

**Report of the meeting of the
Task Team on National Climate Monitoring Products**

12 - 14 September 2012, Geneva, Switzerland

J. Kennedy

The meeting was opened by Carolin Richter, deputy director of GCOS. In attendance were Ladislaus Chang'a, Prithiviraj Booneedy, Andrew Watkins, Olga Bulygina, Mesut Demircan, Deke Arndt, Fatima Driouech and Hama Kontongomde (WMO) with apologies from Mohammad Semawi, recently promoted to Director General of the Jordanian Met Service and his country's permanent representative. David Thomas, Richard Thigpen, Mustafa Adiguzel, Pat Parish, Atsushi Shimazaki and Jay Lawrimore also joined some sessions of the meeting.

David Thomas - WIS project manager – talked about the importance of data discovery metadata and noted that had WIS been fully operational, certain tasks of the team – for example cataloguing existing national climate monitoring products – would have been substantially easier. He noted that one of the targets for NMSs was a count of products produced. NCMPs need to build on existing infrastructure using for example the RCCs which help NMS's implement recommendations. Analogy of software abstraction – used to program in compiler, now we use C to build R to write GUIs.

Fatima provided the OPACE2 perspective reminding the team that the creation of National Climate Products was intended to facilitate poor and developing countries. She noted that the CCI endorsed the NCMPs chosen by the team and that they were intuitive and linked to the impacts of the changing climate. Having addressed some of their terms of reference the next steps for the team were to address the capacity building aspect that is seen as a key goal for CCI.

Actions from the previous meeting

JK and **LC** to contact CBS to establish a focal point to attend meeting of CBS. - pending

OB to draft detailed guidance for NCMP 1 (Mean temp) – complete, draft guidance is available from the team website and was presented at the meeting

AW to draft detailed guidance from NCMP 2 (Total precip percentage) – complete, draft guidance was presented at the meeting.

DA to draft detailed guidance for NCMP 3 (SPI) – complete, the work was presented at the meeting.

RB to draft detailed guidance for NCMP 4 and 5 (Warm days, Cold nights) – complete, draft guidance is available from the team website and was presented at the meeting

JK, DA, AW to draft detailed guidance for NCMP 6 (Significant Climate Event) – partially complete (see later notes)

OB, AW, DA, RB to cooperate on production of detailed guidance

LC and **RB** to draft short survey of current climate monitoring capabilities to be sent to NMSs – complete, draft survey was presented at the meeting

DA to talk to world data centre and feedback world data centre guidelines to the team. - complete

MS and **OB(WMO)** to investigate the mechanisms within CBS for metadata definition and dissemination and report back to the team – complete MS sent information on CBS to the team.

DA to provide list of reliable monitoring focal points within countries. – DA has started to compile a list.

PH will provide list of RAVI contacts. – complete, list sent to chair

JK and **LC** to contact other WMO region leads (I, II, III, IV, V) - pending

JK and **LC** to follow up on Andrew Watkins email to Lisa Alexander of ETCCDI to check the practicality of harmonising our software with theirs including the question of area-averaging. – complete.

MD, MS, DA and **AW** to forward to the team information on systems for aggregating spatial data to a representative area-average as used in their institutions. A more exhaustive literature review to be carried out to recommend a simple means of creating area-averages from point data – complete, information is available from task team website

JK to contact Steve Palmer and Roger Stern and Ian Dale at ReadingUniversity to find out more about the provision of e-learning. - complete

MD and WMO Secretariat to provide skeleton design for training workshops. – complete, skeleton design presented at meeting.

NCMP draft guidance

The first session of the meeting focused on the draft guidance produced by the team members. The six proposed NCMPs were:

1 Monthly area-average mean temperature time series $(\max + \min)/2$. Anomaly to be defined relative to 1971-2000. (or WMO preferred alternative) with the actual normal temperature for 71-00 included in metadata. Units degC. (Olga Bulygina)

2. Monthly area-average of total precipitation anomalies expressed as percentages. Anomalies to be defined relative to 71-00 period (or WMO preferred alternative). Units none (A. Watkins)

3. Monthly area-average of standardised precipitation index (SPI) calculated for each station. Standardisation will be to the 71-00 period (or WMO preferred alternative). Based on proposed ETCCDI index definition. Units none (D. Arndt).

4 Monthly area-averaged Percent of Time $T_{max} > 90$ th Percentile of Daily Maximum Temperature 71-00 period for standardisation (or WMO preferred alternative). Based on ETCCDI definitions. Units none (P. Booneeady).

5 Monthly area-averaged Percent of Time $T_{min} < 10$ th Percentile of Daily Minimum Temperature 71-00 period for standardisation (or WMO preferred alternative). Based on ETCCDI definitions. Units none (P. Booneeady).

6 Significant climate and weather event relevant to the area or region. This product consists of zero or a number of these events coded from a predefined table: cold snaps, heat waves, snow storms, dust storms, wind storms, sea level or heavy swell events, flooding, heavy rainfall, volcanic ash. Referring to guidance from the WMO task team on the definition of extreme weather and climate events. (J. Kennedy, D. Arndt and A. Watkins with input from WMO Region VI monitoring).

Olga Bulygina presented the draft guidance on NCMP 1, monthly mean temperature anomaly. The agreed form of the monthly mean temperature NCMP included the absolute area-average temperature for the country in the metadata. Calculating the absolute average is considerably more complex than calculating the average anomaly because absolute temperatures vary less smoothly than do anomalies, with a strong dependence on altitude. The proposed solution was to split the country into bands of roughly equal altitude and average over each one separately within quasi-homogeneous climatic regions using a fixed station network. However, it is also possible to include altitude as a secondary variable in various forms of interpolation (see below).

OB raised an important point concerning the meaningfulness of an area average over a whole country, particularly larger and more climatically diverse countries. Climate and weather are no respecters of political borders. The eventual written guidance will need to contain a guide to what the NCMPs represent, but it should also be possible to adapt the proposed software to output interpolated maps and area-averages over other user-defined regions.

Andrew Watkins presented progress on the guidance for producing NCMP 2. He noted that there are difficulties with averaging precipitation anomalies, whether they are expressed as percentages or straight deviations from the mean. Arid areas will tend to be over-represented in the former and areas of higher rainfall in the latter. His suggested method is to average the percentages, rather than averaging the anomalies and then calculating a percentage.

AW pointed out that different interpolation schemes will give different answers and that it was important that we open up the black box so that users could gain insight into the sensitivities and dependencies and inner workings of the analysis for themselves. This could form part of the ongoing capacity building efforts allowing the users to suggest and make improvements and modifications to the code. This would also mean that the users would have a greater understanding¹ and personal investment in the continued production and use of the NCMPs.

¹ As scientists we feel that a system is not fully understood until it has been taken to pieces and put back together. No animals were harmed in the production of this theorem.

Ladislaus Chang'a noted that stations are often closing and that there needed to be some motivation to continue taking measurements.

Deke Arndt presented his work on developing the detailed guidance for NCMP3. The SPI (Standardised Precipitation Index) was adopted by the WMO a universal approach to drought monitoring. It is a simple precipitation-based measure of the 'unusualness' of rainfall developed by the University of Nebraska. Because the distribution of precipitation totals are non-normal, the data first need to be transformed. This is often done by fitting a gamma distribution to the data which works well for mid-latitude precipitation, but is less effective in arid areas or tropical areas where rainfall behaves quite differently. A Pearson Type 3 distribution gives a better fit in drier areas and is only a little worse than the gamma distribution in other regions. There is an ACTION on Deke to dig out the appropriate reference concerning which of the Pearson Type 3 and Gamma distributions works best and what the differences are.

To note for the detailed guidance, the calculation of the SPI requires near-complete (>90%) data coverage in the climatology period and can be calculated for periods from a month upwards. For the purposes of NCMP3 a 1-month SPI is preferred.

The SPI has a number of advantages. It is simpler than pure drought indices and it captures extremes of both high and low rainfall. By transforming to a normal distribution it is possible to explain the unusualness of rainfall events in comparison to common experience, either by converting to a return period, or by analogy. For example the monthly rainfall total in the UK in July 2007 is as unusual as a 7ft 2inch man. Disadvantages were [I didn't get a chance to list these...]

A country-average SPI could be calculated in two ways: first by area-averaging the precipitation totals at each station and then calculating an SPI, or by calculating the SPI at each station and area-averaging the SPIs. The latter was preferred (ACTION Deke to check this is OK) as the former could likely be calculated from NCMP2 and would therefore render NCMP3 redundant.

As with other NCMPs it was felt that careful guidance needs to be given for interpretation. How can the NCMPs be used, how might they be mis-used?

Prithviraj Booneeady presented his draft guidance on NCMP 4 and 5. NCMPs 4 and 5 are based on the ETCCDI indices of the percentage of warm days and the percentage of warm nights. As it stands these indices are defined to be ANNUAL so some work will need to be done to adapt the RClindex software to output monthly indices.

Raj stressed the importance of only using homogenised data. However, the problem of reliably homogenising daily data has not yet been solved. It was suggested that obviously inhomogeneous sections of the record could be discarded leaving a more homogeneous remainder.

After lengthy consideration John Kennedy suggested that NCMP6 might be too difficult to define and write comprehensive and comprehensible guidance for. The proposed NCMP consists of zero or more events chosen from a predefined table. The original NCMP was envisaged as being somewhat more subjective than the other NCMPs to be used as a flag that something interesting might have happened. In order to simplify the production of

guidance it was suggested to wait on the Task Team on the Definition of Extreme Weather and Climate Events, which is due to produce a draft report towards the end of 2012. It was also suggested to flag unusually high values from stations used in the construction of the NCMPs – record values, high indexes etc – or use other ETCCDI indices produced by the RClimdex code.

An important component of the first 5 NCMPs is the method used to calculate the area averages. There is a strong preference for a simple method although literature reviews such as Li and Heap (2008) and COST action 719 report (2002) suggest that more complicated methods such as Kriging tend to perform better. As pointed out by Olga in her draft guidance for NCMP1 there is also a need to provide some method of averaging absolute temperatures over a country. Some versions of Kriging can accommodate secondary variables such as elevation.

In terms of implementing a particular method, R was the preferred language. R has packages for performing geostatistical operations such as interpolation and keeping a common language with that used to generate the RClimdex code would reduce training and maintenance overheads. The downside is that there is little experience within the group of scripting in R. Consequently there were actions to contact more knowledgeable folk.

ACTION - Ask via WMO/Omar to get in touch with ETCCDI code expertise to ask about feasibility of implementing the area-averaging in R. And ask about feasibility of packaging RH test, RClimdex and NCMP_area_average.

ACTION – All team members to ask around about using R. What would be needed to turn point data to an area average in R based on R Climdex? (secondary question – what extra complication is introduced by adding elevation and secondary parameters).

The question we would seek to answer is what is the likely cost of implementing the spatial averaging? Can we package RHtest and RClimdex together in a one-stage process ([RHTest+RClimdex + area_averaging]), or two-stage process ([RHTest]-[RClimdex + area_averaging]). What extra complexity would be introduced by adding an additional variable (like elevation) to the interpolation?

An alternative, though less preferred alternative to producing software or recommending that software be produced would be to establish a detailed methodology for generating the data and suggested software, but leave it up to the individual members for the implementation. In the first meeting of the team, it was felt that this could easily lead to inconsistencies between nations.

The overall guidance was suggested to have four components

1. Scientific justification : rationale behind the products
2. Detailed Guidance with all steps necessary to implement the products in software
3. Software: a working implementation in R of the detailed guidance.
4. Instructions for using the data.

A schema for the detailed guidance (Component 2) was drafted in the meeting giving all the details necessary to implement the NCMPs in software. This will be used as a framework – large sections will be common to all NCMPs – for the detailed guidance of NCMPs 1 to 5.

Mesut Demircan outlined the format of the ETCCDI workshops and explored what might be necessary for NCMP training workshops. Capacity building – whether via workshops or distance learning or other means – is an aim of the GFCS which will develop the capacity of countries to apply and generate climate information. Mesut also noted that they can provide financial support. ‘Basic’ climate services including observations, data management and user engagement are a foundation for ‘essential’ climate services such as climate monitoring.

There are 23 WMO Regional Training Centres (RTCs) who provide a variety of climate training with help from WMO. RTCs are required to have facilities necessary to host a meeting. If we have the resources (WMO has some funds for this and workshops such as the Mauritius workshop have been funded by other agencies Amnesty, COI) then we can use the RTC facilities (computers, rooms, experts, toilets, possible accommodation) to host a workshop. However, not all RTCs are equal with some being more active than others

In order to ensure continuity of the NCMPs it was thought that RTCs might take responsibility for the training process, after a few trial runs to be led by the NCMP task team. The NCMP team would design the course and provide experts (from within the team, or by engaging suitably skilled outsiders) to deliver the initial training.

The question was raised of whether or not we could ‘piggy back’ on the ETCCDI workshops either by providing a short follow on workshop that would be an optional extra for those attending the regional ETCCDI workshops, or by making attendance at an ETCCDI meeting a pre-requisite. Fatima stated that the people producing ETCCDI indices and those creating NCMPs would not necessarily be the same people and that there would be advantage to ‘doubling up’ on the numbers of ETCCDI-capable staff. This essentially rules out the possibility of making ETCCDI workshop attendance, but not the possibility of piggy-backing. Piggy backing could be a way of bringing together climate monitoring and climate change personnel.

Mustafa Adiguzel and Pat Parish (chief of training) provided an in-depth introduction to the provision of e-learning. The WMO has a platform run by the UK Met Office based on moodle, an open source content management system. In the US the COMET program has developed a great deal of free to use training material on the MetEd website. They have developed resource materials on climate topics and are planning on providing university level courses. MetEd may have some material the task team could draw on when developing its own training courses. ClimAndes – Peruvian RTC, led by university of Bern are developing e-learning systems. The EUMETCAL group is also developing courses.

The resources needed to generate highest-quality training materials such as the MetEd courses amount to around 800 hours’ work for 1 hour of delivered teaching. Their high production values are perhaps something to aspire to rather than hope to realise, but we should still factor in several weeks to develop and beta test the materials. It was also pointed out that distance learning requires more teacher time than face-to-face classroom teaching although the timing is clearly somewhat more flexible.

The Moodle Course management system (UK Met Office) can be used to build quizzes, questionnaires, drop boxes for assignments and many different media can be incorporated in the online presentation of material. There are also facilities for recording commentaries for presentations. Users need an account and a key for the platform which will allow them to

access specific materials. Multiple people can be designated as administrators, or 'teachers' with greater privileges. The e-learning tools can be used in a variety of ways:

1. We can use it as a task team for our web presence, for group communication, to share resources, set up wikis etc. **ACTION** Hama will set this up.
2. Pure Distance learning where trainers and students meet only online
3. Blended workshop combined with distance learning.
4. Train the trainers, and then support the trainers you've trained online. The system also allows trainers to personalise or regionalise the training materials.

The WMO education and training team (ETR) can help us provide and develop materials and help with technical issues.

A set of proposed outcomes for both workshop and e-learning and a skeleton workshop plan was put together during the meeting **ACTION** on Deke Arndt and Mesut Demircan to carry this forward.

Prithviraj Booneeady and Ladislaus Chang'a have drafted a clear and useful survey to be sent out to NMS and have also made personal contacts with PRs and potential climate monitoring focal points at meetings and workshops. The chief aim of the survey is to identify within each country a focal point for National Climate Monitoring. The secondary aim is to assess the current capabilities within countries for climate monitoring. There are facilities within the WMO to present the survey online, but Hama pointed out that many NMSs are suffering from survey fatigue. Hama said that he would locate the responses to previous surveys so that we could target our questions more carefully. The updated survey will be circulated by Raj and Ladislaus for comment (**ACTION**) and a letter to the PRs will be drafted.

Deke briefly reported on World data centre guidelines – Jay Lawrimore's branch would ingest the products and present them as reported. The file format will be fine if it is CLIMAT-like and distributed over the GTS. An exotic file format would be problematic, but is unlikely to be our preferred option. We would need to prepare a submission agreement and there is an **ACTION** on Deke to start submission agreement and place on moodle.

Jay Lawrimore joining us via the miracles of modern communication technology, gave a presentation on the plans to create a method for routinely transmitting daily observations for climate. Daily climate observations are reported in a different way to SYNOPS. The estimation of the global mean temperature depends on monthly CLIMAT reports. However there is a growing demand for indices that measure extremes. Along with concerns about timeliness there is also the problem of incompatibility between daily and monthly aggregates. SYNOPS messages are not optimised for climate analysis and are generally incompatible with climate observations (Van de Besselaar et al. 2012). For example, there are differences in the ways that max and min temperatures are reported. SYNOPS max/min calculation is based on 12-hours and is hence less than perfect, tending to underestimate extremes. There is a similar problem for precipitation with reports covering less than a full 24 hour day. There are other problems with SYNOPS: SYNOPS are reported at fixed UTC, whereas true climate observation occurs at 00 local time (or 0900 or others depending on

country). The data cover a different period. Daily max min temps not mandatory in SYNOPSIS and there is inconsistent reporting.

To meet climate requirements daily summaries need to be consistent with national monitoring practices for: 24-hour max, min and mean temperatures, precipitation, snowfall and daily snow depth. The proposed solution is to use monthly CLIMAT messages to transmit daily observations in the BUFR format.

Each CLIMAT message would have 31 daily observations with the following information: time of observation, 24hr max, min, mean (if different from $x+n/2$) time of precipitation observation, 24-hr precipitation total, depth of snowfall in past 24-hr. Depth of total snow on the ground. The BUFR template is part of the manual for codes (WMO-no 306). Reporting of the daily data would be compulsory.

When thinking about the possibility of creating a similar code for transmitting NCMPs, the following ought to be borne in mind. The team needs to help people understand what we are after and make a clear case that this is a requirement for climate purposes. A well thought out stakeholder engagement with clear communication and a compelling case for why we are asking for this. Rules for getting data into the format need to be developed. BUFR is not transparent. It is a binary format and is therefore not human readable so mistakes in coding and decoding are expected. With training and time NMS will become used to it.

Astusushi gave a presentation on BUFR codes. BUFR stands for Binary Universal Form and is in principle infinitely extensible. The proposed system would have the daily data observed daily, but transmitted monthly. The format contains metadata such as the height of the sensor above the ground, time of observation and UTC to local time conversion factors. The code is not expected to come on line until 2014. Clearly these things take time (the proposal was first mooted at the first ISTI meeting in 2010). There is a question of whether it is necessary to separate the monthly CLIMAT from the daily CLIMAT message.

Can BUFR be used to transmit NCMPs? After November 2014, all data should be reported in BUFR. As it stands the BUFR template needs a station ID and there is no provision for a country ID (strange as that may seem). If there is a strong requirement it ought to be possible. Rogue elements in the team suggested hacking BUFR using a spoof station ID to represent a whole country. No. A country ID needs to be explicitly added to BUFR. After developing the codes climate centres need to validate the templates – one nation codes it, another decodes it.

ACTION – . Andrew Watkinsto write strong justification to forward to CCI management via OPACE chairs. We would hold off coding messages until we had a response.

Climate normal

The team considered the discussion document circulated by the WMO team on climate normals. In the previous report, the team recommended that 1971-2000 be used as the climatology period for NCMPs, updated every 10 years. This is described as the 30-10 model in the discussion document.

The rationale for doing so was

- A later start date would increase the available number of stations and therefore lead to a more accurate product
- A later start date would make better use of expanding networks
- Metadata is likely to be more complete in the later period.

There was some uncertainty as to exactly how one might implement the proposed dual-standard. Some entities, such as the NCMPs might conceivably be assigned to be either climate monitoring, or climate application products depending on their use.

The future of the group

Fatima summarised the progress of the group so far. The use of smiley faces was much appreciated. Of the terms of reference, some progress has been made on all but the final ToR.

1. Consider the existing national climate monitoring products and determine which of these products are most important from a scientific perspective as well as which products generate the most interest among the general public within those countries.
2. Consider the existing capabilities within developing countries to potentially produce the climate monitoring products documented in (1) above.
3. Develop a list of from two to six national climate monitoring products that the team recommends Members produce.
4. Precisely document the construction of this priority list of national climate monitoring products in a publication intended to be an addition to the WCDMP publications.
5. Determine if it would be helpful to develop software to calculate these products and, if so, what language would be appropriate for the software.
6. Should software be deemed appropriate, either create the software or recommend that such software be created.
7. Report to OPACE 2 co-chairs. [*Develop guidelines with appropriate formats and suitable mechanisms for the Members to follow when submitting their national contributions to the WMO annual statement on the Global Climate.*]
8. Task team lead to inform OPACE 2 co chairs that the task is finished and that the team can be dissolved.

Work that remains to be done for the terms of reference

- Finalise, distribute and analyse responses to survey of existing capabilities
- Finalise the guidance NCMP 1-5
 - Some questions over the NCMP 2 (percentage precipitation).
 - decide on final method for area-averaging
 - Write software to calculate NCMP
 - determine appropriate grid-spacing
- Draft guidance for NCMP 6
- Finish scoping the feasibility of generating software, or implement the proposed software – contingent on finding someone with appropriate expertise.

- Develop guidelines for submitting the NCMPs
 - BUFR message
 - WIS and RCCs.
- Workshops and distance learning.
- ToR for focal points (access to NCMPs, coordinate with subservices, knowledge about products, send products, respond to questions about NCMPs)

Other loose ends

1. Workshops, e-learning

Recommendation of the task team

In order to ensure that the good efforts of the team are not wasted and the wide range of expertise is preserved it was recommended that on fulfilling the terms of reference of the task team, the task team would hand over to a team with terms of reference dedicated to the implementation of the NCMP plan with some, or all of the current task team members.

DA to dig out the appropriate reference concerning which of the Pearson Type 3 and Gamma distributions works best and what the differences are. (Sep 30)

DA to check averaging of SPI is OK (Sep 30)

WMO/Omar to get in touch with ETTCDI code expertise to ask about feasibility of implementing the area-averaging in R. And ask about feasibility of packaging RH test, RClimdex and NCMP_area_average. (Sep 30 2012)

ALL members to ask around about using R. What would be needed to turn point data to an area average in R based on R Climdex? (secondary question – what extra complication is introduced by adding elevation and secondary parameters). (open ended)

DA ask ETCCDI to include SPI in RClimdex as a priority. will consult on SPI. (Sep 30)

HK will set up TT-NCMP moodle pages. (Sep 30)

HK to ask around about the results of other WMO surveys (Sep 30)

PB and LC to update survey and circulate for comment by all (Oct 31)

ALL members to comment on survey (30 Nov)

DA to start submission agreement and place on moodle (Oct 31).

AW to draft a justification for creating a suitable message format within BUFR for NCMPs for elevation up the CCI hierarchy. (Oct 31)

FD to establish contact with CBS to establish a focal point to attend meetings of CBS (Sep 30).

JK to circulate schema for detailed guidance (17 Sep).

OB to draft detailed guidance for NCMP 1 (Mean temp) and circulate to team (Oct 31)

AW to draft detailed guidance from NCMP 2 (Total precip percentage) and circulate to team (Oct 31)

DA to draft detailed guidance for NCMP 3 (SPI) and circulate to team (Oct 31)

RB to draft detailed guidance for NCMP 4 and 5 (Warm days, Cold nights) and circulate to team (Oct 31)

JK to draft detailed guidance for NCMP 6 (Significant Climate Event) and circulate to team (Oct 31)

JK and **LC** to contact other WMO heads of RCCs (I to VI) (Sep 30)

DA and **MD** to carry forward workshop and e-learning plan. Finalise proposed outcomes and draft plausible implementation plan. (Dec 31)

MD to contact ETCCDI and ETCRSCI regarding possibility of 'piggy backing' NCMP training on their workshops (Sep 30)

LC to draft ToR for focal points and circulate to team via moodle. (15 Oct)

JK to feedback to WMO normals team. Concerns about language regarding monitoring vs climate change (Sep 30).

JK – finalise meeting report and circulate (Today)

ALL members to upload meeting materials (15 Oct)

JK to consider existing WCDMP publications and produce outline of report structure. WCDMP <http://www.wmo.int/pages/prog/wcp/wcdmp/series.php>

RB to attempt practical implementation of NCMP for Mauritius with the aim of having a concrete example for the WCDMP report (end 2013)

OB – to ensure standardisation on production of detailed guidance

PB – to oversee software and liaise with ETCCDI

DA – workshops, training, distance learning

Guidance – losing local detail especially for extremes, so maps have to be an output. What are the NCMPs/What are they not?

Outputs – maps as well as NCMPs.

Software needs to have user defined inputs such as base line, outputs monthly seasonal annual

Is there a WMO preferred programming language?

Documentation – scientifically detailed step-by-step schema with dangers to avoid. Data quality, periods, homogenisation, quality control, steps of calculation. Guidance to also help development of the software (refer to appropriate literature).

Future – do we need a champion to maintain the online learning experience. A succession plan.

What remains to be done:

What is the purpose of NCMPs? focus on anomalies and variability, rather than specifically long term changes. Will meet objective already mentioned in the last report and in the terms of reference and maybe we don't need to focus on climate change. The output should be a useful input to wider climate change assessments although this is not the primary focus.