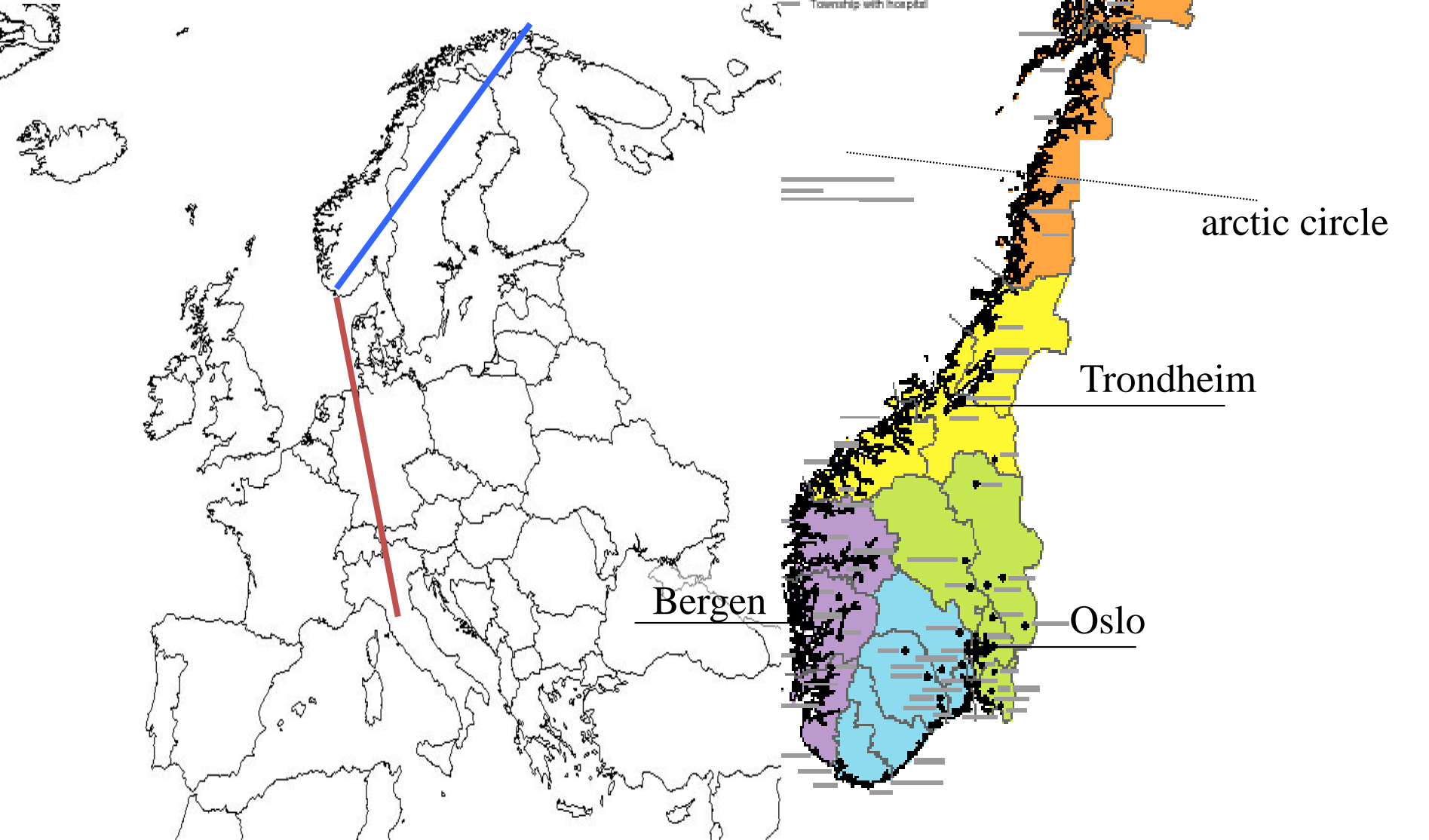


Sykehusbygg HF - Norwegian Hospital Construction Agency

Developing pre- and post-occupancy
evaluation of Norwegian hospitals



**Norway: 323 700 km² – 5, 345 mill
inhabitants**

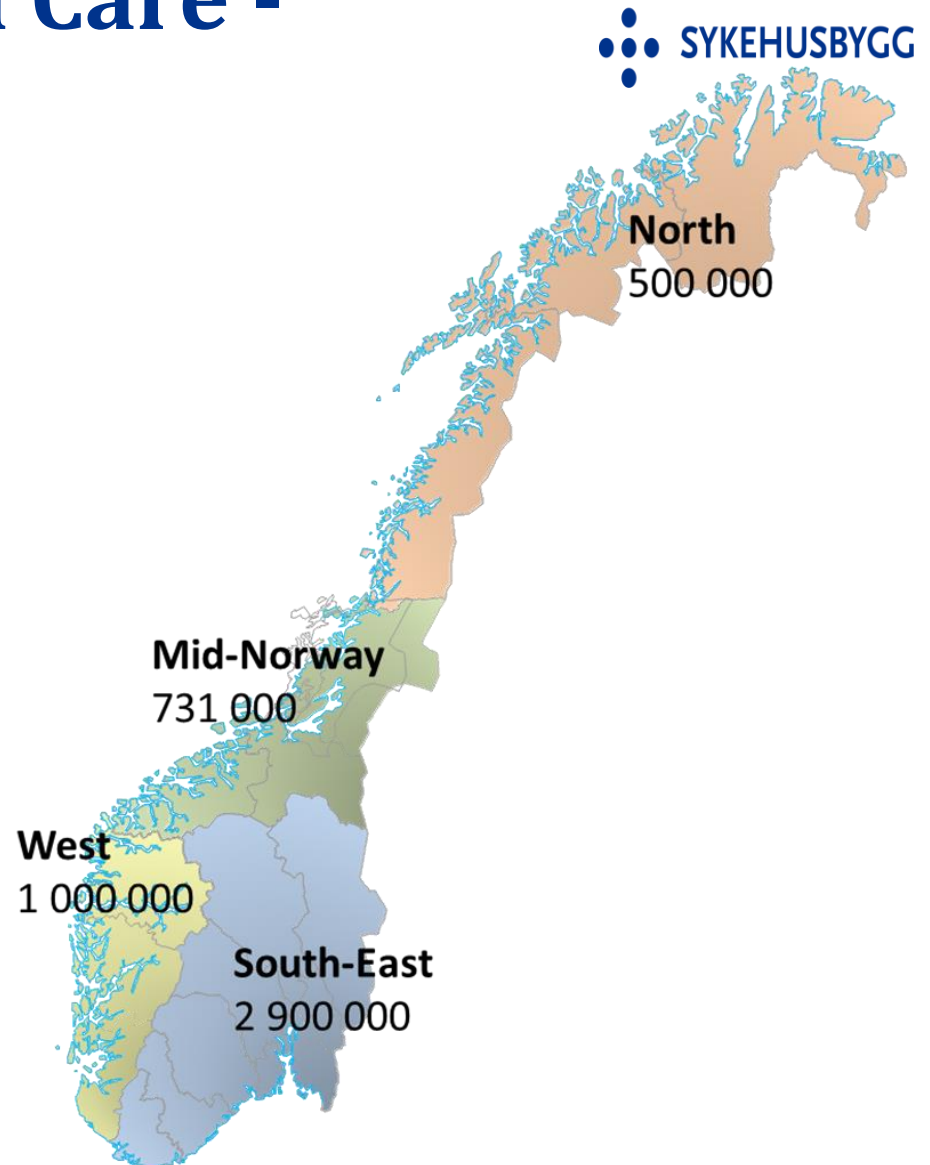


Specialized health Care - Hospitals

Hospitals:

- State owned
- Organized within Health Enterprises
- Managed by 4 Regional Health Authorities

- Equal access to healthcare services
- 422 municipalities (number will be reduced)
- 50 percent less than 5 000 inhabitants
- Areas with small population
- Long distances
- Harsh climate



The municipalities

- Responsible for primary healthcare services such as
 - General practitioners
 - Home care
 - Nursing homes
 - Physiotherapy



Sykehusbygg's two major focus areas

Hospital planning and
building projects in
Norway

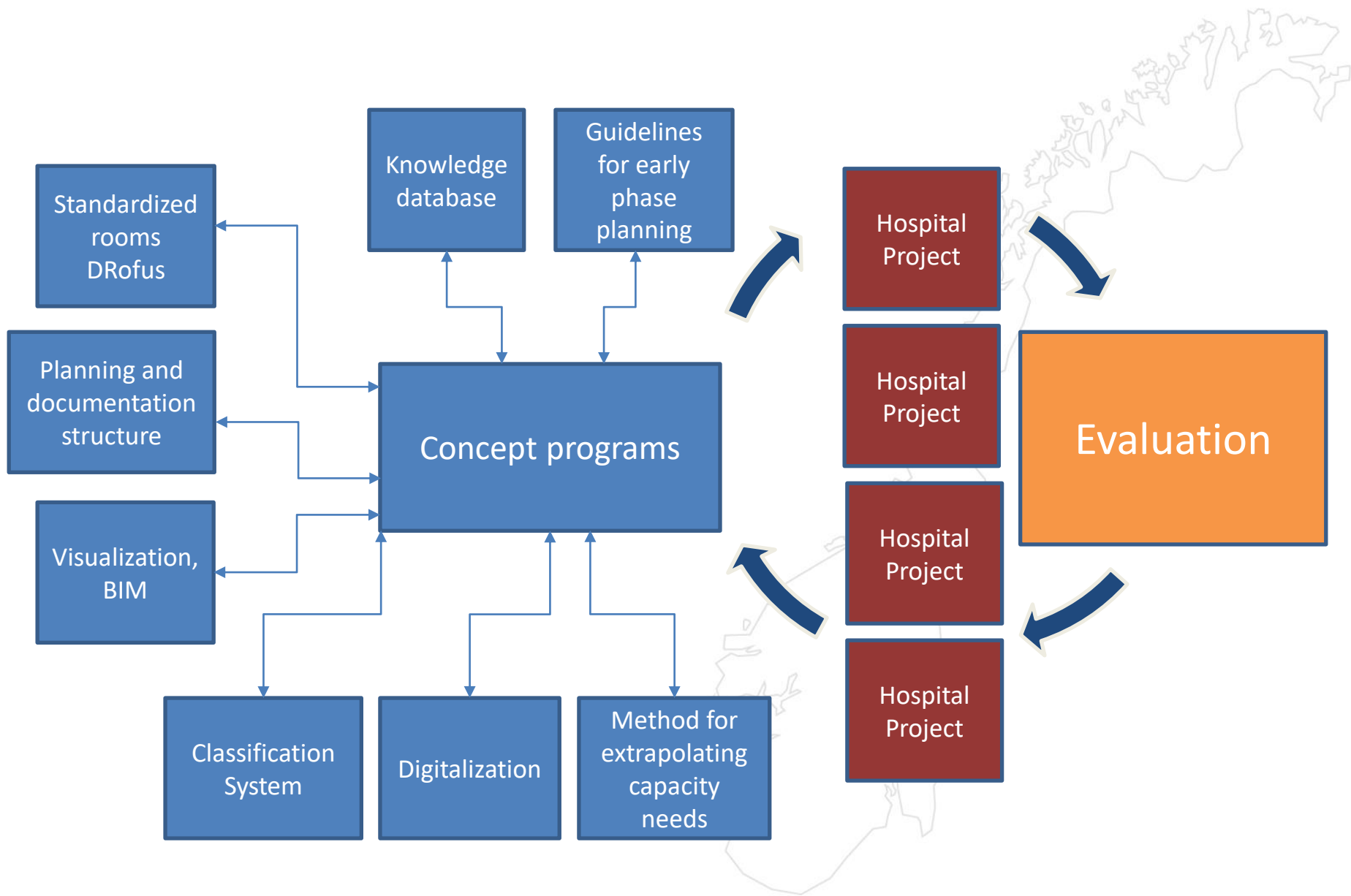
Knowledge development



Knowledge Development



- Guidelines for pre-planning process
- Guidelines for programming functions, area, equipment and technology
- Developing extrapolation methods
- Technology report
- Guidance for infection control in built environment
- Standardized rooms and functional areas
- Classification system
- Hospital logistics
- **Guidance for evaluation of hospitals**
- Networking and knowledge sharing
- Knowledge database



Evaluation of Norwegian hospital projects is based on:

2017: Guidelines for early phase planning:

- Funding for pre- and post-occupancy evaluation shall be included in the overall project costs

2018:

- The Ministry of Health and Care Services (HOD) requested a guideline basis for evaluation of hospital projects

Starting point for evaluation

- What is the goal for the new hospital?
- How to measure the intended outcome?
- How can the evaluation results be used and implemented for improved planning and design?
- How to involve participants and collect data?

Areas of evaluation

Evaluation should be a part of every phase during planning, building and operation



Performance Assessment Program (PAS)- CII 10-10

- Construction Industry Institute (CII), The University of Texas at Austin
- Launched July 2013 (CII Annual Conference)
- Industrial, Building and Infrastructure
- Phase-Based Surveys
- The Nordic Countries are managed by the membership organisation **Nordic 10-10**
- Researchers at NTNU and SINTEF offer support to the enterprises using Nordic 10-10

How 10-10 works

- Combine facts and an anonymous survey
- Each project consist of five phases and each phase is organized in three sections:
 - General information ('GEN') (Project Coordinator)
 - Input ('IN') (Project Team)
 - Out ('OUT') (Project Coordinator)
- A link to the questionnaire (ca 50 questions) is sent to members of the Project Team (IN) (ca 1 hour response time)
- The survey is submitted to CII for validation
- A project report available after 2-3 weeks
- Presentation of results from the report to the Project Team
- Discussions and develop corrective action plans

Input Measures

10 Input Measures – Leading Indicators

Planning

Organizing

Leading

Controlling

Design Efficiency

Human Resources

Quality

Sustainability

Partnering and Supply Chain

Safety



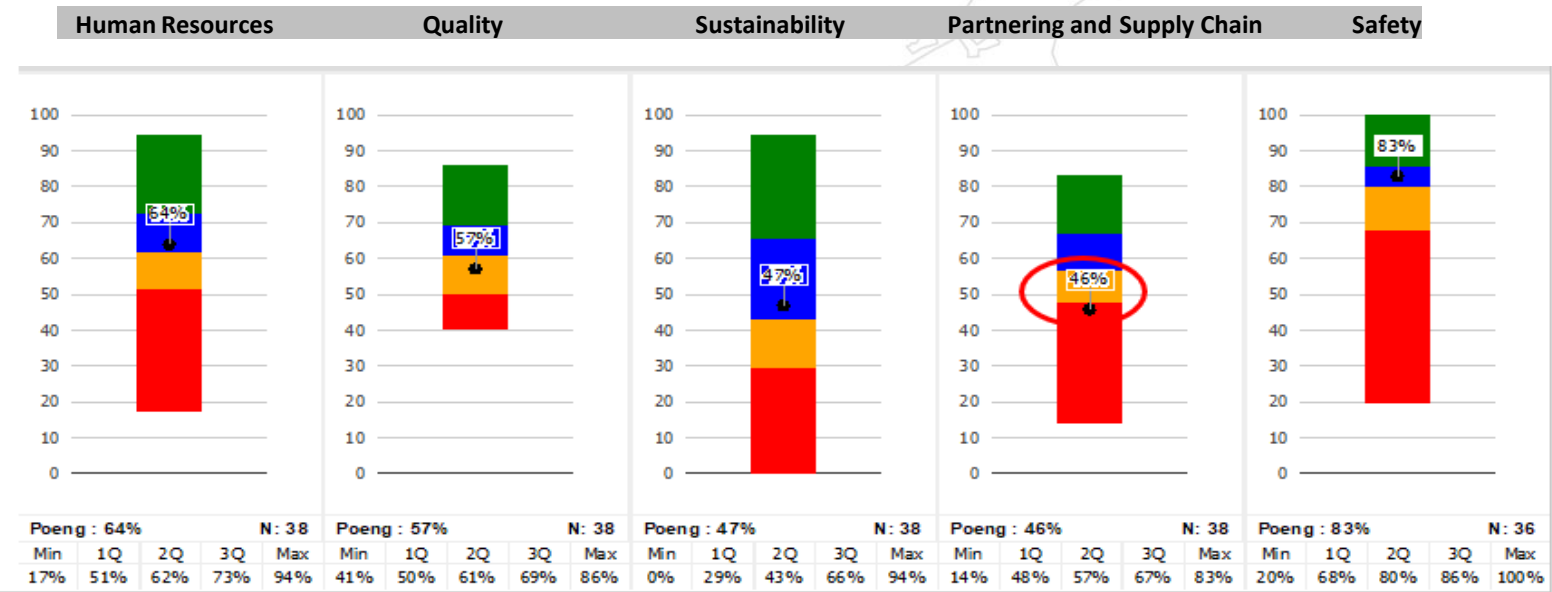
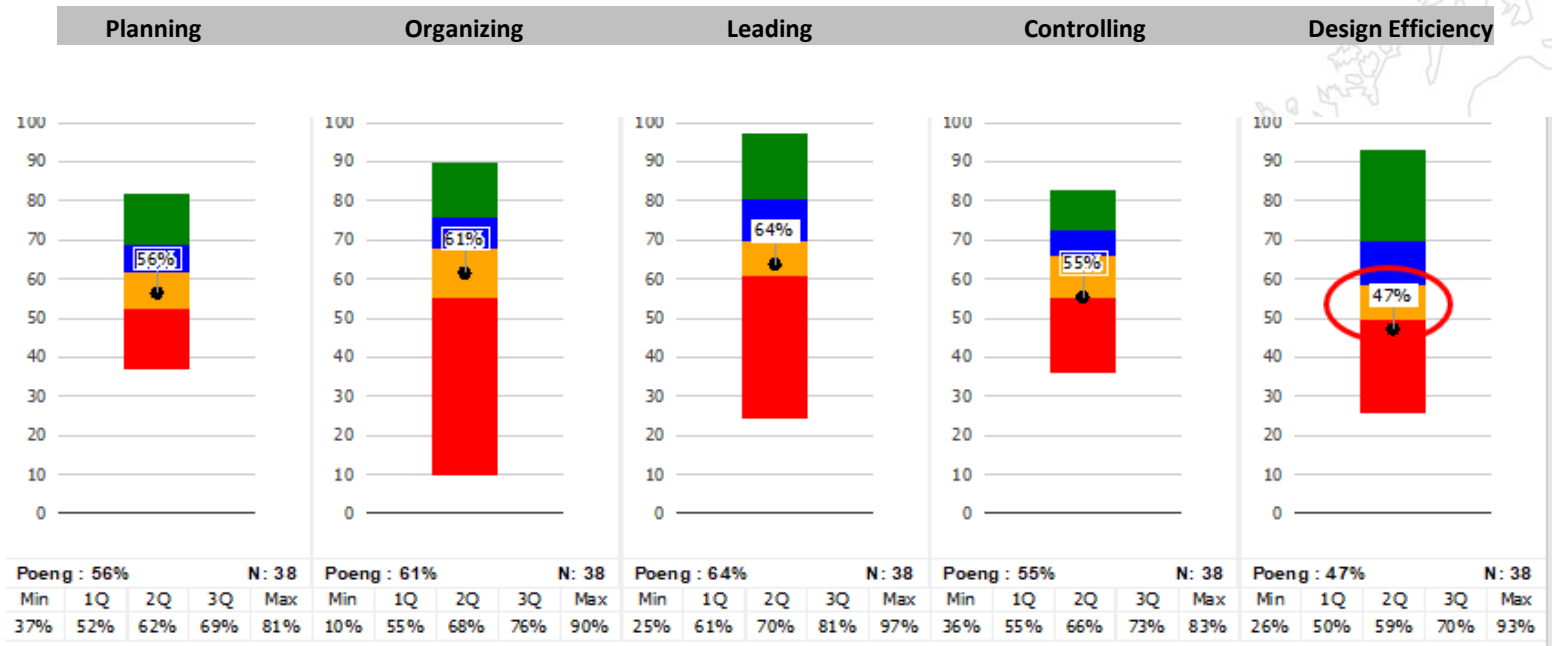
Some Questions

5. Did the project objectives change during Design?

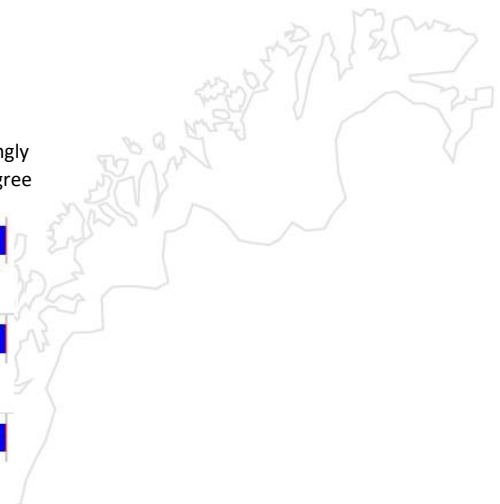
Strongly Agree, Agree, Neutral, Disagree, and Strongly Disagree

<i>Building Projects – Design Phase</i>		Planning	Organizing	Leading	Controlling	Design Efficiency	Human Resources	Quality	Sustainability	Supply Chain	Safety
5	Did the project objectives change during Design?										
7	This project experienced a high number of:										
8	Please characterize how project meetings were conducted.										
9	Which of the following statements characterized the decisions made by the manager(s) of this project?										
10	Was a life cycle cost analysis completed for this project?										
11	Is this project intended to be LEED certified or equivalent (certifiable)?										
12	Did this project use a Building Information Model?										
14	Was the Construction manager involved during Design?										
15	Were multiple Design offices used on this project?										
16	The owner level of involvement was appropriate.										

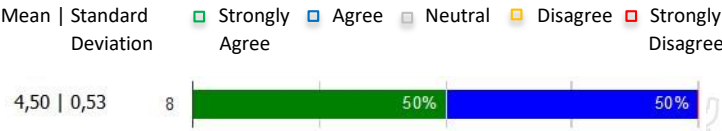
An Example, Psychiatric Hospital at Østmarka



Best score - Design



36. Project leaders were open to hearing "bad news", and they wanted input from project team members.



24. Project management team* members were clear about their roles and how to work with others on the project.



31. Key project team members understood the owner's goals and objectives of this project.



44. Regulatory requirements (e.g., permitting and environmental issues) were properly managed and Design is in compliance.



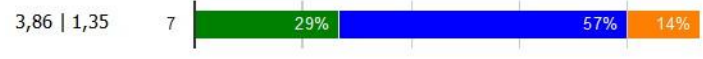
25. Project team members had the authority necessary to do their jobs.



42. The number and quality of Design/consulting engineering personnel was sufficient.



40. The project's commissioning objectives were appropriately communicated to the relevant project team members.



52. The customer was satisfied with the Design phase deliverables.



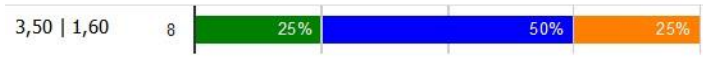
39. A high degree of trust, respect and transparency existed amongst companies working on this project.



28. The project experienced a minimum number of project management team* personnel changes.



30. The interfaces between project stakeholders were well managed.



35. Resources were allocated according to project priorities.



An Example, Psychiatric Hospital at Østmarka

Lowest score - Design



	Mean Standard Deviation		Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
48. A dedicated process was used to proactively manage change on this project	2,50 1,69	8	13%	25%	38%	13%	13%
33. Project leaders recognized and rewarded outstanding personnel and results	2,43 1,13	7		29%		57%	14%
17. The project team members were familiar with the project execution plan (PEP) and they used it to manage their work	2,38 1,41	8		38%	25%		38%
51. The project team members attended sufficient professional training directly related to their Design work	2,33 1,37	6		33%	33%		33%
32. All of the necessary, relevant project team members were involved in an effective risk identification and management process for Design	2,14 1,77	7	14%	14%	29%	29%	14%
46. The Design deliverables received from consulting engineers or other architects were complete and accurate (possessing a minimal amount of errors and omissions)	2,13 1,55	8		38%		63%	
20. The equipment procurement and vendor schedules were not a significant challenge for this project during Design	1,88 2,10	8	13%	25%		25%	38%
29. The key stakeholders (owner, architect, consulting engineers, etc.) were fully aligned during Design.	1,88 1,46	8		25%	25%	38%	13%
21. Comprehensive constructability suggestions (e.g., preassembly*, prefabrication*, modularization*, and offsite fabrication*) were evaluated and incorporated into the Design of the project.	1,83 2,14	6	17%	17%		33%	33%
50. An interim product database and/or standardized designs were used extensively in the Design of this project	1,13 1,25	8	13%			63%	25%
45. Design deliverables were released in a timely manner as a result of a good Design work sequence on this project.	1,00 1,55	6	17%		33%		50%

Chance of Improvement

Findings in the Report:

- Bullet points

Summary of the discussion from the meeting of experience:

- Bullet points

Corrective Action Plans:

- Bullet points

Areas of evaluation



Pre- and post-occupancy evaluation

Evaluation after 3 years

- Pre-evaluation
- Post-occupancy evaluation
 - Common evaluation (standardized to compare)
 - Evaluation themes adapted to each hospital



Evaluation methods and tools

- Projection of activity and capacity compared with today's activity and capacity
- Observation
- Interviews
- Questionnaire – employees and patients
- Mapping tools
- Indicators (e.g. fall, infection rates, medication errors, LOS, readmissions)
- Costs (e.g. staffing)

How staff and patients experienced hospital wards with single patient rooms

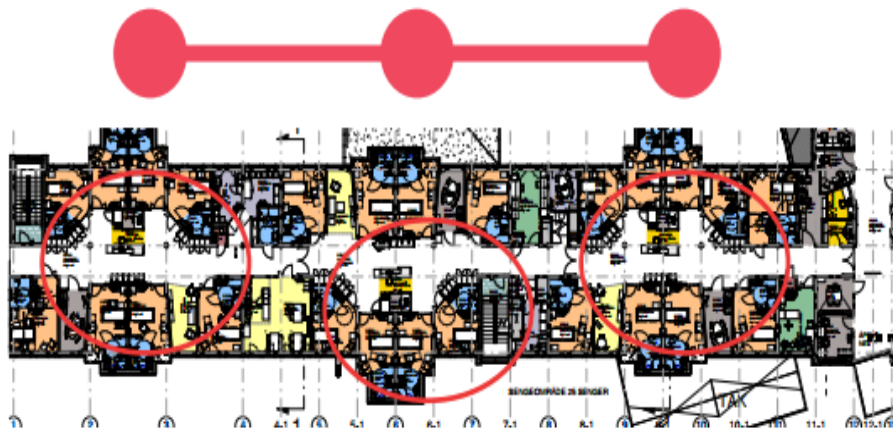


ARCHITECTURAL LAYOUTS OF WARDS

NORDLAND HOSPITAL VESTERÅLEN

Medical and surgical wards, each bed cluster: 8-9 patient rooms
all single-bed rooms with private bathrooms
decentralized work stations, small social areas for patients, kitchen/dining room for patients
work room/meeting room for staff, staff manager office, shared clinical support rooms

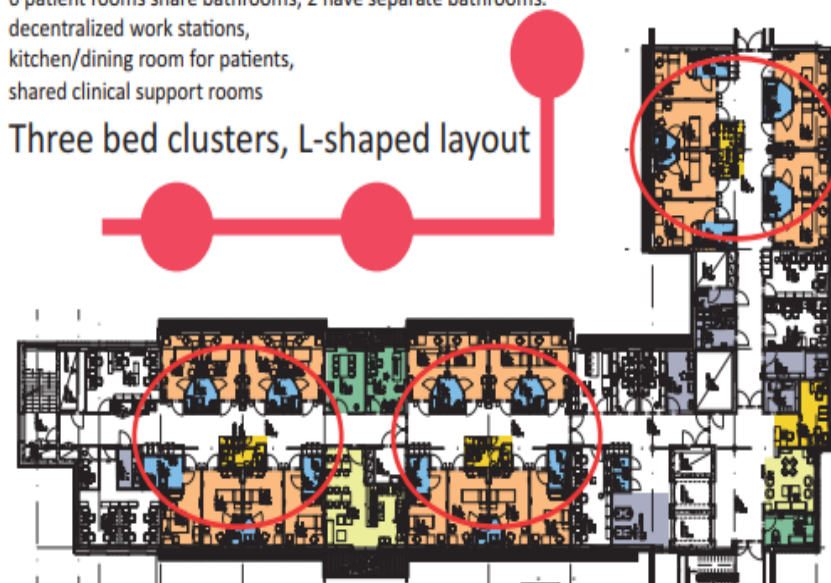
Three bed clusters in linear layout



ST. OLAVS HOSPITAL PHASE 2

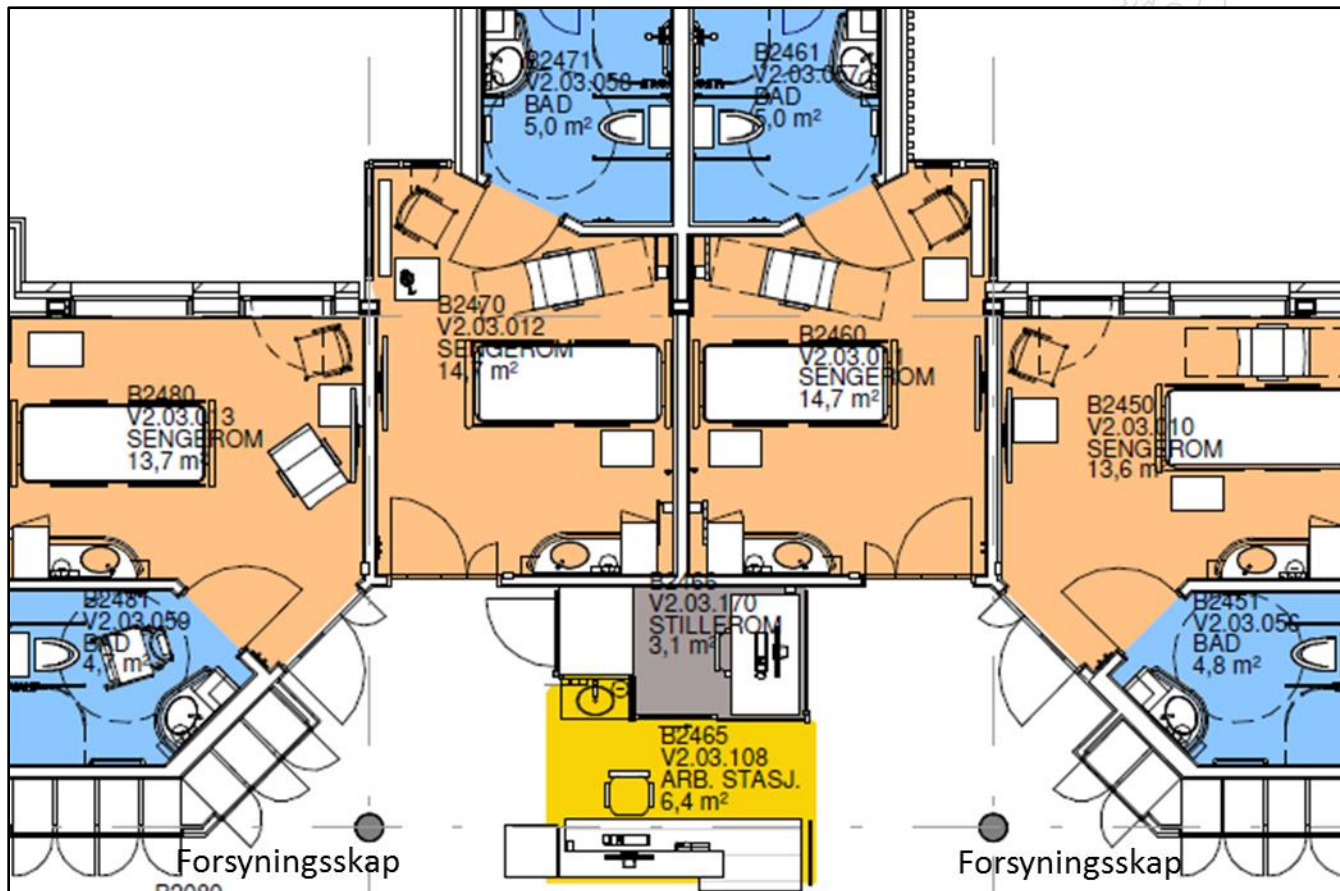
Endocrinology and thorax ward, each bed cluster: 8 single bed patient rooms.
6 patient rooms share bathrooms, 2 have separate bathrooms.
decentralized work stations,
kitchen/dining room for patients,
shared clinical support rooms

Three bed clusters, L-shaped layout



Ref: Poster. «Evaluation of hospital ward layouts in recent Norwegian hospitals». 2019

Sengetun – Bed Cluster at Vesterålen

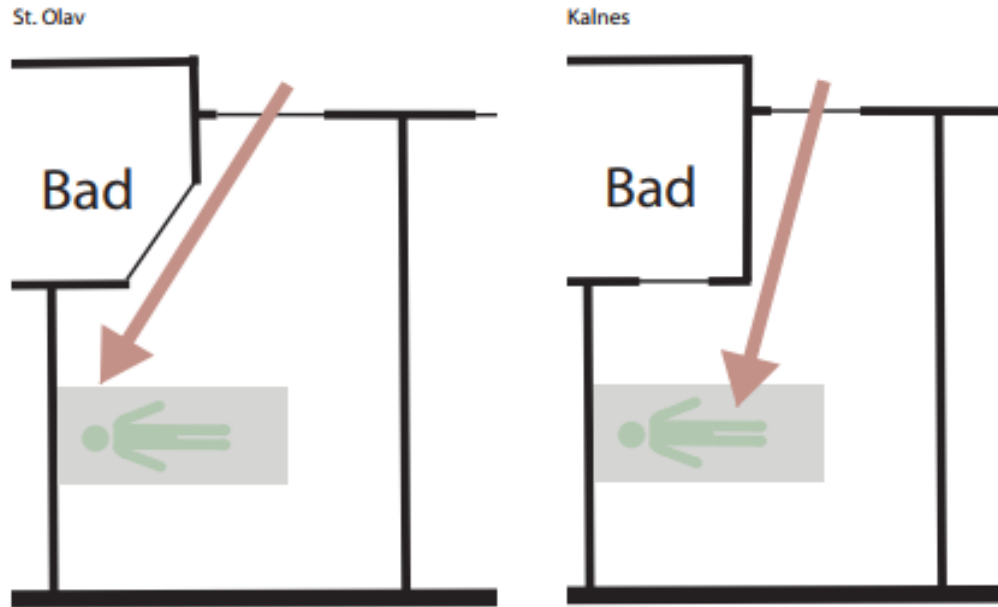


Design of bath rooms

St. Olavs hospital HF (left) and Sykehuset Østfold HF, Kalnes (right)



Bilde 41: Fra korridor har man visuell kontakt med hele pasientsengen på St. Olav



Figur 48: Siktlinjer fra dør til seng, St. Olav vs. rom med gang ved Kalnes



Bilde 42: Det er ikke mulig å se hodeenden av sengen fra korridor på Kalnes. Bildet er tatt av kontaktsmitteisolatet, men situasjonen vil bli den samme ved de andre rommene



Concluding remarks

- Continue the evaluation work
- Develop standardized methods
- Evaluate and compare hospitals
- Share the results

