange (Scottish Centre of Expertise on Climate Change) which is a two year project with the second half focussing on adaptation.
* Multi pollutant cost curves were also thought to be worth mentioning. The UK has produced a decision support tool (FarmScoper) which is now being developed further with revised costs.
* The UK has 15 case study farms which provide good economic data prior to the implementation of mitigation. Benefits are hard to track due to market variation. Immediate measures are also hard to track.
* Spain is working on GHG quantification producing a road map on all sectors. This looks at how much it will reduce, and costs and savings.
* There are links to adaptation within work area 13 on guidance for determining emissions intensity. It was suggested that the Group could produce a matrix of how to compare systems. It was noted that the improved UK agricultural GHG inventory will report some metric of intensity mainly for the purpose of sector specific reports.

**UPDATES FROM MEMBERS AND GENERAL DISCUSSION**

Due to the limited number of countries present, the Group had a general discussion on various topics rather than a round-table of specific updates from individual countries.

***Moving to higher tier inventories***

The next international symposium for non-carbon greenhouse gases (NCGG7) will be held in November 2014 in Amsterdam. The meeting includes a session on the topic of moving from Tier 1 to Tier 2 inventories, which is related to the work of the I&M Group. There is an additional session planned to showcase UK progress and to ask for other countries to say how they are doing.

*Action – Dave Chadwick to provide further information on the Amsterdam meeting*

The Group felt that this topic would be of interest to many members, Japan would have some valuable experience in this area, Australia should be asked to provide their view on the difficulty of improving inventory reporting through modelling. Canada has a document on the level of development that countries are at with their inventories which will be circulated to the Group.

*Action - Jan Verhagen to circulate the document to the Group*

***Links between the Alliance and the IPCC***

The question of links between the Alliance and the Intergovernmental Panel on Climate Change (IPCC) was raised by UK researchers. People sit in both the Alliance and the IPCC so there are connections through the individuals. However there are political differences with the IPCC being focussed on international science assessment and reporting whereas the Alliance is more focussed on research and research collaboration. The Alliance can support the IPCC by helping countries to share experiences on ways they have improved their inventories, including through the improved relationships between science and government. Any problems or improvement to a national inventory is a discussion between individual countries and the IPCCC rather than the Alliance, but general capacity and capability building efforts under the Alliance will support national capacities to improve their emissions inventories. UNFCCC have a training course on moving to higher inventory and what they are looking for. The main course text is freely available on the web and will be circulated to the Group.

*Action – Luke Spadavecchia to provide UNFCCC training material*

***Adoption***

Dominic Moran provided a description of SRUC’s adoption work including the new FACCE-JPI project I.N.C.O.M.E which looks at barriers to farmer adoption of low-cost mitigation measures.

Although the Alliance has no direct links to Nationally Appropriate Mitigation Actions (NAMAs) under the UNFCCC that are set by its member countries, the Alliance may play a role in enabling a country to undertake research to support such goals where they are consistent with broader national strategies. The Climate Change, Agriculture and Food Security (CCAFS) programme of the CGIAR has a project on metrics and commonality.

The discussion covered additionality which is not a part of the Alliance. The Alliance mainly focuses management practices that can be changed by the farmer. The Alliance is not currently at landscape level which would be covered by CCAFS. Projects under the Climate and Clean Air Coalition also strongly focus on implementation and are already drawing on the expertise of the Alliance.

***LULUCF***

The Group discussed theEuropean pressure to account for the effects of land use on soil carbon storage in LULUCF inventory. The suggestion to set up an informal network to discuss these issues was made. The UK could provide a literature review relevant to this topic (Defra project SP1113). A relevant paper will be presented at a recent meeting (Buckingham *et al.* 2014) which was of interest to the European attendees. There are links with a similar literature review carried out within the Croplands Research Group. There are implications for carbon footprinting as “crops remaining crops, grass remaining grass” is not included. The Group expect that there would be some interest in this topic in South East Asia. There are links between this and the SOC Guidance.

The Netherlands propose to look at large scale sampling schemes.

*Action – Luke Spadavecchia to provide SP1113 document*

*Action – Include this topic the SOC guidance work area?*

***Farmer cooperation***

The group discussed the role of the Alliance in farmer cooperation and efficiencies of scale. How can farmers be incentivised to come together on these issues (e.g. AD, reservoirs)? The Alliance does not consider the whole supply chain and life cycle analysis (LCA). However, many countries are individually interested in this topic, and some multinational companies are also accounting for the whole supply chain.

The Netherlands has relevant remote sensing data and Jan Verhagen shared some data and results from Ethiopia on the introduction of new technologies with the Group.

**WORK AREA 3: REMOTE SENSING**

The UK is leading the work on scoping the extent to which earth observation (EO) data can cost effectively provide agricultural activity information. The project was developed because activity data is limited and limiting to inventory building in both developing and developed countries e.g. in the UK there are gaps despite the large annual spend on statistical data. This work area was identified at the first I&M Group meeting and confirmed as an action at the second meeting.

Steven Anthony presented the details of the project, work packages and delivery deadlines. The project includes two international stocktakes involving participation by Alliance member countries with the first on activity data requirements and the second on EO experiences (both positive and negative). All participating countries will be required to provide a key contact point for this work. Independent contact points (based on attendance at relevant workshops in the last ten years) will also be used. The presentation emphasised the importance of the work package on cost effectiveness. Current and future inventory needs will be considered in the project. Communicating the project findings will be important and feedback from expert participants at the international dissemination workshop will provide some guidance on where to go next.

2007 was chosen for the evaluation of accuracy as the required data (IACS data) is better until that period and it is now declining. The IACS is a good example of the reduction in UK resource available for survey data and need for EO.

The presentation clarified that this project is not about checking and validating emissions.

The potential consequences of the project were discussed. For example, in the UK there are inconsistencies in the definitions of grassland types in farmer reporting and EO could support clarity of definition, or perhaps the availability of EO will drive the need to produce an emission factor to match it. This work could lead to an impetus to develop EO products if an end user is identified and may provide an opportunity to influence products that emerge.

**WORK AREA 13: SUSTAINABLE INTENSIFICATION**

***Presentation by Bob Rees***

Bob Rees presented on sustainable intensification showing data on increasing productivity and the relationship with nitrous oxide, and that understanding differences in farmer attitudes are important in developing policy. This presentation had recently been delivered at the international Sustainable Intensification Conference held in Edinburgh on 25-27th September 2013.

Nitrous oxide is an important greenhouse gas in global agriculture and emissions growth has tracked increases in agricultural production over the past century. This link between emissions growth and crop production needs to be broken if we are to develop sustainable farming systems. Opportunities exist to manage systems to achieve this, but we need good emissions estimates, an understanding of costs, an understanding of farmer behaviours, and supportive policies.

Nitrogen fertiliser use increases productivity but there is a large potential to reduce losses. The discussion identified that it is risky for farmers to use the optimum e.g. if they put lots of fertiliser on then there is a better guarantee of good crop yield. It is therefore important to convince farmers about optimum use. There is a role for industry to play as farmers follow what they are required to do by industry.

This debate is at the heart of sustainable intensification. Landscape scale collaboration is required with farmer groups meeting all stakeholders to understand why optimum use is needed, to show the benefits and to gain trust and then change behaviour. There is no one size fits all and it is important to define realistic targets. Measuring it is not easy.

The potential payment for ecosystem services was mentioned during this part of the discussion, as was nitrogen rich strip technology (monitoring equipment linked to tractors to measure soil nitrogen) which was discussed at the recent Cropland Research Group meeting in Tampa, Florida.

*Action – Luke to send around abstracts on nitrogen rich strip technology*

***Presentation by Jan Verhagen***

The idea of greenhouse gas emission intensity and trade offs with total emissions was presented. Intensification will also require higher inputs of fossil fuel and may during transition from low input to high input systems result in overall emissions to increase, if production levels fail because of for example weather conditions also greenhouse gas emission intensity will go up. In addition it is important to understand motivations of farmers. In many cases productivity increase is a strong entry point but in other cases labour requirements could be more important.

A paper on this topic is being drafted and will be sent to the Alliance Council in June. The first draft will be circulated to I&M Group members for comment before then. The work remains within the biophysical domain and does not address different farmers (there is work in another EU survey). This is a farm level and farming systems analysis rather than high scale analysis.

Bob Rees mentioned the LINK-funded MIN-NO project which aims to improve estimates of nitrous oxide emissions associated with production of UK arable crops and to develop strategies for mitigation at field and farm level. The project is attempting to develop a comprehensive view and is looking at nitrogen input and emissions intensity. Some of the results from this project could be fed into the report.

This led on to a discussion about the use of fertiliser recommendations (e.g. RB209 in the UK). There is no policy lever to force people to use recommendations so there is a need to build confidence in them; there is an industry responsibility to get the message out. Defra is talking to industry such as Agriculture and Horticulture Development Board (AHDB) and Agricultural Industries Confederation(AIC) about how to better get information to farmers, for example the easy to understand summary of grassland recommendation for beef and sheep farmers (a document produced by EBLEX).

The result of sustainable intensification work will be more detailed recommendations although it will take years to reach these. It is important to have a consistent message, and there is a need to up-skill advisors. Farmers are more likely to trust their neighbours and the experiences of other farmers rather than farming consultants. Andrew Barnes mentioned the community based work in Malawi led by farmers. It is more powerful if the farmers and farmer groups are leading the extension but the message needs to be clear.

Use of tools and technologies, such as mobile apps, were discussed. If there were to be a project on this within the Alliance it would be important to identify target groups. In Thailand farmers believe the scientists but require strong evidence. The connection between scientist and farmer groups is good although in more rural areas they use traditional techniques and their priority is productivity and cost savings, not emissions. Farmers wouldn’t believe the phone if they were sent advice via text, and not all farmers will have phones.

Sustainable intensification is a process rather than goal. There are lots of indicators not applicable to all areas.

**WORK AREA 7: SOIL ORGANIC CARBON GUIDELINES**

The Carbon & Nitrogen (C&N) Cycling Cross-Cutting Group is more focussed on carbon modelling than production of guidance and therefore the task to develop SOC guidance was taken on by the I&M Group. The guidance is targeted at scientists etc, not at farmers.

The meeting chair explained that this work area aims to produce best practice guidance on measurement techniques, harmonisation of approaches, and standardisation of technologies and methodologies for SOC. The guidance is focussing on carbon dioxide only. The guidance will not include protocols or laboratory techniques. Forests are excluded. This will be a living document that can be added to over time.

Participants identified that other groups have produced guidance. For example, the guidance produced by CarboEurope show data that suggest discrepancies/mismatches between methods, and papers (e.g. by Rothamsted Research) have shown that the uncertainty on carbon stock measurements is high.

The discussion that followed identified that the guidance could include:

* Sampling strategies over different landscapes.
* Quantifying carbon stock over time.
* Sensible information on best depth of measurement, sample size and bulk density.
* Sample requirement to arrive at a certain uncertainty/availability.
* Strengths and weaknesses of different sampling schemes. Comparison of methods used in difference countries.
* Emerging low cost technologies (perhaps as a module within the guidance).

The Group may want to link with the Soil Carbon and Nitrogen Cross-Cutting Group on carbon modelling. There are also overlaps with the Grasslands Network of the Livestock Research Group who are planning work on carbon sequestration. The Grasslands Network need to be contacted regarding this.

*Action – Identify overlaps and links with the Grasslands Network*

**WORK AREA 8: FARMING SYSTEMS DESCRIPTIONS**

Linking to farmers and policy makers requires an appropriate entry point; farming systems produce such an entry point. In addition a farming systems approach will allow for cross-regional comparison and evaluation of management. The farming systems approach is used in various studies such as CATCH-C (www.catch-c.eu) and SmartSoil ([www.smartsoil.eu](http://www.smartsoil.eu)).

The farming systems classification work is applicable across the Alliance.There will be more funding for this activity next year and it is hoped that at the next I&M Group meeting there will be something more substantial to show.

The work plan is to:

1. Host a workshop in April 2014 on farming systems. CCAFS is also working on this topic and may co-finance the event. This event could involve economists and social scientists but it is important to keep the project small due to resource.
2. Establish a network
3. Carry out a stocktake including:

* Inventoryof farming systems classification (to be undertaken by the Livestock Research Group?)
* Activities management
* Production level emissions.

The purpose is to facilitate communication at farm level and link the activity with an emission factor. It is important to note that activity data and management link to farming systems. Farm system categories are important as they can then be built upon. We first need to recognise what the common units are and then countries can take information from each other.

The aim for the UK inventory is to be more granular depending on sectors or systems. This farm classification work within the I&M Group will be useful for comparison and sense checking. There has been some work on classifications and typologies in the UK (a cluster analysis of the FADDEN data set, which the FBS feeds into, using robust farm types). There is lots of data in Europe and potential to link with other projects in America.

Farming systems classification is important for communication as farming systems is the entry point for farmers.

**FUNCTIONING OF THE INVENTORIES AND MEASUREMENT CROSS-CUTTING GROUP**

The issue of interaction and engagement of countries in the I&M Group was discussed. It was recognised that the Group is doing good, important work and that there is a need to overcome the problem of lack of engagement. Both the Council and the Group representatives have a role to play in addressing country engagement, some comments on this were included in the update from the Secretariat.

The Group has chosen to focus its resources on a small number of projects initially, 4 of the 13 originally proposed. The first projects will necessarily be of interest to those members leading and progressing the activities. However, the promotion of these outcomes will suggest further activities and opportunities for other countries to become involved.

The Group will have produced deliverables by the next meeting which should encourage attendance and interest. There is a need to have results at the next meeting which will advance the Group alongside the other groups of the Alliance.

*Action - Jan Verhagen to contact the Group working on ‘financing of economics of mitigation’ work*

To encourage participation at the next meeting it was proposed that the I&M Group partner up with another Group to hold a meeting e.g. alongside the next Cropland Research Group meeting in August 2014 (Hungary). The Group would meet alongside a different Research Group each time achieving the expected Cross-cutting objectives.

*Action – Jan Verhagen to explore having the next I&M Group meeting alongside the Cropland Research Group meeting*

Another suggestion was to invite speakers to the events (as work progresses) although the Co-Chair was not keen to have large audiences as work is still premature.

The I&M Group meetings need to be attended by representatives who know what resources are available in their country and have some discretion over budget and have a knowledge/overview of relevant work in their country (to ensure opportunities are not missed). Meetings should include both those that feed into policy and researchers from academic institutes.

**LINKS WITH OTHER INITIATIVES**

The Group discussed initiatives with synergies and related aims to the Alliance and ways that this cross-cutting Group can develop partnerships and activities to support them. Some Partnerships such as with the Climate Smart Agriculture initiative and the Climate and Clean Air Coalition are relationships that should be developed at the Council level and, for the CCAC, are already progressing at the Research Group level, but the I&M Group should be aware of potential links.

Practical ways to develop country inventories with UNFCCC could be developed. This would be at the level of understanding data collection and improving organisational structure within countries. A document on where countries are with their inventories has been published and will be circulated to members by the Co-Chairs. Once the Tier 2 Agricultural GHG inventory is delivered, UK scientists may be interested in sharing knowledge about moving to improved inventories, using experience gained.

The Group could also look to develop links with the FACCE-JPI.

**ADDITIONAL NOTES**

* Thailand has a lot of work on rice production emissions.
* Spain commented that they are aiming to improve their participation in the Alliance and asked if a video link might be provided at future meetings. They also asked for the notice of the meetings to be provided with as much advance notice as possible, helping to plan travel across the year.
* The UK involvement in the Alliance is about added value and the UK is keen to keep up momentum and interest from UK research institutes.
* The meeting participants thanked the Scottish Government and SRUC for hosting the meeting and ADAS UK Ltd for taking the minutes.

APPENDIX 1: Participants List

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| **Country** | | **Attendees** |
| **Alliance Member Countries** | | |
| Netherlands | Jan Verhagen, Wageningen UR ([adrianus.verhagen@wur.nl](mailto:adrianus.verhagen@wur.nl)) | |
| Spain | Marta Hernández de la Cruz ([MHCruz@magrama.es](mailto:MHCruz@magrama.es)) | |
| Thailand | Akarapon Houbcharaun ([akaraponh@gmail.com](mailto:akaraponh@gmail.com)) | |
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| **Other Participants** | | |
| ADAS UK Ltd | Steven Anthony ([steve.anthony@adas.co.uk](mailto:steve.anthony@adas.co.uk))  Rachel Thorman ([rachel.thorman@adas.co.uk](mailto:rachel.thorman@adas.co.uk))  Brian Chambers ([brian.chambers@adas.co.uk](mailto:brian.chambers@adas.co.uk))  Adele Hulin, ADAS UK Ltd ([adele.hulin@adas.co.uk](mailto:adele.hulin@adas.co.uk)) | |
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| **Secretariat:** Unable to attend | | |

APPENDIX 2: Work areas of the Inventory and Measurements Cross-Cutting Group

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| **Area of Work** | **Countries to Develop the**  **Terms of Reference** |
| **Information Sharing** | |
| 1. To foster effective mechanisms of sharing emission factors and emission data | Canada |
| 2. To produce an inventory and guidance on the use of tools and methods for Greenhouse Gas (GHG) estimation; Sharing approaches and lessons learned on application of Tier 3 methods. | not determined at meeting |
| 3. To share methods and lessons learned on application of remote sensing to improve activity data. | United Kingdom, Philippines, Ireland Viet Nam |
| **Networking** | |
| 4. To promote communication between inventory practitioners and research scientists working on specific inventory-relevant topics. | Ghana, Philippines, Malaysia |
| 5. To identify opportunities to involve partners to further work on GHG inventory and measurements. | Canada, Netherlands, Uruguay, New Zealand, Japan |
| **Guidance** | |
| 7. To produce best practice guidance on measurement techniques, harmonisation of approaches, and standardisation of technologies and methodologies for soil organic carbon (SOC), nitrous oxide (N2O) and methane (CH4). | New Zealand, Canada (SOC); United Kingdom, (N2O); Japan, United Kingdom, (CH4) |
| 8. To produce the best practice guidance on development of activity data. | Netherlands, Canada |
| **Methods and Capacity Development** | |
| 9. To increase our capability to estimate and communicate uncertainties of GHG emission/removals. | United Kingdom, Viet Nam, Canada, New Zealand |
| 10. To build capacity to estimate and measure GHG emission and removals. | New Zealand, Netherlands, Ghana, Viet Nam, Indonesia, Uruguay, Argentina, Chile |
| 11. To develop methods to evaluate the economic value of GHG mitigation. | Ghana, United Kingdom, Indonesia |
| 12. To improve capability to quantify GHG emission and removals for further scenarios of farming systems and climates. | Uruguay, Netherlands, Canada, Viet Nam |
| 13. To produce guidance on methodologies for determining emission intensity. | New Zealand, Netherlands, Canada, Canada, Viet Nam, United Kingdom |

Reference List

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Ref Type: Conference Proceeding