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SLIDA
"Learning Confers Discipline"

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ජනවාරි - ජූනි 2025

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01. The Way Forward for SLIDA: Transforming Public Sector Learning and Development

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Introduction:

In the face of rapidly evolving global governance trends and increasing demands for public sector reform, traditional time-based training models are often inadequate. Recognizing the need for a more flexible and competency-driven approach to public sector training, the Sri Lanka Institute of Development Administration (SLIDA) launched the **Credit-Based Qualification System (CBQS)** in January 2024. CBQS is designed to develop civil servants' capacity by equipping them with the skills, knowledge, and competencies to steer complex trends and challenges, foster leadership, and deliver efficient, citizen-centred, effective governance. By aligning training with the **Sri Lanka Qualification Framework (SLQF)**, the CBQS offers a comprehensive, modular approach to clear and structured pathways for career progression, focusing on mastering competencies that matter most in the public sector rather than just time-based participation (Gamage, 2024).

SLIDA CBQS Structure: Three-Fold Qualification System:

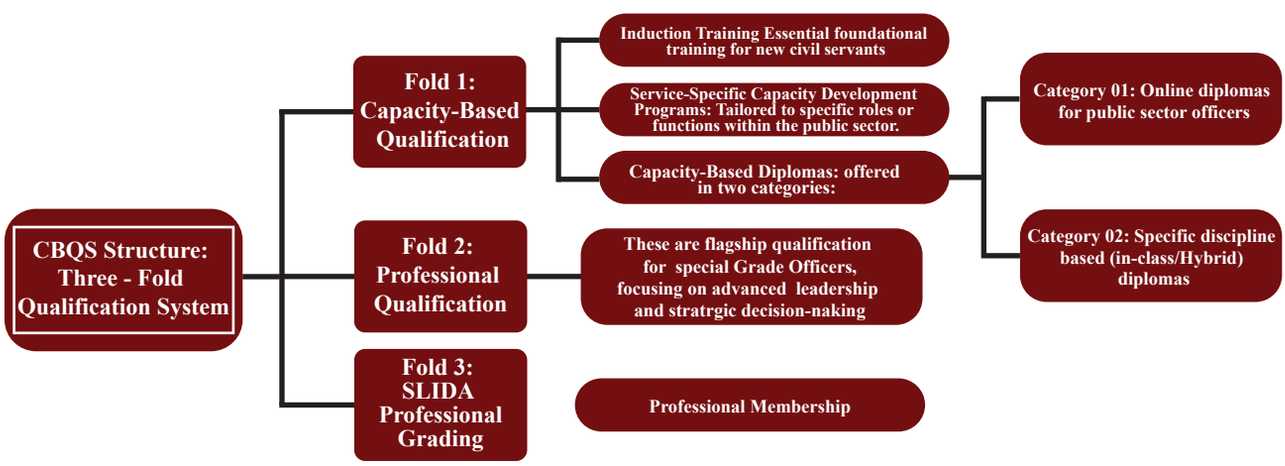

Fig 1 CBQS – Threefold structure (Source: Gamage, 2024)

The Rationale of CBQS Implementation:

The implementation of the CBQS at SLIDA is grounded in the recognition that public sector training must evolve to meet contemporary demands. Traditional education and training systems are often structured around time-based models where civil servants are required to attend training for set durations without necessarily demonstrating the mastery of skills required for effective governance (Kok, 2017). CBQS seeks to address this limitation by emphasising **competency-based learning**, where participants must demonstrate measurable skills and knowledge in a range of areas relevant to public administration and service delivery. This approach ensures that training is directly aligned with the needs of modern governance, public administration, and service delivery.

Furthermore, CBQS offers flexibility through the use of **credits** as a means of earning while learning. Each course or module is assigned a credit value based on the required learning hours. Participants earn credits upon successfully completing modules, which can be accumulated toward **certificates, diplomas**, and professional qualifications. This system supports lifelong learning and ensures that civil servants can accumulate competencies at their own pace through **online, blended**, or **in-person** learning environments (Noe, 2010).

Understanding CBQS in Relation to Competency Baskets, SLQF, and KSAM:

The CBQS system integrates three core frameworks into a cohesive model:

1. **Competency Baskets:** This defines civil servants' skills, knowledge, and capabilities to excel in their roles. The competencies are mapped to specific areas of expertise, ensuring that training is relevant to managerial level and real-world challenges in public administration.

2. **Sri Lanka Qualifications Framework (SLQF):** The SLQF provides the foundational standards for CBQS by guiding the qualification levels and ensuring that they align with national standards. SLIDA uses the SLQF guidelines to determine credit values and progression pathways for civil servants' career development.

3. **KSAM (Knowledge, Skills, Attitude, and Mindset):** CBQS is grounded in the KSAM model, which emphasizes the development of well-rounded civil servants. This model ensures that training encompasses **the knowledge, skills, attitude,** and **mindset** needed to thrive in a dynamic service environment.

Systematic process of Design and Development of Capacity-Building Programs within CBQS:

The design of SLIDA′s capacity-building programs under CBQS adopts a modular and competency-based approach, ensuring flexibility and continuous professional development. The core modules emphasise essential knowledge areas and skills necessary for effective public administration, while elective modules provide opportunities for specialization in diverse fields. This flexibility allows civil servants to tailor their learning experiences to their career needs and aspirations.

(1). Developing Program Outcomes: Program outcomes are developed based on the competencies required for specific managerial levels. Each outcome defines the knowledge, skills, and abilities participants should demonstrate after completing the training program.

(2). Competency Mapping: Each program and module is mapped to specific competencies within the competency baskets. This ensures that learning objectives align with the skills required for public sector roles and that participants can track progress across various career stages.

(3). Integration with SLQF Standards: Modules are designed to meet the SLQF standards.

(4). Learner-Centred Discussions: A critical step in the CBQS process is conducting learner-centred training needs analysis with the respective group of participants. This ensures that the learning outcomes are aligned with the competencies required at various managerial levels and meet the specific needs of individual participants.

(5) Translating Competencies into Learning Activities: Once the competencies are identified, learning activities are designed to ensure that the competencies are effectively taught and demonstrated. The learning activities vary based on the managerial level and competency requirements.

Competency Baskets and Development Focus:

CBQS categorizes competencies into three key baskets, each aimed at strengthening specific areas of public sector governance. These baskets are designed to equip public servants with the required skills to adapt to emerging public administration and service delivery challenges.

Table 1- Competency Baskets, Competencies, and KSAM Development Focus in the CBQS System

Competency Basket	Competencies	Development Focus (KSAM)
Interpersonal Skills, Service Delivery & Digital	Customer Care, Social Networking, Digital Skills, Legal Knowledge	Knowledge: Public service knowledge, legal frameworks Skills: Digital tools, communication, Customer care, Regulatory Compliance, social skills, and Customer Engagement & Support Attitude: Service-oriented, empathetic Mindset: Adaptability, resilience
Finance, Policy, Sustainability & Resilience	Financial Management, Procurement, Economic Literacy, Policy Analysis, Sustainability, Resilience	Knowledge: Budget & Resource Management, Financial Management, Public Policy, Economic Literacy, and sustainability practices Skills: Financial planning, policy development, Procurement Management Attitude: Commitment to sustainable practices Mindset: Resilience, forward-thinking
	Communication, Leadership, Entrepreneurship, Decision-Making	Knowledge: Leadership principles, strategic management, Business leadership, and entrepreneurial Knowledge Skills: Communication, leadership, solution-based problem-solving, stakeholder management, and soft skills Attitude: Innovation, accountability Mindset: Visionary, proactive

The CBQS system is structured around three core competency baskets, each targeting crucial skill sets for effective public sector performance, from foundational competencies to professional mastery (UNESCO, 2012). These categories ensure that civil servants acquire well-rounded competencies that can be applied directly to their roles.

Conclusion:

The **Credit-Based Qualification System (CBQS)** is a transformative approach to public sector training in Sri Lanka. By integrating the **SLQF, KSAM model**, and competency baskets, SLIDA ensures that public sector professionals are equipped with the **knowledge, skills, attitude,** and **mindset** required to meet the dynamic challenges of modern governance. By aligning with **SLQF** standards, incorporating **KSAM development**, and emphasizing practical, real-world competencies, CBQS equips civil servants with the knowledge, skills, attitude, and mindset required to address contemporary public administration challenges. With its modular structure, continuous learning pathways, and continuous assessment mechanisms, CBQS is designed to transform the public sector′s approach to professional development, making Sri Lanka′s governance systems more adaptive, resilient, and future-ready.

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ආයතනයක පුද්ගල අභිප්‍රේරණය ප්‍රමුඛවම සිදුකරනු ලබන්නේ මානව සම්පත් අංශය මගිනි. එබැවින් ආයතනයක් තුළ අභිප්‍රේරණ සංකල්පය යොදා ගැනීමේදී ප්‍රධාන වශයෙන් මානව සම්පත් කළමනාකරුවාගේ භූමිකාව වැදගත් වේ. නූතන ව්‍යාපාරික පරිසරය තුල ක්‍රියාත්මක වන මානව සම්පත් කළමනාකරුට ප්‍රධාන භූමිකාවන් (ROLES) 03ක් ඉටු කිරීමට සිදුව තිබේ.

1. පරිපාලන භූමිකාව (Administrative Role)
2. උපදේශන භූමිකාව (Consulative Role / Advocacy Role)
3. උපක්‍රමශීලි තීරණ ගැනීමේ භූමිකාව (Strategic Decision Making Role)

අතීත මානව සම්පත් කළමනාකරු තම සේවා කාලයෙන් වැඩි කාලයක් එසේම වැඩි ආයාසයක් සේවාදායක පරිපාලන කාර්යයන් වෙනුවෙන් කැපකළ නිසා ඔහු බොහෝදුරට සේවාදායක පරිපාලකයෙක් විය. ඔහු /ඇය මානව සම්පත් කළමනාකරණයට අදාළ උපක්‍රමශීලි තීරණ ගැනීමට සහ උපදේශක භූමිකාව සඳහා දැක්වූ දායකත්වය ඉතා අල්ප විය. නමුත් වර්තමානය වනවිට මානව සම්පත් කළමනාකරුගේ උපදේශක හා උපක්‍රමශීලි තීරණ ගැනීමේ භූමිකාවන්ගේ වැදගත්කම අතීතයට සාපේක්ෂව වැඩි වී ඇති අතර පරිපාලන භූමිකාවේ කාර්යයන් සඳහා ගත කරන කාලය සහ දැරිය යුතු ආයාසය සාපේක්ෂව අඩු වී ඇත.
(අතීතයට සාපේක්ෂව වර්තමානයේ මානව සම්පත් කළමනාකරුවාගේ පරිපාලන කාර්ය භාර්යය වැඩි වී තිබුණද පරිගණක හා තොරතුරු තාක්ෂණය නිසා පරිපාලනමය භූමිකාව නිසා ගතකළ යුතු කාලය සහ දැරිය යුතු ආයාසය අඩු වී ඇත) වර්ෂ 1997 දී Dave Ulrich විසින් නූතන මානව සම්පත් කළමනාකරුවන් සඳහා ප්‍රධාන භූමිකාවන් 04ක් යෝජනා කරන ලදී.

1. පරිපාලන විශේෂඥයාගේ භූමිකාව (Administrative Expert)
2. සේවකයින් වෙනුවෙන් සටන් වදින්නාගේ භූමිකාව (Employee Champion)
3. වෙනස්වීම් කළමනාකරණය කරන නියෝජිතයාගේ භූමිකාව (Change Agent)
4. උපායශීලි තීරණ ගැනීමේ හවුල්කරුගේ භූමිකාව (Strategic Business Partner)

රැකියා නිර්මාණය හා ඒ හා සම්බන්ධ වෙනත් ශිල්ප ක්‍රම

රැකියා නිර්මාණය සෑම සංවිධානයකටම අරමුණු තිබෙන අතර එකී අරමුණු ළඟාකර ගැනීමේදී කාර්ය භාර්යයන් රාශියක් ඉටු කිරීමට සිදුවේ. පුද්ගල දැනුම හා දක්ෂතාවන්ගේ පවතින සීමිත බව, කාලයෙහි පවතින සීමිත බව වැනි කරුණු නිසා එකී කාර්ය භාර්යයන් සියල්ලම තනි පුද්ගලයෙකුට ඉටුකළ නොහැකිය. එහි ප්‍රතිඵලය සංවිධානය සමස්ත කාර්ය භාරය කුඩා කොටස් වලට බෙදා රැකියා නිර්මාණය කිරීමයි. ඒ අනුව සරළව ගතහොත් රැකියා නිර්මාණය යනු, නිර්මාණාත්මක රැකියා සෑදීමයි. රැකියා නිර්මාණය ඉතා වැදගත් මානව සම්පත් කළමනාකරණ කාර්යයක් වන අතර එය මානව සම්පත් කළමනාකරණ ව්‍යත්තිකයන් සහ රේඛීය කළමනාකරුවන් විශේෂයෙන්ම කාල සහ චලන අධ්‍යයනයන් පිළිබඳව අවබෝධයක් තිබෙන කළමනාකරුවන් සාමූහිකව සිදුකළ යුතු කාර්යයකි.

රැකියා නිර්මාණය කිරීමේ මූලිකාංග (Job Design Elements)

සංවිධාන නිර්මාණය කරන රැකියා කාර්යක්ෂම විය යුතු අතර එම රැකියාවන් ඉටු කිරීමෙන් සේවාදායකයින්ට තෘප්තියක් ලැබිය යුතුය. රැකියා නිර්මාණය කිරීමේදී ප්‍රධාන මූලිකාංග 02ක් අනුගමනය කිරීමෙන් කාර්යක්ෂමතා-වයත්, සේවාදායක තෘප්තියත් ලබාගත හැකි වේ.

1. කාර්යක්ෂමතා මූලිකාංග (Efficience Elements)
2. චර්යාත්මක මූලිකාංග (Behavioural Elements)

★ රැකියා විශ්ලේෂණය

රැකියා විශ්ලේෂණයේදී පළමුව එක් විශාල කාර්යයක් කොටස් වලට විභේදනය කරනු ලැබේ. මෙසේ විභේදනය කළ එක් එක් කුඩා කොටසක් රැකියාවක් වන අතර දෙවනුව එක් එක් රැකියාව සඳහා වෙන වෙනම පුද්ගලයන් පත්කරනු ලැබේ.

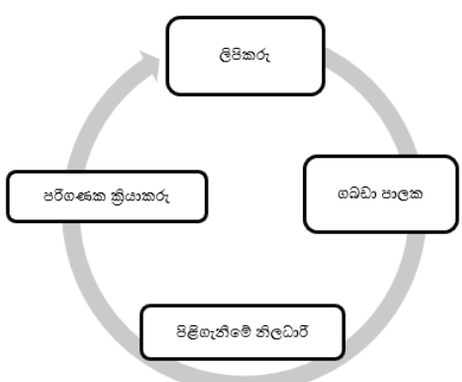
රැකියා නිර්මාණය කිරීමට රැකියා විශ්ලේෂණය යොදා ගැනීමේදී හැකිතාක් රැකියා චක්‍රය (Job Cycle) කෙටි කිරීමට උත්සහ කරනු ලබේ. රැකියා චක්‍රය යනු, යම් රැකියාවක අඩංගු සියළුම රාජකාරී එක් වරක් සම්පූර්ණයෙන්ම නිම කිරීම පිණිස ගත වන කාලයයි.

රැකියා නිර්මාණය කිරීමට රැකියා විශ්ලේෂණය යොදා ගැනීමේ පරමාර්ථය රැකියාවල කාර්යක්ෂමතාවය වැඩි කිරීම වේ. (නමුත් එකම කාර්යයක දිගින් දිගටම නිරතවීම නිසා දිගු කාලයකදී සේවාදායකයාට රැකියාව නීරස විය හැකිය.)

රැකියා විශ්ලේෂණය රැකියා සරලකරණය ලෙසද හැඳින්වේ. මේ ආකාරයට සේවකයින් අභිප්‍රේරණය කිරීම තුළින් කාර්යක්ෂමතාවය ඉහළ නංවා ගැනීමට හැකියාව ලැබෙනවා මෙන්ම නිෂ්පාදනය වැඩිකර ගැනීමටද හැකියාව ලැබේ.

★ රැකියා භ්‍රමණය/ රැකියා වටමාරු ක්‍රමය (Job Rotation)

රැකියා භ්‍රමණයේදී, රැකියා විශ්ලේෂිකරණයේදී මෙන් සේවාදායකයා එක් රැකියාවකට සීමා නොකර වරින්වර රැකියා කිහිපයක් අතර මාරු කරනු ලැබේ. සේවාදායකයා රැකියා කිහිපයක් අතර වරින්වර මාරුවීම නිසා රැකියා භ්‍රමණයේදී විශේෂිකරණයේදී මෙන් දිගු කාලීනව රැකියාවේ නීරස වීමක් සිදු නොවේ. රැකියා භ්‍රමණයේදී සේවාදායකයා එකම මට්ටමේ (එනම් එකම ශ්‍රේණියක හෝ පංතියක) රැකියාවන් අතර මාරු කිරීමට ආයතන කළමනාකරුවන් වගබලාගත යුතුය. මේ සඳහා එක් උදාහරණයක් පහත දක්වා ඇත.



★ කණ්ඩායම් ශිල්ප ක්‍රමය/ සමූහ ශිල්ප ක්‍රමය (Group Technique)

ව්‍යාපාර සංවිධානවල සමහර රැකියා තනි පුද්ගලයෙකු ඉටුකරනු වෙනුවට පුද්ගලයන් කිහිප දෙනෙකු එකතු වූ විට වඩා කාර්යක්ෂමවත් සඵලදායකවත් ඉටුකළ හැකිය. එවැනි රැකියා සඳහා කණ්ඩායම් ශිල්ප ක්‍රමය භාවිතා කිරීමට අවශ්‍ය පෙළඹවීම කිරීම වඩාත් යෝග්‍ය වේ.එවිට සේවාදායකයින් තුළ ඇතිවන කම්මැලි ස්වභාවයන්ද නැතිව යයි. උදා:

- **වානේ ගෘහ භාණ්ඩ නිෂ්පාදන ආයතනයක වානේ අල්මාරි නිෂ්පාදන කිරීම**
- **රැකියා නිර්මාණය කිරීමේදී සමූහ ශිල්ප ක්‍රමය භාවිතා කිරීමෙන් සේවාදායකයන්ගේ රැකියා තෘප්තිය වර්ධනය වේ.**

★ වෘත්තිය ශිල්ප ක්‍රමය (Professional Technique)

වර්තමානයේදී බොහෝ ව්‍යාපාර ආයතන තම මෙහෙයුම් කාර්යයන් සඳහා විවිධ වූ වෘත්තිකයන් යොදාගනු ලැබේ. ව්‍යාපාර ආයතන සිය මෙහෙයුම් කාර්යයන් සඳහා වෘත්තිකයන් යොදා ගැනීමේදී අදාළ වෘත්තිකයන්ට / වෘත්තීන්ට ගැළපෙන ලෙස රැකියාවන් නිර්මාණය කළ යුතු අතර එසේ එක් එක් වෘත්තීන්ට ගැළපෙන සේ රැකියා නිර්මාණය කිරීම වෘත්තිය ශිල්ප ක්‍රමයයි.එහිදී තම දක්ෂතා

කාර්යක්ෂම හා සඵලදායක රැකියා නිර්මාණයක් තුළින් සංවිධාන වලට ලබාගත හැකි ප්‍රයෝජන

★ සේවක තෘප්තිය ඉහළ යයි
★ සේවක නොපැමිණීම අඩුවේ
★ සේවකයින් ආයතනය අතහැරයාම අඩුවේ
★ සේවකයින් වෘත්තීය සමිති වශයෙන් ඒකරාශී වීමට තිබෙන ඉඩකඩ අඩුවේ
★ සේවක කායික හා මානසික සෞඛ්‍ය තත්වය ඉහළ යයි
★ කාර්මික අනතුරු අවම වී සේවක ආරක්ෂාව තහවුරු වේ
★ සංවිධානය තුල සේවක ගැටලු අවම වීමෙන් කාර්මික සාමය ස්ථාපිත වේ.
★ නිරන්තර සුපරීක්ෂණය අඩුකර ගැනීමට හැකිවීම නිසා කළමනාකරුවන්ට තම කාලය වෙනත් ඵලදායි කාර්යයන් සඳහා යොදාගත හැකිවේ.
★ සංවිධාන කාර්යක්ෂමතාවය සහ සඵලදායකත්වය ඉහළ යයි
★ සංවිධාන ප්‍රතිරූපය වර්ධනය වේ

සේවක අභිප්‍රේරණය සඳහා ගතහැකි වෙනත් ක්‍රියා මාර්ග

1. පුහුණුව හා සංවර්ධනය

සේවකයින් වෙනුවෙන් සේවාවන් පිළිබඳව මනා පුහුණුවක් ලබාදීම කළ යුතුය. නිසි ආකාරව තම රාජකාරිය ඉටු කරන්නේ කෙසේද යන්න පිළිබඳව දැනුම ලබා දීම තුළ ඒ තුළින් නිවැරදිව කටයුතු කිරීමට අවශ්‍යය අවස්ථාවක් උදාවේ. එපමණක් නොව එකම රාජකාරියේ නොතබා විවිධ පුහුණු කටයුතු ලබා දී සේවකයින් සංවර්ධනය කිරීම තුළ සේවක තෘප්තිය මෙන්ම දැනුම වර්ධනය වී ආයතනයේ කාර්යක්ෂමතාව හා ඵලදායිතාවය ද ඉහළ යයි.

2. කාර්යවල ඇගයීම/ රැකියා ඇගයීම

මේ යටතේ ආයතනයේ සේවකයින් සිදුකරනු ලබන සේවාවන් සැලකිල්ලට ගනිමන් ඔවුන් ඇගයීමකට ලක් කිරීම තුළින් ඔවුන් තෘප්තිමත් වී ඵලදායිතාවය ඉහළ නංවා ගැනීමට හැකියාව ලැබේ. අනෙකුත් සේවකයින් ඉදිරියේදී ප්‍රශංසාව ලැබීම මඟින් තව තවත් උනන්දුවෙන් තම රැකියාව කිරීමට සේවකයින් පෙළඹේ.

3. උසස්වීම පටිපාටියක් සකස් කිරීම

ඉහතින් සඳහන් කරන ලද කරුණ හා සම්බන්ධවම මෙය දැක්වීමට හැකිය. ආයතනයේ ඉහළ තනතුරු වල පවතින පුරප්පාඩු වෙනුවෙන් සේවක බඳවා ගැනීමේදී ආයතනය තුළ සිටින තම සේවය ඵලදායිව ආයතනය වෙත ලබා දෙන සුදුසුකම් සහිත සේවකයින් වෙත එම අවස්ථාවන් ලබා දීමෙන් සේවක තෘප්තිය ඉහළ යයි. ඒ ඔස්සේ ඔවුන් අභිප්‍රේරණය කිරීම තුළ ආයතනයේ ඵලදායිතාවය ඉහළ නංවාලීමට අවස්ථාව ලැබේ. ඒ නිසා දක්ෂතාවය පදනම් කරගෙන උසස්වීම් ලබාදීම සිදුකළ යුතුය.

4. සංවේතන කළමණාකරණය

සංවේතන නමින් හඳුන්වනු ලබන්නේ ආයතනයක් මගින් ලබාදෙන වැටුප් හා අනෙකුත් දීමනාවන්ය. තම ආයතනයේ සේවකයින් හට සැලකිය යුතු ප්‍රමාණයේ වැටුපක් ලබාදීම තුළින් සේවක තෘප්තිය ඉහළ යයි. එපමණක් නොව ඔවුන් දිරි දීමනා එනම්, නිෂ්පාදන දීමනා. පැමිණීමේ දීමනා, කණ්ඩායම් දීමනා. අතිකාල දීමනා, වාර්ෂික දීමනා, ප්‍රසාද දීමනා ආදිය ලබා දීමට කටයුතු කිරීම තුළින් ඔවුන් අභිප්‍රේරණය, ආයතනයේ ඵලදායීතාවය ද ඉහළ නංවා ගැනීමත් එපමණක් නොව සේවකයන් සේවය හැරයාම හා සේවා ස්ථාන මාරු කිරීම ආදිය ද සිදු කිරීම අවම වේ.

5. සුඛසාධන සේවාවන් ක්‍රියාත්මක කිරීම

ආයතනයක හෝ වේවා, සමාජයේ හෝ වේවා ඒ ඒ පුද්ගලයින්ට අවශ්‍ය කරන සුඛසාධන සේවාවන් පවතී. ඒ වෙනුවෙන් ආයතනයේ බලධාරීන් විසින් යම්කිසි පියවරයන් ගැනීම තුළ සේවකයින් අභිප්‍රේරණය කල හැකිය. මේ යටතේ සේවකයින් බලාපොරොත්තුවන සුභසාධක සේවාවන් ලෙසින් වෛද්‍ය සහ ප්‍රථමාධාර පහසුකම්, ආහාරපාන හා ආපනශාලා පහසුකම්, ප්‍රවාහන පහසුකම්, ණය පහසුකම්, මරණාධාර හා විවාහ උත්සව දීමනා.

නීති පහසුකම්, සනීපාරක්ෂක පහසුකම්, ශිෂ්‍යත්ව ලබාදීම, සුබසාධක අලෙවිසැල්, නිල ඇඳුම් ලබා දීම, විදේශ සංචාර, විවේකාගාර පහසුකම් ආදිය පෙන්වාදීමට හැකිය. මේවා සේවකයින්ට ආයතනය තුළින්ම ලබාදීම මඟින් වෙනත් මාර්ග වලින් ලබා ගැනීමට නොයයි. ඒ තුළින් ඒවාට යොමුවීමේදී අහිමිවන කාලය, ශ්‍රමය ඉතිරිකර ගැනීම තුළින් මෙන්ම පහසුකම් සියල්ල සේවා ස්ථානයෙන්ම ලැබීම පිළිබඳව සේවකයින් සෑහීමකට පත් වීම තුළ සේවක අභිප්‍රේරණය නිෂ්පාදනයන් වැඩි දියුණුකර ගැනීම වෙනුවෙන් යොමුකළ හැකිය.

6. ක්‍රීඩා හා විනෝදාත්මක ක්‍රියාවන් සඳහා අවස්ථාවන් ලබාදීම

දීර්ඝ කාලීනව සේවා ස්ථානයේ තම රාජකාරී වල නිරතවීම මත ඒකාකාරී බවක් සේවකයින් හට ඇතිව තිබේ. එය වළක්වාලමින් ආයතනය තුළ විනෝදාත්මක වැඩසටහන් සංවිධානය කිරීම කළ යුතුය. ඒ තුළින් සේවකයින් අභිප්‍රේණය වී අලස බව නැතිව ගොස් ක්‍රියාශීලිව රාජකාරී කිරිමට පටන් ගනී. මේ තත්වය මත නිදහස් මානසිකත්වයෙන් සේවය කිරිමට හැකි වීම මත නිෂ්පාදනය වර්ධනයකර ගැනීමට හැකියාවක් ලැබේ. මෙලෙස සිදුකරන ක්‍රියාකාරකම් අතර සංගීත වැඩසටහන්, චාරිකා, ක්‍රීඩා උත්සව, අවුරුදු උත්සව, දන්සැල් ආදිය පෙන්වාදීමට පුළුවන.

7. උපදේශනයන් වෙනුවෙන් ඉඩකඩ සපුරා දීම

සේවකයින්ගේ ගැටලු විසඳා ඒවාට නිසි අයුරින් පිළිතුරු ලබාදීමට ආයතනය විසින් පියවරයන් ගත යුතුය. ඒ මඟින් සේවකයින් බියකින් හා සැකයකින් තොරව සේවයට පැමිණිමට පියවර ගනු ලබයි. මෙහිදී ආයතනයේ හෝ පෞද්ගලික ජීවිතයේ සේවකයින් වෙනුවෙන් ඇතිව තිබෙන ප්‍රශ්න ගැටලු වලට පිළිතුරු ලබා දීමට ආයතනය විසින් වැඩපිළිවෙලක් සකස් කර තිබිය යුතුය. එවිට සේවකයින් තම ගැටලු විසඳා ගනිමින් සේවය නිසි අයුරින් ඉටුකිරිමට යොමුවේ. එමඟින් කාර්යක්ෂමතාවය මෙන්ම ඵලදායිදාවය ඉහළ නංවා ගැනීමට හැකිවක් ලැබේ.
මේ සඳහා උපදේශකවරුන්ගේ වෙනමම පත්කර තිබීම සුදුසු වන අතර, ඇතැම් කරුණු සම්බන්ධයෙන් සේවකයින්ට තම ගැටලු ඉදිරිපත් කිරීමට ආයතන ප්‍රධානියා වෙතටම ගොස් ඉදිරිපත් කිරීමට ද අවකාශ ලබා දීම සුදුසුය. මේ අයුරින් සේවකයින් අභිප්‍රේරණය කිරීම තුළ ආයතනයක කාර්යක්ෂමතාවය වැඩිකර ගනිමින් ඵලදායිතාවය ඉහළ නංවා ගැනීමට හැකියාව ලැබේ.

03. நிலையான அபிவிருத்தி மற்றும் சுற்றாடல் முகாமைத்துவம்

மு.இ. ஐயூப்
சுற்றாடல் அபிவிருத்தி உத்தியோகத்தர்
பிரதேச செயலகம் ஏறாவூர் பற்று, செங்கலடி

உலகிலுள்ள ஒவ்வொரு நாடும் சுற்றாடலை பாதுகாக்கும் வேலைத் திட்டங்களை இன்றைய காலத்தில் அக்கறையுடன் நடைமுறைப்படுத்தி வருகின்றன. பல்வேறு அனர்த்தங்களும் மனித நடவடிக்கைகளும் சுற்றுச் சூழலை பாதித்து வருவதால், உலகம் அழிவின் விளிம்பில் உள்ளது என்பதை உணர்ந்து, அத்தகைய திட்டங்கள் முன்னெடுக்கப்படுகின்றன.

இதை மனதில் கொண்டு, சுற்றாடலை பாதுகாப்பதற்காக ஐக்கிய நாடுகள் சபையால் உருவாக்கப்பட்ட நிலைபேறு அபிவிருத்தி நோக்கங்கள் உலக நாடுகள் அனைத்தும் அதிக முன்னுரிமை அளித்து, உரிய வேலைத் திட்டங்களை நடைமுறைப்படுத்தி வருகின்றன.

நிலைபேறு அபிவிருத்தி நோக்கங்களில், நோக்கு இலக்கம் 13 - காலநிலை மாற்றத்திற்கு எதிரான நடவடிக்கைகள், நோக்கு இலக்கம் 14- நீர்வாழ் உயிரினங்களைப் பாதுகாப்பது, நோக்கு இலக்கம் 15- நிலத்தில் வாழும் உயிரினங்களைப் பாதுகாப்பது என்பன முக்கியமானவை. அத்துடன், தூய நீர் மற்றும் சுகாதார வசதிகள் (நோக்கு இலக்கம் 6), தூய மற்றும் மீள்ச்சுழற்சி செய்யக்கூடிய ஆற்றல் (நோக்கு இலக்கம் 7), நிலைபேறான நகரங்கள் மற்றும் சமூகங்கள் (நோக்கு இலக்கம் 11) ஆகியனவும் சுற்றுச்சூழலை பாதுகாப்பதில் முக்கிய பங்காற்றுகின்றன.

மேற்படி நோக்கங்கள் ஊடாக சுற்றுச்சூழலை எவ்வாறு பாதுகாப்பதென்பது தெளிவான இலக்குகள் மூலம் குறிப்பிடப்பட்டுள்ளது.

தூயநீரும் தூய்மையான சுகாதார வசதிகளும் எனும் நோக்கத்தின் கீழ் திறந்தவெளியில் மலம் கழிப்பதை இல்லாமல் ஆக்குதல் எனும் இலக்கு மூலமும் நீர் மாசுபடுதலை குறைத்தல், குப்பைகளை நீக்குதல், அபாயகரமான இரசாயனப் பொருட்களின் வெளியீட்டை குறைத்தல் ஆகிய இலக்குகள் மூலமும் மலைகள் காடுகள் ஈரநிலங்கள் ஏரிகள் மற்றும் நீர்நிலைகள் என்பவற்றை பாதுகாத்தல் போன்ற இலக்குகள் ஊடாகவும் சுற்றுச்சூழல் பாதுகாப்பானது கருத்தில் கொள்ளப்பட்டுள்ளது. அதே போல் தூய மின்சக்தியை வழங்குதல் எனும் நோக்கின் கீழ் இயற்கை வளங்கள் அழிவுறாத வகையில் புதுப்பிக்கத்தக்க வளங்களைப் பயன்படுத்தி சுற்றாடல் சீர்கெடாத வகையில் மின்சக்தியை தயாரித்து வழங்கல் என்ற இலக்கும் வடிவமைக்கப்பட்டுள்ளது.

நிலைபேறான அபிவிருத்தி நோக்கு இலக்கம் 11 இன் கீழ் பாதகமான விளைவுகள் சுற்றுச்சுழலுக்கு ஏற்படுவதை குறைத்தல் மரபுரிமைகளை பாதுகாப்பதோடு பொது இடங்களையும் பாதுகாத்தல் காலநிலை மாற்றம் பேரழிவுகள் என்பதைத் தடுத்தல் மற்றும் இடர் முகாமைத்துவத்தை உருவாக்குதல் போன்ற சுற்றாடலை பாதுகாப்பதற்கான இலக்குகள் உருவாக்கப்பட்டுள்ளன.

காலநிலை தொடர்பான ஆபத்துக்கள் இவ்வாறான ஆபத்துக்கள் வராமல் தடுப்பதற்கான யுத்திகள் அனர்த்தங்களிலிருந்து மீளும் திறன், விழிப்புணர்வு மற்றும் நேர்சிந்தனையான மனோநிலை என்பவற்றை உருவாக்குதல் போன்ற இலக்குகள்

ஊடாக காலநிலை மாற்றத்தினால் ஏற்படும் பாதிப்பை குறைத்தலை ஐ.நா சபையானது கருத்தில் கொண்டுள்ளது. இது போன்றே கடல் மற்றும் நிலம் மாசுபடுதலை தடுத்தல் கடல் சார்ந்த மற்றும் கடலோர சுற்றுச் சூழலை பாதுகாத்தல் மற்றும் நிர்வகித்தல், கடல் அமிலமயமாகுதலின் தாக்கத்தைக் குறைத்தல் சிறந்த மற்றும் வினைத்திறனான மீன்பிடி முறைமையை உருவாக்கி முகாமை செய்வதுடன், உற்பத்தித் திறனை விருத்தி செய்தல் போன்ற இலக்குகளில் அதிகம் கவனம் செலுத்தப்பட்டுள்ளது.

நிலம், நன்னீர் சூழல் மலைகள் காடுகள் என்பவற்றை பாதுகாத்தல் கடலரிப்பை தடுத்தல் அழிக்கப்பட்ட காடுகளை மீள் உருவாக்கல் உயிரியல் பல்வகைமை இழப்புக்களை குறைத்தல் தாவரங்களையும் விலங்குகளையும், பாதுகாத்தல் போன்ற இலக்குகள் ஊடாக சுற்றாடலை பாதுகாத்தல் நடவடிக்கைகள் மேற்கொள்ளப்பட்டு வருகின்றன. உலகலாவிய ரீதியில் உருவாக்கப்பட்ட ஐ.நாவின் நிலைபேறு அபிவிருத்தி நோக்கங்களை அடிப்படையாக வைத்து இலங்கையில் அண்மையில் தயாரிக்கப்பட்ட செழிப்பானதும் சுபிட்சமானதுமான நாட்டை உருவாக்கும் கொள்கைச் சட்டகத்திலும் சுற்றாடலை பாதுகாப்பதற்கான ஒரு பூரணத்துவமான கொள்கைச் சட்டகம் தயாரிக்கப்பட்டுள்ளது. செழிப்பானதும் சுபிட்சமானதுமான நாட்டை உருவாக்கும் கொள்கைச் சட்டத்தின் அத்தியாயம் 8இல் **"நிலைபேறான சுற்றாடல் கொள்கை"** உருவாக்கப்பட்டுள்ளது.

சமூக பொருளாதார மற்றும் சூழல் நடைமுறைகளின் சமநிலையை பேணுவதன் ஊடாக நாட்டின் நிலைபேறான அபிவிருத்தியை அடைந்து கொள்ளலே இலங்கையின் நிலைபேறான சுற்றாடல் கொள்கையின் பிரதான நோக்கமாகும். சூழலைப் பாதுகாப்பதற்கான சட்டம் ஒழுங்குகளை உருவாக்கி அவற்றை அமுல்படுத்துதல் நடைமுறையிலுள்ள சட்டம் ஒழுங்குகளை மீள்பரிசீலனை செய்து அவற்றை ஒழுங்குபடுத்துதல், சர்வதேச நிலைபேறு இலக்குகளுடன் ஒருங்கிணைந்த கொள்கைச் சட்டகத்தை உருவாக்குதல், தொழிநுட்பத்தையும், பாரம்பரியத்தையும் இணைக்கும் வகையிலான நிலைபேறு திட்டங்களை தயாரித்து அமுல்படுத்துதல் மற்றும் மக்களின் வாழ்க்கைத் தரத்தை உயர்த்தும் வகையிலான நிர்வாகக் கட்டமைப்பை ஒழுங்கமைத்தல் போன்ற பல்வேறு குறிக்கோள்களை கொண்டு இலங்கையில் இச்சட்டகம் தயாரிக்கப்பட்டுள்ளது.

விவசாயம், விலங்கு வேளாண்மை மற்றும் பயிர்ச் செய்கைகளுக்கான நிலத்தை நிலைபேறாக பயன்படுத்தல் புதிய தொழில்நுட்பத்தின் ஊடாக மண்சரிவை கட்டுப்படுத்தும் செயல் திட்டத்தை அமுல்படுத்தல் மனிதர்கள் மற்றும் விலங்குகளின் செயற்பாடுகளால் அழிந்து செல்லும் கண்டல் மற்றும் அதே போன்ற தாவரங்களைப் பாதுகாத்தல், தரிசு நிலங்கள் கைவிடப்பட்ட நிலங்கள் ஆகியவற்றை அடையாளப்படுத்தி அவற்றை உற்பத்திக்காக பயன்படுத்தல் போன்ற செயல் திட்டங்களை அமுல்படுத்துவதன் ஊடாக நிலத்தை வினைத்திறனாக பயன்படுத்தலை இச்சட்டகம் பிரதான கொள்கையாகக் கொண்டுள்ளது.

கழிவுகளை மீள்உற்பத்தி செய்தல் செயல் திட்டத்தின் ஊடாக கழிவு முகாமைத்துவத்தை வினைத்திறனாக்குதல், காடுகளை உருவாக்குவதுடன், பச்சைக் கூரை, நகரக் காடுகள் விவசாயக் காடுகள் போன்றவற்றை உருவாக்குவதன் ஊடாகவும் எண்ணெய் வளப்பாவனையை குறைத்தல் ஊடாகவும் காபன் அற்ற நாட்டை உருவாக்குதல், நிலையான நீர் முகாமைத்துவத்தை விருத்தி செய்தல் மற்றும் சுற்றுச்சூழல் கல்வி கலாசார நிகழ்வுகளை அடிப்படையாக கொண்டதும் பொருளாதாரத்தை மையப்படுத்தியதுமான சுற்றாடலையும், உயிர்ப் பல்வகைமையையும் பாதுகாத்தல் ஆகியவற்றை இச்சட்டகம் தெளிவாக கொண்டமைந்துள்ளது.

மேலும் கடல் வளம், இயற்கை வளம் எழில்மயமான நகரம் ஆகியவற்றை சிறப்பாக பராமரிப்பதுடன், சுற்றாடல் கல்வியையும் ஒழுங்குபடுத்துவதன் ஊடாக சுற்றாடலை நிலைபேறு தன்மையுள்ளதாக உருவாக்கலாம் எனவும் இச்சட்டகத்தில் குறிப்பிடப்பட்டுள்ளது. இவற்றைப் பயன்படுத்தி நிலைபேறான சுற்றாடலை உருவாக்குவதற்கு இலங்கை அரசு பல்வேறு கருத்திட்டங்களை திட்மிட்டு வடிவமைத்து அமுல்படுத்தி வருகின்றது.

அவ்வாறானதொரு கருத்திட்டமாகவே கங்கைகளை காப்போம் எனும் கருத்திட்டம் தயாரிக்கப்பட்டு அது அண்மையில் அமைச்சரவையின் அங்கீகாரத்தையும் பெற்றுள்ளது. **"கங்கைகளை காப்போம்"** கருத்திட்டத்தின் கீழ் ஆரம்பக் கட்டமாக ஒவ்வொரு மாகாணத்திற்கும் ஒவ்வொரு கங்கையென 9 கங்கைகள் தெரிவு செய்யப்பட்டு அவைகள் யாவும் அபிவிருத்தி செய்யப்படவிருக்கின்றன. மேல்மாகாணத்தில் **களனி கங்கையும்,** மத்திய மாகாணத்தில் **மகாவலி கங்கையும்** தென்மாகாணத்தில் **வளவை கங்கையும்** சப்ரகமுவ மாகாணத்தில் **களுகங்கையும்** ஊவா மாகாணத்தில் **மெனிக் கங்கையும்,** வடமேல் மாகாணத்தில், **தெதுறு ஓயாவும்** கிழக்கில் **கல்ஓயாவும்,** வடமத்தியில் **மல்வத்து ஓயாவும்,** வடக்கில் **கங்கராயன் ஆறும்** தற்காலிகமாக தெரிவு செய்யப்பட்டுள்ளன. இத்திட்டம் தொடர்பான அறிவுறுத்தல் யாவும் 2021 சுற்றுநிருபம் மூலம் வெளியிடப்பட்டுள்ளதாக திருகோணமலை மாவட்ட ஒருங்கிணைப்புக் குழுக் கூட்டத்தின் போது இடம்பெற்ற **"கங்கைகளை காப்போம்"** கருத்திட்டம் பற்றிய அறிமுக நிகழ்வில் குறிப்பிடப்பட்டது. இத்திட்டத்தின் கீழ் அமைச்சிக்கிடையிலான குழு மாவட்ட ஒருங்கிணைப்பு குழு மற்றும் பிராந்திய ஒருங்கிணைப்புக் குழுக்கள் உருவாக்கப்பட்டு அக்குழுக்களுக்கு விளக்கம் அளிக்கப்பட்டுள்ளது.

"கங்கைகளை காப்போம்" எனும் கருத்திட்டமானது உள்நாட்டு நிதிவளத்துடன் மத்திய சுற்றாடல் அதிகார சபையினால் அமுல்படுத்தப்பட திட்டமிடப்பட்டுள்ளதோடு சுற்றாடல் அமைச்சின் ஒருங்கிணைப்பின் கீழ் 25 அமைச்சுகளின் நேரடியான பங்குபற்றுதலுடன் நடைபெறும் எனவும் தெரிவிக்கப்பட்டது.

கழிவுகள் நீருடன் கலத்தல், மண்ணரிப்பு மற்றும் ஆறுகள் இடிதல் அத்துமீறிய குடியேற்றத்தின் ஊடாகவும் அனுமதியற்ற கட்டடங்கள் அமைப்பதன் ஊடாகவும் ஆற்றை சுரண்டல் கட்டுப்படுத்த முடியாததும் அத்துமீறியதுமான மண் அகழ்வு மற்றும் உயிரியல் பல்வகைமை பாதிப்பு போன்ற பாரிய பிரச்சினைகளிலிருந்து கங்கைகளை பாதுகாத்துக் கொள்வதோடு கங்கைகளை புனரமைப்பதன் மூலம் நிலைபேறான சுற்றுச்சூழலை உருவாக்குவதை நோக்கமாகக் கொண்டே இத்திட்டம் தயாரிக்கப்பட்டுள்ளது.

இதன் மூலம் உயிர்ப் பல்வகைமையை பாதுகாத்தல் நாட்டு மக்களின் பாதுகாப்பான குடிநீர் பெறுகைகளை உறுதிப்படுத்தல் நிலையான நீர்ப்பாவனையை விருத்தி செய்தல் மற்றும் ஏரிகளை அடையாளப்படுத்துதல் போன்ற நோக்கங்களையும் அடைந்து கொள்ள முடியும் எனவும் இத்திட்டம் பற்றி விளக்கப்பட்டது.

நாட்டு மக்கள் தங்களுடைய பிரதேசங்களிலுள்ள ஆறுகள் மற்றும் கங்கைகளின் பிரச்சினைகளை விளங்கிக் கொள்ளும் பொருட்டு ஒவ்வொரு கங்கை தொடர்பாக அடையாளங் காணப்பட்ட பிரச்சினைகளை சுற்றாடல் அமைச்சின் இணையத்தளம் மூலம் அறிந்து கொள்ளக் கூடியதாக வடிவமைக்கப்பட்டுள்ளது. தங்கள் பிரதேசத்தில் கங்கை மற்றும் நீர்நிலைகள் தொடர்பான பிரச்சனைகளையும் இதில் பதிவேற்றக் கூடிய வசதிகளும் வழங்கப்பட்டுள்ளது. மேலும் அவற்றை முழுமைப்படுத்துவதற்கான அனைத்து தகவல்களும் குறிப்பிடப்பட்டுள்ளன. முன்னோட்ட தகவல்களும் இதில் சேர்க்கப்பட்டுள்ளன.

மனித நடத்தையின் விளைவுகள் சுற்றாடலை வெகுவாகப் பாதிப்படையச் செய்வது கவலை தரக் கூடிய விடயமாகும். சுற்றாடலை பாதுகாக்கும் நடவடிக்கைகளை வினைத்திறனான முறையில் மேற்கொள்ளும் அதேநேரம், ஒவ்வொரு மனிதனும் சுற்றாடலைப் பாதுகாப்பதில் அக்கறையுடனும் நேர்சிந்தனையுடனும் செயற்படும் போது மாத்திரமே சுற்றாடலை நிலைபேறானதாக உருவாக்க முடியும். எமது நாட்டினதும் உலகிலுள்ளதுமான அனைத்து வளங்களையும் பாதுகாத்து அவற்றை எதிர்கால சந்ததிகளுக்கு வழங்கவேண்டிய பொறுப்பும் கடமையும் எம் ஒவ்வொருவர் மீதும் சுமத்தப்பட்டுள்ளது.

04. Analysis of Concealed Construction Waste in Government Construction Projects

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Abstract

The definition of Sustainable development is the idea that human societies must live and meet their needs without compromising the ability of future generations to meet their own needs. This paper intends to research the ways in which resources waste in construction projects, not only in physical resources but also in human resources. Type of waste, magnitude, its causes, and the ways of minimizing the waste. This paper is going to discuss the waste of materials in projects due to poor management. We commonly identify a lot of material waste in construction sites due to poor construction management. By having a deep analysis, a lot of waste inside the projects can be identified without showing that they are waste. Those are very much larger than the waste we have physically seen on the site. This paper is going to discuss the waste hidden in the projects. The main attention is given to the pre-contract period rather than post contract period because with proper pre-contract management and proper identification of user needs we can reduce unnecessary spaces, land, materials, and natural environment. This paper is going to explore the hidden waste in construction projects and how we can overcome these losses of materials by proper use of qualified professionals and managing them in the preliminary design stage of the project and saving natural resources for future generations.

Keywords: Sustainable development, pre-contract period, post-contract period, preliminary.

1. Introduction

There are a lot of research papers written on material waste and human resource wastage in construction projects. Ganesan, (2000) stated that materials account for the largest input into construction activities, in the range of 50% to 60% of the total cost. In addition, a wide range of materials are used in the construction industry and it consumes 25% of virgin wood and 40% of raw stone, gravel, and sand used globally each year (Hobbs, 2000).

In Sri Lanka, concrete and mortar showed 20% and 25% of wastage respectively due to the excess use of materials in rectification of inaccuracies. (Jayawardana,1994). Waste of materials in construction to a certain extent is unavoidable. Therefore, any action taken to prevent the "unavoidable" portion would create another waste in terms of money or resources (Raufdeen, 2004).

The emergence of new technologies and practices in both waste disposal and recovery, and the rising tide of public awareness are all conspiring to change the face of waste management.
The opportunities and responsibilities to minimize construction waste rest with clients, contractors, suppliers, and designers (architects/engineers).
This paper intends to discuss not only these measurable wastes, but also discuss waste hidden in projects without showing that they are waste.

There is a lot of waste created before commencing the construction. Most of them are in the design stage and in the hand of professionals and clients′ organizations .

Emerging sustainable building practices offer an opportunity to create environmentally sound and resource-efficient buildings by using an environmental friendly approach in design. Minimization of construction waste can occur at various levels along the supply chain, the opportunities and responsibilities to minimize construction waste lie with clients, designers, contractors, and suppliers. Reducing physical waste could be achieved by redirecting the focus to the design stage of projects so that there will be no onsite waste to manage. The aim of the paper is to examine the potential for construction waste reduction through design.

2. Methodology

The study of concealed construction waste is a new approach to looking at material wastage in construction. There are a lot of researchers who found material waste in construction. (Raufdeen, 2004; Jayawardana, 1992 & Jayawardana, 1994). These studies have explained the percentage of waste that is commonly used materials in Sri Lanka and how it happened in different stages of construction projects.

Scope of the Study

When reviewing research papers about construction waste, it is very rare to find research papers on the subject of concealed construction waste. Therefore, this study has mainly focused on construction waste before the commencement of construction and the ways of minimizing them.

The study focuses on several groups who initiate the project, implementation agencies, professionals, and the users or beneficiaries. In a study of construction waste, material waste, labour, and plant are the main elements to be considered. But this study is forecasting on the mass scale of wastage during the design stage.

Type of construction waste

According to the literature apart from the basic material wastage in construction, it is estimated that 30% of the total weight of building materials creates waste as a cleanup of the site. Packaging, which includes all plastic wrappings, plastic bubble wrap, and cardboard, was another major contributor to waste generation. (Raufdeen, 2004).

Origins of construction waste

There are a variety of different approaches to the classifications of the main origins of construction waste. It has classified sources of construction waste according to the nature and technology of using materials in building products such as concrete, bricks, and wood construction waste can also be categorized according to design, operational, material handling, and procurement sources. A substantial amount of construction waste is closely related to design errors. Design changes during construction and the lack of information on the drawings are the most significant contributors to waste generation. Other design-related waste causes include the complexity of detailing, the selection of low-quality materials, and lack of familiarity with alternative products The highest 'operational' waste contributors are damages to subsequent works, errors by tradesmen and improper planning, while inappropriate storage facilities at the site and lose forms of material supply to the site were the major waste generation actors due to 'material handling'.
'Procurement' wastage was mainly related to the over-ordering of building materials. Waste can also occur during the design stage due to errors in contract clauses or incomplete contract documents. When considering the pre-construction stage, waste is generated during the design process for a number of reasons: 'building complexity', through the emergence of a variety of design approaches and responsibilities within the same project leading to design changes; 'co-ordination' and 'communications' problems due to the multi-disciplinary nature of design projects where the information that passes to contractors is highly variable and open to misinterpretation contributing inevitably to waste generation. Therefore, there is a need to understand the underlying causes of design waste; change processes and practices; and adopt a holistic approach to building design.

The wastage during the design stage

The design variations and changes can lead to considerable amounts of design-generated waste by variations, it is frequently changing the type or quantity of the building materials required. The standardization of design as a construction method to improve buildability and reduce the number of offcuts. Hobbs (2000) argued that standardization and prefabrication of both building layouts and components result in less waste. Further, the waste can be reduced in a number of ways by specifying the use of efficient framing techniques, standard size supplies, prefabricated materials, and the incorporation of green building materials into the design.

The building designer needs to have a voluntary approach towards waste minimization promotion and education, in particular bringing the associated financial benefits to the attention of the client. The flow of information and dissemination of best practices to reduce design waste will require investment and publicity in technology and education to reshape societal attitudes to waste disposal. This will involve partnerships between the national government, local authorities, industry, the media, and community organizations.

Conclusion

The current thinking of waste minimization practices is heavily focused on the physical minimization of construction waste and the identification of site waste streams. Tools, models, and techniques have been developed to help handle and better manage onsite waste generation While these tools facilitate auditing, assessment, and benchmarking, a waste source evaluation approach does not offer long-term benefits, as it fails to address the causative issues of waste production In the design stage, it's considered the user requirement in order to implement the project. The user or the project implementing agency may be,

i. Political authority in National projects
ii. Government organizations and their higher officials for government projects.
iii. Private organizations and individual clients

In construction projects, we use a higher amount of natural resources. Out of them, we waste a huge amount of resources as waste. As mentioned earlier we have done a lot of research to find out the type of waste, when it generates, how it generates, and ways and means of mitigating this waste. When considering building projects, we can always find out unnecessary spaces, underutilized spaces, and space reserved for future requirements, etc. We build this space with our scarce resources without considering that they are waste. A simple example is the construction of personalized residences. Most of the clients need their houses to build not only for their families but also for their future generations. But they are very rarely using its space.

Considering government construction projects most of them are only for fulfilling the political wish. They do not follow the national plan which is repaired for up to 2050 considering all factors and contributing all professionals in all key sectors. They have set goals and targets to achieve the development of the country accordingly to prevailing government policy. Although this document was repaired by multi-disciplinary professionals from all major agencies of the country and approved by the panel chaired by the His Excellency President. But some politicians override professional advice and guidance. Therefore, unnecessary projects implement by using government funds and resources.

Sometimes professionals also tend to support these decisions to gain their personal benefits rather than thinking of future generations.

In small-scale projects, people are reluctant to consult an Architect or Engineer for their projects. The result is a waste of space, material, and money. In small-scale projects, they do not get a structural design, the mason will do the job with large-scale wastage of materials. This is also a huge loss of materials considering the whole of the country.

There is another type of waste in the construction Industry. That is intangible. The human workforce is also affected by the built environment. Better working environments enhance working efficiency. With limited rescores creative professionals will create a sound livable working environment and enhance the efficiency of the workforce by using different materials, colours, and volumes. Making a good built environment results in a healthy population and they can work efficiently, children can learn effectively, and dissection makers can get correct decisions because they are relaxing mentally and physically.

Therefore, we can minimize waste in the pre-construction stage of government construction projects by

i. Evaluating the environmental impacts of construction and the triple bottom line (environmental, financial, and social) benefits of reducing these impacts.

ii. Spending sufficient time on design. A detailed brief and comprehensive design detailing will minimize waste through the construction of buildings that meet the client's needs and by eliminating or substantially reducing the potential for unnecessary variation.

iii. Giving priority to Repair and refurbishment without demolition and reconstruction

iv. Designing the building to be flexible for future uses.

v. Keeping the design simple so that it will be easier to build and hence less likely to have things go wrong during construction. Simple designs also tend to require less maintenance.

vi. Designing the building so that it can be easily adapted for other uses over time. Consider how the building will be used in 10, 20, or even 30 years′ time. Ensure spaces are flexible (to allow for changes in usage) and future-proofed against advances in technology and trends.

vii. Selecting dimensions to suit standard modular construction sizes so that the floor, ceiling, and wall surfaces conform to the size of sheet materials, which will reduce unusable off-cuts and make the most efficient use of materials.

viii. Preparing accurate drawings - clear, comprehensive, accurate documentation will reduce the likelihood of design variations.

ix. Providing detailed drawings and instructions to contractors to minimize mistakes, rework, and temporary works.

x. Documenting the design, including the location of all services, keeping records of the as-built design, and leaving it with the building's owners or occupiers. This will ensure that alterations, maintenance, and deconstruction are easier and less wasteful with the implementation of these factors.

The pre-construction stage is in the hands of professionals. Therefore, it′s their duty to design the projects considering the factors to use minimum resources for their construction projects. Then it will our scarce resources for future generations and be able to achieve sustainable development goals.

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05. පුස්තකාල පොත් අපහරණය

ප්‍රියානි බාලසූරිය
පුස්තකාලයාධිපති
ශ්‍රී ලංකා සංවර්ධන පරිපාලන ආයතනය

පුස්තකාල කළමනාකරණ ක්‍රියාවලියේදී අපට ඉතාමත් වැදගත් අංගයක් වනුයේ තොරතුරු සම්පත් කළමනාකරණයයි.මෙහිදී තොරතුරු සම්පත් යනුවෙන් අදහස් කරනුයේ දැනුම අඩංගු මාධ්‍යය ලෙස සරලව දැක්විය හැක. මෙම දැනුම් මාධ්‍ය නූතනයේදී මුද්‍රිත මාධ්‍යයෙන් මෙන්ම විද්‍යුත් මාධ්‍යයෙන් ද දක්නට ඇත. මෙම කවර මාධ්‍යයෙන් වුවද පවත්නා තොරතුරු සම්පත් අත්පත් කර ගැනීම, සංවිධානය කිරීම. පවත්වාගෙන යාම ආදි කාර්යයන්හිදී එම තොරතුරු සම්පත් නිවරදිව තිබේද යන්න පරීක්ෂා කිරිමට තොග සමීක්ෂණයක් පවත්වනු ලබයි. එකි තොග සමීක්ෂණයක් මගින් පවත්නා තොගයේ ඌනතා, අතිරික්තය සොයා ඒවා ගණනය කර තථ්‍ය ශේෂය හඳුනා ගැනීම මූලික අරමුණ වේ. එකී මූලික අරමුණු ඉටු කර ගැනීමට කටයුතු කරන අතර තුර පොත් තොගයේ පවත්නා කාලීන බව, පාඨක පරිශීලන ස්වභාවය, කාලීනමය වැදගත්කම, එම පොත් පත්වල භෞතික තත්වය, ආදි වූ තත්වයන් ද පරීක්ෂා කර බැලිය හැක. එසේ පරීක්ෂා කර බලා අවශ්‍ය පොත් පත් පමණක් පුස්තකාලයේ රඳවාගෙන සෙසු පොත් පත් පුස්තකාලයෙන් ඉවත් කිරිම සඳහා අදාළ කටයුතු කිරිම පුස්තකාල පොත් පත් අපහරණය වශයෙන් හැඳින්විය හැකි ය. පුස්තකාලය හා සම්බන්ධ මව් ආයතනයේ පරිපාලනමය අවශ්‍යතාවයක් වශයෙන් පුස්තකාලයක තොග සමීක්ෂණ පවත්වන අතර පුස්තකාලයේ පවත්නා අනවශ්‍ය පොත පත ඉවත් කර ගැනීමට අවශ්‍ය මූලික කාර්යය භාරයක් ඉටු කර ගැනීමටද මෙය කදිම අවස්ථාවක් ලෙස හඳුන්වා දිය හැකි ය. පොත් සමීක්ෂණයේ දී පුස්තකාලයේ පවත්නා සියලුම පොත් පත් භෞතිකව පරීක්ෂා කර බලා ගණනය කර ගනු ලබයි. මෙහිදී සමීක්ෂණ කටයුතු ආයතනය මගින් පත් කරනු ලබන විශේෂිත වූ කමිටුවක් මගින් සිදු කරනු ලැබුවත්, ඒ සඳහා අවශ්‍ය පහසුකම් සැපයීම පුස්තකාලයාධිපතිගේ සහ පුස්තකාල කාර්යය මණ්ඩලයේ වගකීමකි. සමීක්ෂණ අවස්ථාවේදී පුස්තකාලයේ නිතර පරිශීලනය වන පොත් පත්, කල් ඉකුත් වූ තොරතුරු ඇතුළත් පොත් පත්, යාවත්කාලීන නොවූ තොරතුරු ඇතුළත් පොත් පත්, මව් ආයතනයේ විෂයය පථයට අදාළ නොවන පොත් පත්, අබලි පොත් පත් ආදි වශයෙන් එකතුවේ පවත්නා පොත් පත් වල භෞතික ස්වරූපය අනුව වෙන් කර හඳුනා ගැනීමට පුස්තකාල කාර්යය මණ්ඩලයට හැකිය.

පොත් පත් අපහරණ ක්‍රියාවලිය

පුස්තකාලයක පොත් අපහරණ ක්‍රියාවලිය වඩාත් විමසිලිමත්ව, තම ආයතනයේ විෂයය පථය, පාඨක ප්‍රජාව, දෛනිකව සංසරණය වන පොත් පත් ආදි සියලු කාර්යයන් පිළිබඳ අවබෝධයක් ඇතිව සිදු කළ යුතුය. එබැවින් මෙම කාර්යය ද පුස්තකාලයේ සෙසු කටයුතු මෙන්ම කැපවීමෙන් සහ වගකීමෙන් කළ යුතු කාර්යයකි.

මෙම කාර්යය පියවර කිහිපයකින් සිදු කළ යුතුය.

1. අපහරණ සඳහා පොත් තේරීමට අදාළ නිර්ණායක තීරණය කිරිම
2. අපහරණ නිර්ණායකවලට අදාළව අපහරණයට යෝජිත පොත් තේරීම
3. අපහරණ පොත් ලැයිස්තුවක්/ ලේඛනයක් සකස් කිරීම
4. සකස් කරන ලද අපහරණ පොත් ලැයිස්තුව/ ලේඛනය නිර්දේශ කර ගැනීම
5. නිර්දේශ කරන ලද පොත් පුස්තකාලයෙන් අපහරණය සඳහා ආයතන ප්‍රධානියාගේ අනුමැතිය ලබා ගැනීම
6. අනුමත වූ ලැයිස්තුවට/ ලේඛනයට අදාළ පොත් අපහරණය සඳහා කටයුතු කිරිම
7. අපහරණය කරන ලද පොත් පරිග්‍රහණ ලේඛනවලින් කපා හැරිම.

අපහරණ සඳහා පොත් තේරීමට අදාළ නිර්ණායක පිළියෙල කිරීම

පොත් අපහරණයේදී තම පුස්තකාලයට අදාළව අපහරණ නිර්ණායක සකස් කර ගත යුතුය. මේ සඳහා ජාතික පුස්තකාල හා ප්‍රලේඛන සේවා මණ්ඩලය මගින් ලබා දී ඇති උපදෙස්, මුදල් රෙගුලාසි අංක 756 (6) යටතේ ලබා දී ඇති උපදෙස් මෙන්ම අදාළ පුස්තකාලයේ පුස්තකාල ප්‍රතිපත්තිමාලව පරිශීලනය කරමින් ආයතනයේ පුස්තකාල උපදේශක කමිටුව සමඟ සාකච්ඡා කිරීමෙන්ද තම පුස්තකාලයට උචිත වන පරිදි පොත් අපහරණ නිර්ණායක තීරණය කර ගත හැක. එසේ සකස් කර ගනු ලබන අපහරණ නිර්ණායක ඇතුළත් ලේඛනය නෛතික ලේඛනයක් බවට අනුමත කර ගත යුතුය.

පරිග්‍රහණ ලේඛනයේ සඳහන් පොත් පත් ඉවත් කිරීමේදී එසේ ඉවත් කිරීමට අදාළ හේතු දක්වා වාර්තාවක් සකස් කළ යුතුය. ඒ සඳහා පහත සඳහන් කරුණු සලකා බැලීම වඩාත් යෝග්‍ය වේ.

★ භාවිත කළ නොහැකි පරිදි ඉරී ගිය, දිරා ගිය හෝ අබලි වූ එහෙත් ඓතිහාසික හෝ කෞතුක වටිනාකමක් නොමැති ද්‍රව්‍ය වීම.

★ අවශ්‍ය ප්‍රමාණයට නව සංස්කරණ, නව මුද්‍රණ පුස්තකාලයට ලැබී ඇති විට පැරණි අන්තර්ගතය වර්තමානයට වලංගුතාවක් නොමැති වීම.

★ පළමු මුද්‍රණයෙන් වසර 20 ට අධික කාලයක් ගත වුවද පසු ගිය වසර 05 තුළ කිසියම් පාඨකයෙකු විසින් භාවිත නොකරන ලද යල් පැන ගිය පොත් හෝ අනාගත පරිශීලනයට භාවිත වෙතැයි සිතිය නොහැකි පොත් හා ද්‍රව්‍ය.

★ පැරණි බව හෝ වෙනත් හේතු නිසා හෝ අඩංගු කරුණු නිරවද්‍ය නොවන බවට පැමිණිලි ලැබූ පොත් හෝ වැරදි අර්ථකථන හෝ වැරදි මඟපෙන්වීම් (Misleading) සිදු කරන පොත්.

★ විනය හෝ වෙනත් කරුණක් පදනම් කර ගෙන අභියෝගයට ලක් වන පොදුවේ පාඨක භාවිතයට ඉදිරිපත් කිරීමට නුසුදුසු ග්‍රන්ථ.

★ අදාළ පුස්තකාලයේ පාඨකයින්ගේ අවශ්‍යතා සීමාවෙන් ඔබ්බෙහි ඇති පොත්පත්.

★ යම් කෘතියක අතිරික්ත පිටපත් ප්‍රමාණයක් තිබීම. මෙහිදී අවශ්‍ය පිටපත් ප්‍රමාණය රඳවාගෙන ඉතිරි පොත් අපහරණය කිරීම.

කාලය ඉකුත් වූ විමර්ශන කෘති

> මෙම කරුණුවලට අමතරව පුස්තකාලය අයත් මව් ආයතනයේ ප්‍රතිපත්ති, කාර්යයභාරය සහ අවශ්‍යතාවන් අනුව සුදුසු නිර්ණායක සකස් කර ගත හැකිය.

අපහරණ නිර්ණායකවලට අදාළව යෝජිත පොත් තේරීම

අපහරණය කළ යුතු පොත් තෝරා ගැනීම සඳහා තේරීම් කමිටුවක් පත් කොට එම කමිටුවට අදාල නිර්ණායක පිළිබඳ දැනුවත් කර එම නිර්ණායකවලට අදාළව පොත් තේරීම සිදු කළ යුතුය

අපහරණ පොත් ලැයිස්තුවක්/ ලේඛනයක් සකස් කිරීම

තෝරාගනු ලබන පොත් සම්බන්ධ ලැයිස්තුවක්/ ලේඛනයක් සකස් කිරීම කළ යුතුය. මෙම ලැස්තුව පොතේ පරිග්‍රහණ අංකය, ග්‍රන්ථ නාමය, කර්තෘ. මිලදී ගත් දිනය, මිල ආදී තොරතුරු සහිතව සකස් කළ යුතු අතර නිර්දේශ කමිටුවේ සාමාජිකයින්ගේ නම, තනතුර, අත්සන සෑම පිටුවකටම ඇතුළත් වන පරිදි සැකසිය යුතුය. පොත් අපහරණ ලැයිස්තුවක් පහත ආකෘතියට අනුව සකසා ගත හැක.

පුස්තකාලයේ නම: ..... පොත් අපහරණ කරන වර්ෂය: .....

අනු අංකය	ප්‍රතිග්‍රහණ අංකය	වර්ග අංකය	මිලදී ගත් දිනය	ග්‍රන්ථ නාමය	කර්තෘ	වෙනත්

ඉහත ලේඛනයේ සඳහන් පොත් අදාළ නිර්නායකවලට අනුව පුස්තකාලයෙන් ඉවත් කිරීම සුදුසු බවට නිර්දේශ කරමු.
නිර්දේශ කමිටුව:-

නම		තනතුර	අත්සන	දිනය
.....	.....	.....	.....	.....
.....	.....	.....	.....	.....
.....	.....	.....	.....	.....

පොත් අපහරණ ලැයිස්තුවක ආදර්ශයක්

මෙසේ සකස් කර ගනු ලැබූ අපහරණ පොත් ලැයිස්තුව සසඳා බැලීමට හැකිවන පරිදි අපහරණය කළ යුතු පොත් ප්‍රදර්ශනය කොට පොත් අපහරණ නිර්දේශ කමිටුවට පරීක්ෂා කිරීමට අවස්ථාව ලබාදිය යුතුය.

අපහරණ පොත් ලැයිස්තුව නිර්දේශ කර ගැනීම

කමිටුව විසින් පරීක්ෂා කරන ලද පොත් ඇතුළත් කර සකස් කරන ලද ලේඛනය පොත් අපහරණ නිරීක්ෂණ කමිටුවට ඉදිරිපත් කළ යුතුය. මෙහිදී පොත් ලැයිස්තුව සහ අදාළ පොත් භෞතිකව පරීක්ෂා කරන බලා ඒවා අපහරණයට සුදුසු බව නිර්දේශ කරවා ගත යුතුය.

අපහරණය සඳහා ආයතන ප්‍රධානියාගේ අනුමැතිය ලබා ගැනීම

අපහරණය සඳහා නිර්දේශ වූ පොත් ලේඛනය/ ලැයිස්තුව ආයතන ප්‍රධානියා වෙත ඉදිරිපත් කොට අනුමත කර ගැනීම කළ යුතුය.

අනුමත වූ ලැයිස්තුවට/ලේඛනයට අදාළ පොත් අපහරණය සඳහා කටයුතු කිරීම

පොත් අපහරණය කිරීමට පෙර ඉවත් කරන ලද බව (උසඑයාර්ඒක) හැඟවීමට අදාළව මුද්‍රාවක් සකස් කර පොත් වල තැබිය යුතුය. මෙම කාර්යය කරන අවස්ථාවේදීම එම පොත්වල භෞතික තත්වය පරීක්ෂා කර බලා ඒවා වෙන් කර ගත යුතුය. මෙහිදී නැවත භාවිතයට ගත නොහැකි අබලි සහ කාමීන්ගේ හානියට පත් වූ පොත් වෙන් කරගත යුතුය. අනතුරුව ඉතිරි පොත් නැවත භාවිත කළ හැකි නම් කමිටුවේ නිර්දේශ මත ඒවා අවශ්‍ය අය වෙත අඩු මිලට විකිණීම හෝ නොමිලේ ලබා දිය හැක. එවන් අවස්ථාවන්හිදී එසේ විකුණූ පොත් සඳහා කමිටුව විසින් නිර්දේශ කරන මිලකට විකුණා මුදල් ලබාගෙන නිසි පරිදි අදාළ මුදල් ආයතනය වෙත භාර දිය යුතුය. නොමිලේ ලබා දුන් පොත් ලබා ගත් අයගේ නම අත්සන සහිත තොරතුරු පත්‍රිකා සකස් කර ගත යුතුය.
අවසානයේ අබලි සහ ඉතිරි වූ පොත් ආයතනයේ එකඟතාව මත ප්‍රතිචක්‍රියකරණය සඳහා අදාළ ආයතන වෙත කඩදාසි බරට විකිණීම තුළින් ආයතනය වෙත අමතර මුදලක් උපයා ගැනීමට ද හැකියාව ඇත.

අපහරණය කරන ලද පොත් ලේඛනවලින් කපා හැරීම

පොත් අපහරණය කිරීමේ කටයුතු අවසන් වූ පසු එම අනුමත අපහරණ ලැයිස්තුවේ සඳහන් පොත් පරිග්‍රහණ ලේඛනවලින් කපා හැරීම කළ යුතුය. එහිදී රතු පැනක් භාවිත කර අපහරණ කරන ලද සෑම පොතක්ම පරිග්‍රහණ ලේඛනයේ එම පොත්වලට අදාල පරිග්‍රහණ අංකය යටතේ ඇති තොරතුරු තනි ඉරකින් කපා හැර අදාළ ලිපි ගොනු අංකය සහ අනුමත වූ දිනය සටහන් කළ යුතුය.
ඉදිරි වර්ෂයේ පොත් සමීක්ෂණයේදී තථ්‍ය ශේෂය සැකසීමේදී මෙම අපහරණ ලැයිස්තුව වැදගත් වන බැවින් මෙම සියලු කාර්යයන් අවසන් වූ පසු අපරණ පොත් ලැයිස්තුව සුරක්ෂිතව ගොනු ගත කොට තබා ගත යුතුය.

පුස්තකාල පොත් අපහරණයේ ප්‍රයෝජන

පුස්තකාල පොත් අපහරණ ක්‍රියාවලියක් වාර්ෂිකව පවත්වාගෙන යාම තුළින් පුස්තකාලයකට අත්පත් කර ගත හැකි ප්‍රයෝජන රැසකි.

1. පුස්තකාලයේ පවත්නා අබලි සහ කල් ඉකුත්වූ පොත් පත් ඉවත් කර ගැනීමට හැකිවීම.
2. අනවශ්‍ය පොත් පත් ඉවත් කිරීමෙන් පුස්තකාල පොත් රාක්කවල ඉඩකඩ ලබා ගත හැකිවීම.
3. තම පුස්තකාලයේ පාඨක ප්‍රජාවට නොගැලපෙන එහෙත් වෙනත් පුස්තකාලයක පාඨක ප්‍රජාවට අවශ්‍ය පොත් පත් එම අවශ්‍ය පුස්තකාල සඳහා පරිත්‍යාග කිරීමට හැකිවීම. මේ තුළින් පුස්තකාල අතර අන්තර් සම්බන්ධතා ඇති කර ගැනීමට ද අවස්ථාව සලසා ගත හැකි වීම
4. කල් ඉකුත් වූ වාර සඟරා ආදිය අවශ්‍ය පාඨකයින්ට අඩු මිලකට විකුණා ගැනීමට අවස්ථාව සලස්වා ගැනීම තුළින් පුස්තකාලයකට අමතර ආදායමක් උපයා ගැනීමට හැකි වීම
5. අපිරිසිදු, දූර්වර්ණ සහ භාවිතයට ගත නොහැකි පොත් පත් ඉවත්කිරීම තුළින් පුස්තකාලයේ බාහිර අලංකරණය සහ පාඨකයින්ට ප්‍රියමනාප පරිසරයක් නිර්මාණය කරගත හැකි වීම.

යම් පුස්තකාලයකට පොත් අපහරණය කිරීම සඳහා අවශ්‍ය වූ විටෙක ඒ සම්බන්ධව තනි තීරණයක් ගත නොහැකි අවස්ථාවක ජාතික පුස්තකාල හා ප්‍රලේඛන සේවා මණ්ඩලය අමතා උපදෙස් ලබා ගැනීමට හැකියාව ඇත.

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06. Two Dimensional Treatment Planning of Breasts Using Locally Made Breast Caliper Measurement

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Abstract

Breast cancer has been the leading cancer in the world since 1950s and now it is spreading widely in the world as the most common cancer in females. This disease is treated mainly with surgery, chemotherapy, radiotherapy and also with hormone therapy. In radiation therapy still more than 90% of the breast cancers are treated by two dimensional manual planning method using Co-60 radiotherapy in cancer centers in Sri Lanka due to heavy load of breast patients due to cancer incidence data 2011. Now megavoltage Linear Accelerator machines are used to treat a very small number of breast cancer patients allowing for more accurate protection of risk organs using three dimensional treatment planning systems.
In most of the cancer centers in Sri Lanka two dimensional manual planning method is used to treat breast cancer patients. In Teaching Hospital Anuradhapura, more than 350 breast cancer patients per year have been treated by two dimensional manual planning method using Co-60 radiotherapy. There are two methods to get breast measurements for two dimensional treatment planning. Those are using a lead wire or using a plaster of Paris strip in the centre line of the breast treatment field which is prone to more human errors. Therefore, in this work a locally made simple breast caliper is introduced to get breast measurements very easily, quickly and accurately than the two methods mentioned above in supine or in prone position. The strip method can be used to get measurements at the supine position and so far no any instrument to get accurate readings of breast measurements in prone position. Specifically, the proposed caliper can be used more effectively when the patient is treated in prone position for pendulum like breasts. The general method of the calculation for the treatment time was used in this report

1. Introduction

The basic building block of the human body is the cell. All organs of the body such as the brain, heart, lung, intestine, pancreas or liver are formed from millions of cells. Normal cells grow, divide and die in an orderly fashion and most of the growth usually occurs in the early part of childhood. In a mature adult, cells in most part of the body divide to form new cells only to replace worn out or dying cells or to repair injury to the tissues.

Genes in our body called Deoxyribonucleic Acid (DNA) regulate the growth of normal cells in the body. In every cell there are genes that stimulate growth of the cell and genes that stop its growth. In normal cells there is a balance in the growth genes and genes that stop growth and therefore uncontrolled growth of the cells is prevented.

When the normal mechanisms for regulating growth of cells in our body are disturbed, then cells begin to grow in an uncontrolled fashion. This situation arises when the genes that regulate growth of normal cells are damaged giving rise to abnormal genes with disturbed functions. Cancer cells develop because of damage to the DNA. This damage to the DNA leads to loss of genes that stop growth and activate genes that stimulate growth.

A cancer develops when normal cells in the body begin to develop an abnormal growth pattern. Cancer cells are different from normal cells. In cancer cells, the genes that control growth are abnormal, causing uncontrolled growth of the cells. The uncontrolled rapid growth of cancer cells leads to the formation of cancerous tumor.

Cancer cells often detach from their primary site and travel to other parts of the body where they begin to grow new tumor deposits. This process is called metastasis that occurs when cancer cells invade the blood stream or the lymph nodes. For example, a cancer of the pancreas may give rise to cells that travel in the blood and go to the liver and develop metastatic tumors in the liver.

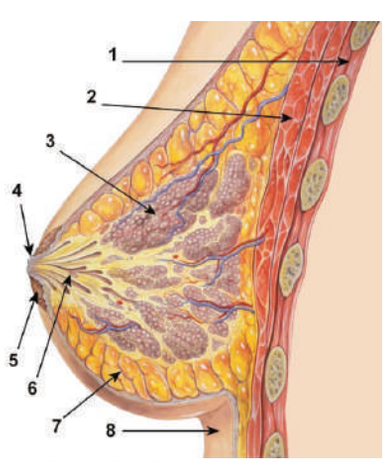
Cancers can be grouped according to the type of cell they start in. There are 5 main categories of cancer that exist in the human body. Those categories of cancers are called mainly as follows.

- **Carcinoma** – cancer that begins in the skin or in tissues that line or cover internal organs. There are a number of subtypes, including adenocarcinoma, basal cell carcinoma, squamous cell carcinoma, and transitional cell carcinoma
- **Sarcoma** – cancer that begins in the connective or supportive tissues such as bone, cartilage, fat, muscle, or blood vessels
- **Leukaemia** – cancer that starts in blood forming tissue such as the bone marrow and causes large numbers of abnormal blood cells to be produced and go into the blood
- **Lymphoma and myeloma** – cancers that begin in the cells of the immune system
- **Brain and spinal cord cancers** – these are known as central nervous system cancers

Cancers can also be classified according to where they start in the body, such as breast cancer or lung cancer.

1.1 What is breast cancer?

Breast cancer is the most common malignancy in women between 40 and 60 years. Every year about 1 million new cases of breast cancers are detected worldwide. According to the data of Department of Census and Statistics, Sri Lanka, 20,450 new cancer patients visited to the hospitals in 2009, 25 percent of female patients had cancer [1]. According to the Annual Health Bulletin 2014, cancer was reported as the second leading cause of death [2].



1. Chest wall. 2. Pectoralis muscles. 3. Lobules (glands that make milk). 4. Nipple surface. 5. Areola. 6. Lactiferous duct tube that carries milk to the nipple. 7. Fatty tissue. 8. Skin

Figure 1.1 The anatomy of a female breast

Figure 1.1 shows the anatomy of a female breast. A mature human female's breast consists of fat, connective tissue and thousands of lobules - tiny glands that produce milk. The milk of a breastfeeding mother goes through tiny ducts (tubes) and is delivered through the nipple. The breast, like any other part of the body, consists of billions of microscopic cells.

These cells multiply in an orderly fashion - new cells are made to replace the ones that died. In cancer, the cells multiply uncontrollably, leading to an excessive number of cells, which continue to increase progressively. Cancer that begins in the lactiferous duct (milk duct), known as ductal carcinoma, is the most common type. Cancer that begins in the lobules is known as lobular carcinoma which is much less common from ductal carcinoma. [3, 4].

1.2 How Breast Cancer Spreads

Breast cancer can spread through the lymph system as shown in Figure 1.2. The lymph system includes lymph nodes, lymph vessels and lymph fluid found throughout the body. Lymph nodes are small, bean-shaped collections of immune system cells that are connected by lymph (or lymphatic) vessels. Lymph vessels are like small veins, except that they carry a clear fluid called lymph (instead of blood) away from the breast. Lymph contains tissue fluid and waste products, as well as immune system cells. Breast cancer cells can enter lymph vessels and begin to grow in lymph nodes [3, 4].

Most of the lymph vessels of the breast drain into:

- Lymph nodes under the arm (axillary nodes).
- Lymph nodes around the collar bone (supraclavicular and infraclavicular lymph nodes)
- Lymph nodes inside the chest near the breast bone (internal mammary lymph nodes)

If cancer cells have spread to lymph nodes, there is a higher chance that the cells could have spread (metastasized) to other sites in the body. The more lymph nodes with breast cancer cells, the more likely it is that the cancer may be found in other organs as well. Because of this, finding cancer in one or more lymph nodes often affects the treatment plan. Usually, surgery to remove one or more lymph nodes will be needed to know whether the cancer has spread there. Still, not all women with cancer cells in their lymph nodes develop metastases, and some women can have no cancer cells in their lymph nodes and later develop metastases [3,4].

1.3 Invasive and non-invasive breast cancer

Breast cancer can be divided into two categories: as invasive and non-invasive cancers, based on how cancer cells spread in the body.

1.3.1 Invasive breast cancer

The cancer cells break out from inside the lobules or ducts and invade nearby tissue. With this type of cancer, the abnormal cells can reach the lymph nodes, and eventually make their way to other organs (metastasis), such as the bones, liver or lungs. The abnormal (cancer) cells can travel through the bloodstream or the lymphatic system to other parts of the body; either early in the disease, or later.

1.3.2 Non-invasive breast cancer

This is when the cancer is still inside its place of origin and has not broken out. Lobular carcinoma in situ is when the cancer is still inside the lobules, while ductal carcinoma in situ is when they are still inside the milk ducts. "In situ" means "in its original place". Sometimes, this type of breast cancer is called "pre-cancerous". This means that although the abnormal cells have not spread outside their place of origin, they can eventually develop into invasive breast cancer [4].

1.4 Breast Cancer treatments

There are different techniques used to treat breast cancer patients with correct medical treatments. Mostly these techniques depend on the stage of the breast cancer. Among the main cancer treatment methods, radiation therapy is widely used.

1.5 Radiation Therapy (radiotherapy)

Controlled doses of radiation target the tumor to destroy cancer cells. Usually, radiotherapy is used after surgery, as well as chemotherapy to kill off any cancer cells that may still be around. Typically, radiation therapy occurs about one month after surgery or chemotherapy. Each session lasts a few minutes; the patient may require three to five sessions per week for three to six weeks. The type of breast cancer a woman has will determine the type of radiation therapy she may need. In some cases, radiotherapy is not needed.

1.6 Radiotherapy of Breast Cancer

Radiotherapy plays an essential and critical role in the management of breast cancer. It is given for primary carcinoma of the breast to reduce the risk of loco-regional recurrence, and has been shown in many studies to improve survival rates in patients after mastectomy [5].

Radiation to the breast is often given after breast-conserving surgery to help lower the chance that the cancer will come back in the breast or nearby lymph nodes [6]. Clinical width of the barest tumour (T) is defined as T1 (20 mm) or T2 (>20-50 mm). For patients with no lesions, breast-conserving surgery followed by radiation therapy to the intact breast is the most widely acceptable standard treatment for the early stage breast cancer [5, 6].

Radiation may also be recommended after mastectomy in patients at high risk with cancer larger than 5 cm, high-grade malignancy, skin or axillary node involvement, incomplete excision, or a tumour close to the excision margin [5]. Breast cancer with red, swollen, and painful overlying skin is classified of T4d and treated with primary chemotherapy and radiotherapy [5]. Primary lymphoma of the breast is commonly high grade and also treated by primary chemotherapy followed by local radiotherapy [6]. Palliative radiotherapy plays an important role in breast cancer patients with metastatic in sites such as bone, brain and skin [5].

1.7 Treatment planning

All radiation fields should be treated with the patient positioned identically to the simulation. The treatment technique may be adjusted based on the capabilities of the treatment planning software and machine, such as Image Guided Radiation Therapy (IGRT), Intensity- Modulated Radiation Therapy (IMRT), Three-Dimensional Conformal Radiation Therapy (3DCRT) or Two-Dimensional Radiation Therapy (2DRT). In 2D conventional radiotherapy, opposing medial and lateral tangential half beam fields with wedges are used for the breast treatment plan to prepare a homogeneous dose distribution [6]. A half beam block is used to minimize the lung and heart exposure in both beams while wedges serve as missing tissue compensators.

The beam arrangement of a 2D treatment plan used for breast radiotherapy is shown in Figure 1.6. below. The International Commission on Radiation Units and Measurements (ICRU) has recommended that the delivered dose remain within -5% and +7% of the prescribed dose to stay be within the optimal treatment window [7].

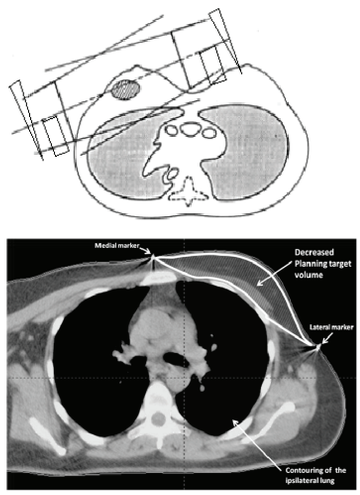


Figure 1.6 Schematic diagrams of beam arrangement for breast radiotherapy treatment with half beam fields and wedges

1.7.1 2D Treatment planning of breasts

2D treatment planning of breasts is mostly done by manually in cancer centers in Sri Lanka using a 2 dimensionally drawn breast contour on a paper usually by POP strip or lead wire method, as described in sections 2.1 and 2.2. Radiotherapy treatment is planned using two-thirds of the breast width (h) as a standard depth as described in 2.3. At this depth, it has been observed that the dose distribution in a manually planned breast is almost same as in software based planning. Additionally, this approach ensures a satisfactory dose distribution to the breast while minimizing radiation exposure to the lungs and heart.

The measurement method, explained in detail in Section 2.3 has been practically implemented in all cancer treatment centers in Sri Lanka. This manual method is applied for all manually treated breasts.

1.7.2 Calculation of Treatment Time

A monitor unit measures ionization occurrin g in the treatment beam within the treatment head. One monitor unit is typically equal to a specific dose of radiation, at a specific depth in a water phantom, for a beam of particular energy, with a particular field size and at a certain distance from the target. Monitor units are used to measure the output of the machine to ensure accurate dose delivery. In teletherapy machines, treatment time is used instead of monitor units. The treatment time is based on similar measurements to monitor units, but uses the known output of the radioactive source to calculate the time required to leave the source in the ‘on’ position.

For the fixed SAD technique the monitor units or treatment time is calculated using the following formula [8],

Treatment time or MU = Daily Dose (cGy) / (OF (cGymin-1) ň TPR ň WF ň no. of beams)

For the fixed SSD technique the monitor units or treatment time is calculated using the following formula [8],

Treatment time or MU = Daily Dose (cGy) / (BSF ň (OF (cGymin-1) ň PDD ň WF ň no. of beams)

2. BREAST MEASUREMENTS AND TREATMENT PLANNING

2.1 Breast measurements by caliper method

In this study, breast measurement using the caliper method is introduced and a locally made caliper is used to obtain the breast measurements of a patient in the supine position. This caliper is also very useful has taking breast measurements when the patient is treated in prone the position. This is a significant advantage compared to the other two methods mentioned above. In above methods, the patient must always be in the supine position on the bed to take breast measurements for 2D treatment planning. If the patient is treated in prone position for intact breasts, 2D measurements of breast contouring are entirely different from those in the supine position. In such cases, only this caliper can be used to take 2D measurements of the breast in prone position.

2.2 Details of the caliper

When a patient in the supine position on the treatment bed for breast measurements, the caliper can be positioned with its jaws on the breast wall, as shown in Figure 2.5. In this caliper all these jaws (1,2,3,4 and 5) as shown in Figure 2.3, can be moved along the ruler and perpendicular to it. The main caliper jaws (1 and 5), as shown in Figure 2.3, are put in medial and lateral lines with same height (at P and Q) and next middle jaw (3), as shown in Figure 2.3, can be positioned in the middle of the main jaws (at C) or at the maximum width (l) of the breast as shown in Figure 2.4. The additional measurements needed for dose calculation taken using the small caliper jaws (2 and 4) as shown in Figure 2.3, can be obtained when those arms touch the breast wall (at D and E) after setting their height (h + h/3) or 2/3 of breast height as a standard value in all cancer centers in Sri Lanka. Already the 2D shape of the breast is determine by positioning these small jaws on the breast wall. The average percentage depth dose (pdd) require for time calculation can be read using the PDD values from the PDD chart (Table 3.1) at distances d1+a/3 (at A) and d2+b/3 (at B) which are, directly taken from the caliper. Here, the distances of a/3 and b/3 are added to the measured distances of d1 and d2 to compensate the tissue-air inhomogeneity correction in both sides of the breast.

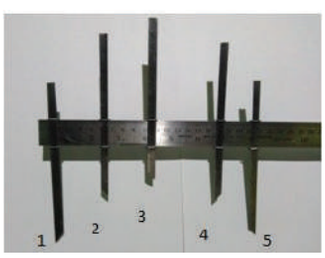


Figure 2.3 Caliper jaws and Caliper

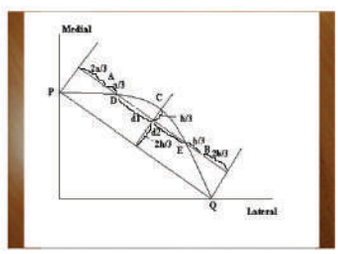


Figure 2.4 Breast measurements
Here; d1 + a = d2 + b

Figure 2.5 Caliper measurements in a breast

2.3 Breast radiation treatment manual planning

The breast contour (PCQ) line measurements at P, D, C, E, and Q can be drawn on a paper sheet by using the caliper as shown in Figure 2.6.

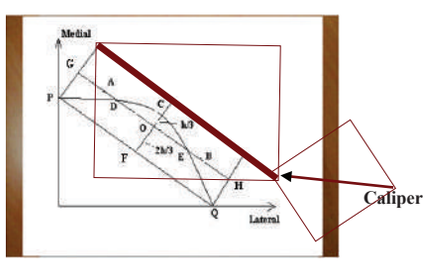


Figure 2.6 Caliper jaw positions

Figure 2.7 Caliper jaws on breast wall of a patient

When caliper jaws are at P, D, C, E and Q , the distances AO and BO can be calculated. When we select the O as the origin the PDD value at normalization point, O can be calculated using the PDD chart as shown in Table 3.1.

3. TREATMENT TIME CALCULATION

For the treatment time calculation of a breast for 2D manual planning, fixed SSD technique is used and the treatment time is given by [8],

Treatment time = Daily Dose (cGy) / { BSF x OF ($cGymin^{-1}$) x PDD x WF x no. of beams}

Where BSF - Back Scatter Factor
OF - Output Factor or Output dose
PDD - Percentage Depth Dose
WF - Wedge Factor

Since BSF is simply the tissue-air ratio at the depth of 0.5 cm or maximum dose on central axis of the beam, BSF values can be taken from the TAR chart as given in Table 3.2. Output factor or the output dose is the teletherapy machine factor. The PDD describes the dose rate at different depths within a target for an equal source-surface distance and the PDD value can be taken from the PDD chart [8] as given in Table 3.1.

Table 3.1 PDD chart [8]

FS/Depth	5x5	6x6	7x7	8x8	9x9	10x10	11x11	12x12	13x13	14x14	15x15
0.5	100	100	100	100	100	100	100	100	100	100	100
1	97.5	97.7	97.8	97.9	98	98.1	98.2	98.2	98.2	98.3	98.3
2	92.1	92.6	93	93.2	93.4	93.7	93.8	93.9	94	94	94.1
3	86.3	87	87.6	88	88.4	88.7	88.9	89.1	89.2	89.4	89.5
4	80.7	81.6	82.3	82.8	83.2	83.7	84	84.3	84.5	84.7	84.9
5	75.2	76.2	77.1	77.8	78.3	78.8	79.2	79.5	79.8	80	80.3
6	69.7	70.8	71.9	72.6	73.3	73.9	74.4	74.9	75.2	75.6	75.9
7	64.7	66	67	67.9	68.6	69.3	69.8	70.3	70.7	71.1	71.5
8	59.9	61.2	62.3	63.2	64	64.7	65.3	65.8	66.2	66.7	67.1
9	55.5	56.8	57.9	58.8	59.7	60.5	61.1	61.7	62.1	62.6	63
10	51.2	52.5	53.8	54.8	55.7	56.4	57.1	57.7	58.2	58.7	59.2
11	47.4	48.7	49.8	50.7	51.6	52.5	53.8	53.8	54.3	54.8	55.3
12	43.8	45	46.2	47.2	48.1	48.9	49.6	50.3	50.8	51.4	51.9

Table 3.2 Back Scatter Factor chart [19]

FS/Depth	5x5	6x6	7x7	8x8	9x9	10x10	11x11	12x12	13x13	14x14
0.5	1.036	1.04	1.043	1.048	1.052	1.054	1.057	1.06	1.063	**1.065**
15x15	**16x16**	**17x17**	**18x18**	**19x19**	**20x20**	**21X21**	**22X22**	**23X23**	**24X24**	**25X25**
1.068	1.07	**1.072**	1.074	1.076	1.078	1.079	1.081	1.082	1.084	1.085

3.1 Treatment time calculation by 2D manual planning

The breast measurements of the patient registration number 589/16, registered at the Cancer clinic, Teaching Hospital, Anuradhapura was taken using the caliper and treatment time calculation was done as described below. This patient was given 40 Gy in 15 daily fractions of 2.67 Gy in 3 weeks.

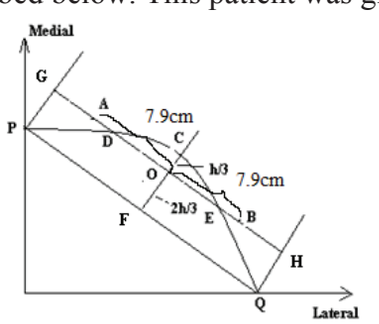


Figure 3.1 Breast measurements taken by caliper

From the contour of the patient body, the breast height FC (h), based on caliper measurements = 3.0 cm.

Therefore, the breast field height is = 3.0 x 2 + 1 cm = 7 cm (an additional 1cm in wedge side height is added from the skin to ensure a satisfactory dose distribution)

The breast width along the body PQ, from caliper measurements = 17 cm

Therefore for the above field 17 x 7W, Equivalent Field Size (E.F.S) $= \frac{2(17 \times 7/2)}{(17+7/2)} = 5.8$ cm

For above E.F.S, the Back Scatter Factor (B.S.F) = 0.8 x (1.04 - 1.036) + 1.036 = 1.039 For 300 Wedge No.15 (15Wx20), Output dose rate of Co-60 source on 24/1/2017 with Half Beam Block = 157.86 cGy/min

For 1/3 depth, distances by caliper measurements after corrections, AO = BO = 7.9cm

PDD % value at normalization point, O from PDD chart =
{[(62.3-67) x 0.9+67] - [(61.2-66) x 0.9+66]} x 0.5 + [(61.2-66) x 0.9+66]
= 62.22%

Treatment time = Daily dose / (B.S.F. x Output dose rate with HBB x PDD value x No. of beams)
= (266.67) / (1.039 x 157.86 x 62.22% x 2) = 1.30 min

Therefore, the treatment time for the patient No. 589/16 for two lateral oblique fields by manual planning is 2.60 minutes.

As described early, Treatment time T is given by,

T = Daily dose / (B.S.F. x Output dose rate with HBB x PDD value x No. of beams)

PDD values for the depths 6.62 cm and 6.88 in the planning sheet (Figure 3.3) are correspondently 67.58% and 66.32%. Then Average Treatment time, T

T = (266.67) min / (1.039 x 157.86 x 66.95% x 2) = 1.21 min

Therefore, the treatment time for the patient No. 589/16 for two lateral oblique fields by Prowess Panther planning system is 2.42 minutes. It is possible to observe that the treatment times in both 2D manual planning and Prowess Panther planning are roughly equal. The error calculation for the distance range from 5.0 cm to 10.0 cm is the same as in Table 3.2 above.

4. RESULTS AND DISCUSSION

The 2D contouring measurement of breasts of patients in the supine position using the breast caliper is much easier and quicker than the Lead or POP wire strip methods. Also the caliper method is much more accurate than the traditional method. The treatment time can be calculated due to the dose protocol as described in the calculation. The calculation of treatment time of 1.30 minutes for two oblique lateral beams was done in SSD technique and the treatment times in 2D manual planning and Prowess Panther v 4.72 computer planning are roughly equal. The percentage depth dose and back scatter factor values were calculated using the standard PDD chart and TAR chart. Specially when the patient in the supine position, setting up the caliper is easy, and measurements can be taken directly in a short time.

When the patient is in the prone position, 2D contouring is not possible with general methods as the breasts are hanging down. Then the only option we have is to use a breast caliper in the upward position, as described earlier. This paper also suggests, using the caliper to take breast measurements in order to determine the treatment time for breast patients with minimum exposure. When the patient has pendulous or large intact breasts, they cannot be positioned in the supine position on the couch due to sagging of the breast to the lateral sides. Then the Lead or POP strip cannot be pasted to breast with better contacts with the skin to get breast measurements due to sagging of breasts to lateral sides (Figure 4.1).

Figure 4.1 A Sagging breast

Therefore, it is better to treat the breast patient in the prone position to minimize measuring errors, to reduce lung and heart doses than the supine position and the designed caliper can be used to obtain breast measurements very accurately in both the supine or prone positions.

4. RESULTS AND DISCUSSION

The caliper designed in this work is much easier and more accurate for taking breast measurements for treatment time calculations of 2D RT treatments compared to the normal lead wire or POP strip method. The normal methods are time consuming and prove to volumetric measurement errors. This caliper can be used successfully when the patient is in the supine position and this caliper is especially useful if the breast patient is treated in the prone position, where breasts hang down or pendulous, on the treatment couch. In breast radiotherapy treatments, it has been found that when the patient is treated in the prone position, the lung and heart doses can be reduced by more than 15% compared to the supine position treatments. When the patient is in the prone position, the 2D contouring possible with traditional methods as breasts are hang down. The only option available is to use a breast caliper in the upward position, as described earlier. This paper also suggests taking the breast measurements using this caliper to find treatment time of breast patients with minimal exposure to the outside. When the patient has pendulous or large intact breasts, they cannot be positioned in the supine position on the couch due to sagging of the breasts to the lateral sides. In such cases, the Lead or POP strip cannot be applied to breasts with better contacts with the skin to obtain breast measurements due to sagging of breasts to the lateral sides. Therefore, if the breast patient is treated in the prone position to minimize measuring errors and to reduce lung and heart doses.compared to the supine position, the designed caliper can be used to obtain breast measurements very accurately.

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07. පානීය ජලයෙන් ආර්ථිකය ශක්තිමත් කළ හැකිද?

කේ.ජී.පියවතී
කළමනාකරණ සහකාර (1 පංතිය)
ශ්‍රී ලංකා සංවර්ධන පරිපාලන ආයතනය

ආසියාතික රටවල් අතර ශ්‍රී ලංකාවට ද වසරේ වැඩිම කාලයක් වර්ෂාපතනය ලැබෙන බව ප්‍රචලිතය. නිරිත දිග මෝසම් සක්‍රිය වීම හා ඊසාන දිග මෝසම් සක්‍රිය වීම නිසා වර්ෂාව නොඅඩුව ලැබේ. මීට අමතරව සංවහන වැසිද අපට ආශිර්වාදයකි.

එමෙන්ම අපගේ ආසන්න තම රට වන ඉන්දියාවේ සුළු කුණාටු තත්වයන් ඇති වුවද එය අප රටේ වර්ෂාපතනය සක්‍රීය වීමට හේතු කාරක වේ. නොවැම්බර්, දෙසැම්බර් මාස වල අපට ලැබෙන අධිකතම වර්ෂාවෙන් වැව් අමුණු පිටාර ගලා යන තරමට ජලාශයන්හි ජලය පිරී පවතී.

එසේ වුවද ලංකාවේද බීමට හා සනීපාරක්ෂක නොයෙකුත් කටයුතු උදෙසා පිරිසිදු ජලය ස්වල්පයක් ලබා ගත නොහැකි ප්‍රදේශ කොපමණක් වේද? ප්‍රධාන නගරය වන කොළඹ නගරයේද පිරිසිදු කළ පානීය ජලය මිලදී ප්‍රයෝජනයට ගන්නා අතර ලංකාව පුරාම පාහේ පවතින දේශීය සංචාරක ගමන් වලදී පිරිසිදු කළ පානීය ජලය මිලදී ගන්නා අවස්ථා බොහෝය. එමෙන්ම විදේශීය සංචාරකයන් අතරද ලංකාවේ මෙම පිරිසිදු කරන ලද පානීය ජලය මිලදී ගැනීම ප්‍රචලිතව ඇත.

උතුරා පිටාර ගලන තරමට වැසි සහිත කාලවල අපතේ යන ජල ධාරාවන් අපගේ ආර්ථිකය ශක්තිමත් කිරීමට යොදාගැනීමට ඇති හැකියාව විමසා බැලිය යුතුය. ඒ අනුව මෙම ජලය සංරක්ෂිතව තබාගත හොත් එමගින් ලංකාවේ ආර්ථිකය ශක්තිමත් කරගැනීමටද හැකි වනු ඇත. ඉතා සුළු වශයෙන් දේශීයව කරගෙන යන පානීය ජලය අලෙවිය තීව්‍ර කර විදෙස් වෙළඳ පොළ වෙතද අලෙවි කිරීමට අවස්ථාව ලබාගැනීම මගින් ආර්ථික වර්ධනයක් ඇති කරගත හැකි වෙතැයි අපේක්ෂා කළ හැක.

මේ සඳහා අවතීර්ණ වීමට පරීක්ෂාවක යෙදුන හොත් අප රටෙහි සෑම ප්‍රදේශයක්ම පාහේ ඇති ජෛව විවිධත්වය හා විවිධ පරිසර පද්ධතීන් සංරක්ෂණය කර ගැනීම මගින් මේ පිළිබඳව සුබවාදී ජයග්‍රහණ අත්පත් කර ගත හැකිවන බව පැහැදිලි වේ.

ජෛව විවිධත්ව පරිසර පද්ධතීන් සංරක්ෂණය කර ගත යුත්තේ එම පරිසර පද්ධතීන් තිරසාර ලෙස භාවිතයට යොදා ගැනීමෙනි. ජෛව විවිධත්ව හායනය මැඩ පැවැත්වීම සඳහා ලංකාවේ අද්විතීය වාස භූමි වන තෙත් සදාහරිත වනාන්තර, වියළි කටු ලැහැබ් වනාන්තර, තෘණ භූමි සංකීර්ණ ගංගා ජාල තෙත් බිම්, මිරිදිය පද්ධතීන්, මුහුදු පැලෑටි තවාන්, කොරල් පර , ගංගා මෝයවල් , කළපු සහ කඩොලාන පිරි වගුරු බිම් ආදිය සුරැකිය යුතුය.

සියළුම රක්ෂිත ප්‍රදේශ සඳහා කළමනාකරණ සැලසුම් සකසා ඒවා අවට වෙසෙන ප්‍රජාවන්ගේ සහයෝගයද සලසාගෙන සීමාසන්න කලාප ක්‍රියාකාරකම් වලට අවධානය යොමු කොට පරිසරය සංරක්ෂණය කර ගත හොත් ගැටුමකින් තොරව පරිසරය රැක ගනිමින් අපගේ ආර්ථිකය නංවා ගත හැකි වනු ඇත. එමෙන්ම ගංගා ද්‍රෝණි අවට පදිංචි ජනතාව විසින් බැහැර කරනු ලබන අපද්‍රව්‍ය බැහැර කිරීම වළකාලීමෙන් හා දුම්රිය හා මහාමාර්ග හා පරිසරය අවට කසල එක් රැස් කිරීම නවතාලීමද ජල දූෂණය අවම කර ගැනීමේදී අතිශයින් වැදගත් වේ.

ජෛව විවිධත්වය සුරැකීම හා නාගරීකරණය යටතේ පරිසරයට අපද්‍රව්‍ය මුදාහැරීම වැළැක්වීමෙන් ජල සම්පත් සුරැකිය හැකිය. ගුණාත්මක ජල සම්පත් ප්‍රවර්ධනය මගින් ජලය ප්‍රමාණාත්මකවද සුරැකිය හැකිය. ස්වභාවික ජල සම්පත් උපයෝගී කරගෙන බීමට ගන්නා පිරිසිදු ජලය මිල කිරීම, මහා පරිමාණ ව්‍යාපාරයක් බවට තවමත් තීව්‍ර වී නැතත් එය සංචාරකයින් අතර මීට වඩා ප්‍රචලිත කිරීමේ විභවයන් පවතී. එම ආර්ථික ප්‍රවර්ධන මුල් පියවර අද අප තැබුවහොත් අපගේ අනාගත පරම්පරාව වෙත එය දියුණු ව්‍යාපාරයක් ලෙස තිළිණ කළ හැක.

08. Inclusive Development and Social Enterprises

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Inclusive Development and Social Enterprises

In the early stages of development discourse, economic factors such as per capita income and gross domestic product (GDP) took center stage as key indicators. However, the focus was primarily on income generation, with little consideration given to the equitable distribution of this income. Recognizing the need to address this oversight, the United Nations (UN) introduced the Human Development Index (HDI), incorporating health and education indicators alongside economic measures.

As the concept of development evolved, there was a growing realization that social and environmental dimensions were integral to holistic progress. This led to the introduction of the Millennium Development Goals (MDGs) at the turn of the 21st century, aiming to tackle issues beyond economic measures. Ongoing discussions emphasized the importance of incorporating factors such as environmental protection, gender equality, and inter-generational equity into the development agenda.

Consequently, the very definition of development underwent a transformative process, embracing a more comprehensive approach that integrated social and environmental considerations. This redefined perspective culminated in the 2015 UN summit where world leaders unanimously adopted the Agenda 2030 for Sustainable Development. This agenda comprises 17 Sustainable Development Goals (SDGs), reflecting a paradigm shift towards achieving a balanced growth encompassing social, environmental, and economic dimensions.

The SDGs represent a global commitment to fostering a sustainable and inclusive future. They advocate for a harmonious coexistence between people and the planet, striving for a world where individuals can experience peace and prosperity within the framework of environmental stewardship.

Through the Agenda 2030, the international community aims to steer development towards a path that ensures the well-being of current and future generations while safeguarding the planet for sustainable prosperity.

The global commitment to achieving the Sustainable Development Goals (SDGs) by 2030 has prompted numerous countries to explore innovative ways to reshape and enhance their existing development policies and frameworks. Among the emerging concepts in the realm of sustainable development, "inclusive development" has gained prominence as a transformative approach.

Inclusive development represents a paradigm shift in the development landscape, emphasizing the involvement of all stakeholders, including marginalized groups, in the development process. This approach adopts a pro-poor perspective, strategically addressing the challenges faced by low-income groups. Central to inclusive development is the collaborative engagement of civil society, the private sector, and governmental entities, ensuring a balanced and comprehensive effort towards sustainable progress (USAID, 2020).

What sets inclusive development apart is its departure from prioritizing the interests of donor agencies or private sector investors. Instead, the primary focus is on poverty reduction, with a commitment to active involvement and participation of marginalized communities throughout the entire development lifecycle. This encompasses the planning, execution, and monitoring of development programs, fostering a sense of ownership and empowerment among the target groups.

In the broader context, inclusive development aligns with related terms such as "social economy," "social enterprises," and "social entrepreneurship."

These concepts collectively underscore the importance of incorporating social and economic inclusivity into development strategies. By leveraging the strengths of diverse stakeholders, inclusive development seeks not only to address immediate socio-economic challenges but also to create sustainable, equitable opportunities for communities to thrive.

As countries strive to navigate the complexities of the evolving global development landscape, the adoption of inclusive development principles stands as a promising avenue. It not only responds to the imperative of achieving the SDGs but also embodies a holistic and participatory approach that aims to leave no one behind on the path to sustainable and inclusive progress.

The examination of social economy practices in the United Kingdom underscores the potential of inclusive growth fostered by the social economy. This is evident in the creation of employment opportunities, the diversification of local economies, and the enhancement of skills and employability, particularly among marginalized groups (Vickers, Westall, Spear, Brennan, and Syrett, 2017). The impact of social economy applications is not limited to the UK; examples abound in Europe, the USA, South America, and Africa.

In Eastern Asia, notably in Japan, China, Hong Kong, South Korea, and Taiwan, emerging models of social enterprise are taking shape. These models are often developed through the concerted efforts of Non-Profit Organizations (NPOs) and cooperatives, which have experienced significant advancements in recent years, marked by specific dynamics that drive their success (Defourny and Kim, 2011).

These initiatives reflect a broader trend in the region towards harnessing the potential of social economy principles for sustainable development. Simultaneously, Southeast Asia has witnessed a surge in social entrepreneurship initiatives, further contributing to the region's socio-economic landscape. Recognizing the importance of guiding social entrepreneurs in the region towards more effective practices, the Economic and Social Commission for Asia and the Pacific (ESCAP) launched the ASEAN Social Enterprise Structuring Guide in May 2018.

This guide serves as a valuable resource, offering insights and strategies to promote the growth and impact of social enterprises within the ASEAN region.

The global landscape of social economy practices, as evidenced by diverse examples across continents, emphasizes the versatility and adaptability of these models. From job creation to skill development and the diversification of local economies, the social economy proves to be a powerful force for inclusive growth. As regions like Asia continue to explore and refine their social economy frameworks, the collaborative efforts of various stakeholders, including NPOs, cooperatives, and social entrepreneurs, are vital in driving positive and sustainable socio-economic change.

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09. Does the Death Penalty Deter Crimes?

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Introduction - Death penalty, current situation, and the history

Death penalty, which is also called capital punishment, is defined as 'execution of an offender sentenced to death after conviction by a court of law of a criminal offense' (Hood, 2021). Amnesty International Global Report 2021 reveals that, by the end of 2021, 108 countries in the world had abolished the capital punishment for all sort of crimes, 8 countries for ordinary crimes only, and 28 countries had abolished it in practice. Therefore, in total, 144 countries in the world had abolished the capital punishment in law or practice whereas 55 countries in the world retained it, i.e., currently, more than two third of the countries in the world have abolished the death penalty in law or practice. Amnesty International shows that this number follows an increasing trend.

The history of death penalty law dates back to the eighteenth-century B.C. when in the Code of King Hammurabi of Babylon death penalty had been codified for 25 different crimes. Later in the Fourteenth Century B.C, the death penalty had been a part of Hittite Code, which is also known as the 'Code of the Nesilim'. Moreover, in the Fifth Century B.C., 'Roman Law of the Twelve Tablets' which was a set of laws inscribed on 12 bronze tablets created in ancient Rome also had made the death penalty a part of its law. During those ancient times, the death sentences were carried out by means of crucifixion, drowning, beating to death, burning alive, and impalement. The countries currently practising capital punishment use beheading, electrocution, hanging, lethal injection and shooting as the means of execution

Death penalty statistics

In 2021, at least 2052 death sentences had been reported from the 55 countries retaining capital punishment It is an increase of almost 40% compared to 1477 death sentences in 2020. At least 28,670 people all around the world had been under death sentence at the end of 2021. In 2021, at least 579 executions had been taken place in 18 countries, which is an increase of 20% from 483 in 2020. The top three countries that accounted for 80% of all known executions are Iran (at least 314), Egypt (at least 83) and Saudi Arabia (65) meanwhile the other countries included Bangladesh, Belarus, Botswana, China, Iraq, Japan, North Korea, Oman, Somalia, South Sudan, Syria, United Arab Emirates, USA, Vietnam and Yemen. However, the death penalty statistics of China is classified as a state secret, hence the global figure of 579 recorded in 2021 excludes the numbers of executions which might have been taken place in China.

Out of the eight South Asian countries, Afghanistan, Bangladesh, India and Pakistan have retained the death penalty law having the belief that the death penalty can deter people from committing future crimes, whereas Sri Lanka and Maldives have chosen to retain the death penalty law while abolishing it in practice. Nepal and Bhutan are the only two countries in the region that have abolished death penalty both in law and practice. In 2018, Afghanistan has given more than one death sentence and more than 11 in 2017. Bangladesh has sentences more than 229 death penalty in 2018 and more than 273 in 2017. Pakistan has sentences more than 250 death sentences in 2018 and more than 200 in 2017. India has awarded 162 death sentences in 2018 and 109 in 2017. Out of the countries that have abolished death penalty in practice, Sri Lanka has awarded more than 17 death sentences in 2018 and 218 in 2017.

When the statistics are compared, the higher numbers related to Bangladesh, India, Pakistan and Sri Lanka indicate how effortlessly the judiciaries of those countries use the death penalty.

Moving to the examples from developed countries, each state of Australia has now abolished capital punishment laws. Queensland was the first state to abolish capital punishment (1922) while Western Australia was the final state to abolish the 'death penalty for murder' in 1984 New South Wales was the last State in Australia to abolish death sentence for all crimes in 1984. According to a report prepared by the research division of the Australian Institute of Criminology (1987), the repeal of capital punishment in Australia had been totally driven by the public opinion which had become increasingly against the idea of sentencing someone to die as a retribution for their crime. Public protests the death penalty had persuaded the government that the Australian public are firmly against capital punishment, and thereby to change the law. However, in general, whether the death penalty is effective on a fact remains controversial, hence the next subsection discusses about the controversy around the death penalty.

Death penalty controversy

Despite its long history in practice, death penalty has been subjected to controversy for a long time. For example, in 1969, Hochkiammer, writing to the Journal of Criminal Law has reported that the death penalty had been the subject of heated debate in the United States for over 150 years. Moreover, in his article, he discussed the arguments both for and against capital punishment such as, the deterrence issue, the discrimination issue, the protection of society issue, other issues such as mentally disturbed people being executed and executing being less expensive for the government compared to keeping people in jail, issues and the importance of public opinion on capital punishment.

In a recent study on death penalty in South Asian countries, Silvee and Wu (2020) compared the death penalty trials of Bangladesh and India, to explore the approach taken by the judiciary of those two countries.

Having conducted the study, the authors have concluded that there is inconsistency in death sentencing in both countries (ambiguities in sentencing), the social cry for justice has been prioritised over convicts' rights and all the stakeholders involved in a criminal trial including judges and legal representatives have held a convictive approach (a judge-centric approach that might lead to a miscarriage of justice). Concluding their paper, the authors raise the question, whether justice means only the satisfaction of the victim; or does justice mean a balance between the victim's satisfaction and the convict's punishment proportionate to the nature and gravity of the offence. Finally, the authors suggest that the sentencing guidelines which play a key role in setting out a standard approach for all judges and magistrates should be set to ensure the delivery of justice equal for all.

Apart from academics, global movements such as Amnesty International also have been campaigning to abolish the death penalty around the world due to many reas ons. Amnesty International's major arguments against the death penalty are fivefold:

(1) It is irreversible, and mistakes happen –
Amnesty International raises the fact that more than 184 death sentenced prisoners since 1973 in the USA have later been exempted or released from death row on grounds of innocence.

(2) It is often practised within biased justice systems –
According to Amnesty International, it is not rare that people get executed after being convicted in grossly unfair trials, based on torture-tainted evidence and with inadequate legal representation. Judges in some countries have no opportunity to consider the circumstances of the crime before sentencing, because the death sentences are imposed as the mandatory punishment for certain offences.

(3) It is discriminatory –
People from less advantaged socio-economic backgrounds or belonging to minorities with limited access to legal representation are being discriminated at the trials.

(4) It is used as a political tool –
Amnesty International reveals that the authorities in the countries like Iran and Sudan use the death penalty to punish political opponents.

(5) It does not deter crime –
The countries who retain death penalty in law or in practice firmly believe that the death penalty deters people from committing crimes. However, this claim has been repeatedly discredited, and there is no evidence that the death penalty is effective in reducing crime. The next subsection discusses whether the death penalty deters crimes in detail.

Does the death penalty deter crimes?

Deterrence is found to be the most expressed rationale for the death penalty all over the world. The proponents of death penalty believe that the threat of being executed in the future is sufficient to make a significant number of people to refrain from committing a crime that they would have otherwise committed. Another objective of death penalty is to express society′s disapproval of the offender′s conduct. On the other hand, the opponents argue that other punishments such as life imprisonment without parole might also provide equal deterrence at far less costs and without causing the potential risk of executing an innocent person. These arguments have been long debated, and apart from the fairness of the trials, the fact whether the death penalty is a proven method of lowering crime rates has been subjected to many discussions and studies, and such discussions and debates have even advocated the policy formulating bodies of the countries around the globe. Following are some examples.

e.g. (1) National Research Council of the National Academies in the Washington DC, USA released a report in 2012 on "Deterrence and the Death Penalty" based on a review of more than three decades of research related to the effectiveness of death penalty and concluded that studies claiming a deterrent effect of death penalty are fundamentally flawed. The report says:
"The committee concludes that research to date on the effect of capital punishment on homicide is not informative about whether capital punishment decreases, increases, or has no effect on homicide rates. Therefore, the committee recommends that these studies not be used to inform deliberations requiring judgments about the effect of the death penalty on homicide. Consequently, claims that research demonstrates that capital punishment decreases or increases the homicide rate by a specified amount or has no effect on the homicide rate should not influence policy judgments about capital punishment."

e.g. (2) In 2015, two Australians (Andrew Chan and Myuran Sukumaran) who were convicted to be drug traffickers were executed in Indonesia despite the Australian authorities' diplomatic requests to deport them to Australia. This incident resulted in an intensified debate within Australia about whether the death penalty is necessary or justified. During this debate, Victorian Supreme Court judge Lex Lasry, a prominent Australian campaigner against the death penalty, publicly claimed that the death penalty is not only inhumane, but also there is no evidence that it has any deterrent value. Apart from the campaigns against death penalty, abundant publicity was given to the evidence that Chan and Sukumaran, jailed for a decade since 2005, had been rehabilitated to the extent that they could contribute in effective programmes to reduce the drug trade in Indonesia. It was argued that their execution deprived the criminal justice system of Indonesia of an effective weapon which could have been used against drug crime.

e.g. (3) Abdorrahman Boroumand Center, a Washington DC-based organisation that promotes human rights and democracy in Iran examined murder rates in 11 countries that have abolished capital punishment in 2018. Countries (1) that had formally abolished the death penalty at least ten years ago; (2) at least one death sentence had been imposed or carried out in the decade prior to abolition and; (3) of which murder rate data was available from the World Trade Organisation were included in the study. The countries that met the above criteria were Azerbaijan, Bulgaria, Poland, Serbia, Estonia, Latvia, Ukraine, South Africa, Kyrgyzstan, Georgia, and Albania. Giving evidence from the statistics, the study proved that ten of the 11 countries (except Georgia) experienced a decline in murder rates in the decade following abolition. These findings were consistent with other state-level data in the United States such as 2017 Death Penalty Information Centre (DPIC) Analysis, which analysed U.S. murder data from 1987 to 2015 and concluded that there was no evidence that the death penalty deters murder. Instead, the evidence showed that murder rates are consistently higher in death-penalty states than in the states that have abolished the death penalty.

Conclusion

The 'more than 200 years old controversy' over the death penalty, on whether it deters crime, is currently in need of resolution. When the arguments on death penalty are analysed, it shows that both retentionists and abolitionists have equally contributed to the controversy over the history by presenting their ideologies. Amidst both arguments, the death penalty continues to be imposed for a variety of crimes around the world, largely to promote the culture of retributive justice. However, the fact that more than two thirds of world's countries have now abolished the death penalty in practice or in law, and its increasing trend indicate that the society now tends to believe that the death penalty is not effective and prefers methods of punishment which involve actual elements of deterrence and rehabilitation.

While this controversy should ultimately be settled in the legislatures or in the courts of low the international experience in Australia and the work of academics such as Hochkammer (1969) shows that such a resolution should be achieved through the public opinion. Therefore, apart from the arguments and the evidence supported by the empirical studies and the statistics, an emphasis should be placed on the people's opinion about the death penalty through the means such as referendums and opinion polls. However, justification of the abolition of death penalty does not mean that other issues such as the necessity of punishment methods with deterrent effect to minimise crime and the necessity of protecting society can be ignored. Any means to repeal death penalty due to its ineffectiveness should, therefore, be accompanied by effective means to strengthen the other existing laws and punishments against crime, and to enhance facilities and develop extensive guidelines and adequately broad legal frameworks for rehabilitation of convicts.

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