

The Concept of Environmental Engineering in the Realm of Heritage Architecture of Tamils in India

Dr V Pon Panneerselvam

Abstract— To provide shelter, security and comfortable living conditions for the occupants; and to produce more than 'housing' – to produce homes, Yes, sweet homes. They may play an important role in social development, Providing the environment in which the society can be Developed. Hence, this paper dealt in detail of the concepts of the Tamils in having their abodes with a mind-full knowledge of Environmental factors. The adoption of Geo-physical norms suitable for having proper housing for their self contented life, recorded in the Literatures reviewed are exposed with scientific and technical details.

Index Terms—Environment, society, housing.

I. INTRODUCTION

The Town has emerged in history with two primary characters:

- High density of population concentration in the limited space.
- A predominantly non-Agricultural, particularly non-culturing nature population.

This men-space ratio and occupational heterogeneity into their consequential relationships formed the primary bodies for difference between the city and the village.

“Rural – Urban continuum” the ancient towns of Tamilagam are extensions of the villages carrying over the same social united and attitudes.

II. MATERIALS AND METHODS

The present work covers mostly the first three centuries of the Christian era, generally accepted as the age of the Sangam. The Sangam Literature furnishes us quite considerable information. This paper gives explanative way of interpretation. Hence the explorative method is adapted to analyze the data collected. The main sources of the data are taken from the Sangam classical works, Bakthi Literature and Epics, The modern technical concepts of Architecture and Environmental Engineering disciplines and field data also considered

III. EXAMINATION

Invention of agriculture was the beginning of castigation, Since the occupation (cultivation) was seasonal, and the fundamental Universal factors are understood by the Tamils as the basic requirement of any life in the world. Therefore they worshiped them with all reverence. They give central positions for them-the natural resources amidst their

residency. They never want to live in a settlement. without a space for the omni potential supreme power.

“கோயில் இல்லாத ஊரில் குடியிருக்க வேண்டா”
- (ஆத்திசூடி)

“ஊரூர் கொண்ட சீர்கெழு விழவினும்
ஆர்வலர் ஏத்த மேவரு நிலையினும்
வேலன் றைஇய வெறியியர் களனும்
காடுங் காவுங் கவின்பெறு துருத்திபும்
யாறுங் குளனும் வேறுபல வைப்பும்,
சதுக்கமும் சந்தியும் புதுப்பும் கடம்பு
மன்றமும்பொதியினும்கந்துடைநிலையினும்
- (தீருமுருகாற்றுப்படை 220-226)

IV. ORIGIN OF TOWNSHIP

With utmost care of the Environment and nature, due to the need, with little intervention of nature the ancient Tamils have created their townships. The fundamental requirements like water, shelter etc., are also given with. It is clearly stated in the following reference

“காடு கொன்று நாடாக்கி
குளந் தொட்டு வளம் பெருக்கிப்
பிறங்கு நிலைமாடத் துறந்தை போக்கிக்
கோயிலொடு குடிநீர்இ
வாயிலொடு புழையமைத்து
ஞாயிறொறும் புதை நீர்இ.”- (பட்டினப்பாலை 283-89)

V. DEVELOPMENT OF TOWNS:

The word Nagar is having many meaning starting from single house, palace, Village, Temple, Town and City.

“பைஞ்சேறு மெழுகிய படிவ நன்னகர்”- (பெரும் - 1.298)(House)

Means the polished flooring of the house was made up of cow dung mixed with natural soil. It is so hygienic to have cow dung as the anti-bacterial matter.

“பொந்துஞ்சு விய்நகர்” - (பெரும் - 1.440) (Palace)

Gives glittering surface treatment of the palace showing its rich sense of glory and wealth. Glittering surface treatment showing.

“அறாயாணர் வளங்கெழு திருநகர்”- (மதுரை - 1.169) (Village)
Denotes the continuous income of the village from the social and natural resources.

“நடுவூர் நகர் (கோயில்)” - (கலிா -3 14) (Temple)

Mentions the position of the temple in the center of the town.
“பொன்னகர்க் கூடல் சென்னியம் - கலித்தொகை 5-3
(Temple)

Shows the finial top of the golden temple as the pinnacle of the town.

பிறையோன் (கோயி_)

The temple of Siva wearing the crescent moon is mentioned here.

“பாய வேலையினார்த்தனர் வழிக்கொடு படர்ந்தார்

Points out the road formation to a town.

சேயு காடெறிந் தணரிநகர் செய்தொழின் மாக்கள்” - (பரஞ்சோதி திருவிளையாடல் புராணம் 3 ஈ.26)

Describes the effort of town formation with little deforestation.

“கரைந்து நீணிலந்திருத்திச் செந்நெறிபடக் கண்டு வளைந்து நன்னகரெடுப்ப தெவ்வாறு”

- (பரஞ்சோதி திருவிளையாடல் புராணம் 3.32)

It also give a wide account of the landscaping and encircling mode of town formation which explain the concept of little interaction with the existing landscape and flora.

“கம்பியர் நூல் தொல்லை வரம்பெல்லை கண்டமைத்த - (பரஞ்சோதி திருவிளையாடல் புராணம் 3.38)

This sentence explains the town formation in accordance with the textual references of the technicians.

“மாளிகை தனக்கம்மாநகர் வடகுணபாற் கண்டு”

- (பரஞ்சோதி திருவிளையாடல் புராணம் 3.41)

This verse points out that the palace was built in the north-east direction of the town.

“இத்தனை மாக்களு மிருக்கத் தக்கதாப் பத்தனைங் காணவிப் பதிக்கண்”

- (பரஞ்சோதி திருவிளையாடல் புராணம் 49.18)

That particular town was capable of giving all residential accommodation to the inhabitants.

“மதில் திருக்காற் பின்னரும் பதியை நல்லோர் திருமுடங்கலென்றார்”

- (வேம்பத்தூரார் திருவிளையாடல் புராணம் 47.14)

It mentions that because of the tilting nature the name of the town was formed as the place of tilting.

“வளைமதில் கண்டா ராம் மறுகுகோ புரந்தடாகம்

கிளரொளி மாடங் கூட மண்டபங் கொடி மற்றும”

- (வேம்பத்தூரார் திருவிளையாடல் புராணம் 47.12)

Enumerates the different parts of the township as bending.

“தொல்லை மரபின் மணிமாடங் கூட மஞ்சுதோ யிஞ்சி மல்லல் வீதி மடங் கழக மற்றுந் திருத்தி மாறின்றி”

- (வேம்பத்தூரார் திருவிளையாடல் புராணம் 53.15)

The town consisting of such sky scrapers, broad roads and public halls built in traditional means were renovated without any difference is referred here.

“கழகொள் பும்பொழி லன்னவும் புதியவாக்கண்டு”

- (பரஞ்சோதி திருவிளையாடல் புராணம் 2349)

A quality township must have a vast park of aromatic flora was the concept of the ancient Tamils can be referred here with.

“வதியுங் கவலையு மிகவளம் புகன்று - (கல்லாடம் பாடல்44)

The channels and big wells were giving enormous water potential to the township is explained here.

“யாறு கிடந்தன்ன அகனைநந் தெரு - (மதுரை காஞ்சி வரி - 1.359)

The breadth of the main roads of the township was compared with a river.

“வையை யன்ன வழக்குடை வாயில்” - (மதுரை காஞ்சி 1.365)

The entry gateway should also as broad and tall like the river vaigai.

“காழ் சாய்த்து தொடை நவில் நெடுங்கடை அடைத்து” - (மதுரை காஞ்சி- னூணூர் 621-622)

This verse explains the closing of the main gateway doors.

“நால்வேறு தெருவு” - (மதுரை காஞ்சி - னூர் 520)

It is an explanation of four different streets with different socio-economical activities.

“உயிர் பூரிம விழுத் தெருவி

நூலறி புலவர் நுண்ணீதிற் கயிரிடடு”

- (மதுரை காஞ்சி - 1.18)

The Architects engaged in construction by using the threads with intricate technical know how's are referred in these verses.

“தேளம் கொண்டு தெய்வம் நோக்கி”

- (நெடுநல்வாடை- னூணூர்

76-77)

Such Architects are preparing themselves by worshipping god before they start their work.

“வேழம் சென்றுபுக

குன்று குயின்றன்ன ஓங்கு நிலை வாயில்”

- (நெடு நல்வாடை- னூணூர் 87-88)

The entrance gateway was as tall as an elephant can easily pass through.

“புறச்சிறைப் பொழிலும் பிறங்குநீர்ப் பண்ணையும்

இறங்கு கதிர்க் கழனியும் புள்ளெழுந் ஆர்ப்ப”

- (சிலப்பதிகாரம் 14: 11-12)

The out skirts of the town was having the public parks, bathing ghats, and paddy fields with different bird.

“பக்கஞ் சூழ்ந்த நெடுகன் முன்றில்

கோட கழந் தெடுத்த மறிநீர்க் கானும்- (கல்லாடம் - 1148)

It mentions of a fresh water channel running through the township.

“அறம்புரி மாந்த ரன்றிச் சேராம்

புறஞ்சிறை தேரார்” - (சிலப்பதிகாரம் 13:191-192)

It also mentions that the saintly people are living only in the out-skirts of the town.

“இளை சூழ் மிளையொடு

வளைவுடன் கிடந்த

விலங்கு நீர்ப் பரப்பு”

- (சிலப்பதிகாரம் 14: 62- 3)

The defensive devices like the dense wood and encircling

moat filled with huge waters are referred here.

“பெருங்கை யானை யின நிரை பெயரும்

சுருங்கை வீதி”

- (சிலப்பதிகாரம் 14:64- 65)

Those escape channels were designed and constructed in large scale of size through which a herd of grown up elephants was moving very easily.

“குடகாற் றெறிந்து கொடி நூடங்கு மறுகிற்

கடைகழி மகளிர்”

- (சிலப்பதிகாரம் 14 : 70 -71)

The western wind blow is referred in these verses.

“பொற்கொடி மூதூர்ப் பொழிலாடமர்ந்து”

- (சிலப்பதிகாரம் 14: 82)

The centrally located park of an ancient town is referred here.

“நூலோர் சிறப்பின் முகில் தோய்மாடம்”

- (சிலப்பதிகாரம் 14: னூணூர் 97.98)

The sky scrapping multi-storied building is referred with.

“இளநிலா முன்றில் இளவெயினுகர்”

- (சிலப்பதிகாரம் 14: னூர். 103)

The spaces courtyard of a house with the contacts of enjoying the moon light morning and evening sunlight is referred here.

“சுடுமணைற்றி யாங்குந் சூழ் போகி

வடுவொடு வாழு மடந்தையர்” - (மணிமேகலை 18:33-4)

The houses constructed with burnt bricks are pointed out here.

“எண்ணெண் கலையோரிரு பெரு வீதியும்”

- (சிலப்பதிகாரம் 14: னூர் 167)

The main streets of row houses are mentioned here.

“அரசு விழை திருவிளங்காடி வீதியும்”

- (சிலப்பதிகாரம் 14: னூர் 179)

The attractive rich market street is explained here.

“பால்வேறு தெரிந்த நால்வேறு தெருவும்

சந்தியும் சதுக்கமும் ஆவண வீதியும்

மன்றமும் கவலையும் மறுகும்”

-(சிலப்பதிகாரம் 14: ஊரா 212-214)

The four different streets of various activities, the junction-the meeting place, the open theater, the laetrile parallel streets, the network of lanes and a main street all enhancing the accommodative quality of a township is enumerated by this passage of silappathikaram.

“மரப்புணை போகித் தேமலர் நறும்பொழிற்

தென்கரை எய்தி” -(சிலப்பதிகாரம் 13.ஊரா 197.180)

The wooden float used to across the river is pointed here.

“நெடுஞ்சுவர் நல்லில்” -(புற நானூறு. 373)

The high walls of a house is referred in this sentence.

“சுருங்கைத் தூம்பின் மனைஊர் தோகையர்

கருங்குழல் கழீஇய கலவை நீரும்”

-(மணிமேகலை 28: 5-8)

The embedded water supply pipeline functioning as a shower point is depicted here.

“புவிகா விலன்றன் புண்ணிய நன்னட

சிவிறியுங் கொம்பும் சிதறுவிரை நீரு

மேலை மாதவிர் பாதம் துளக்கும்

சீல உபாசகர் சொங்கை நறு நீரும் அற”

-(மணிமேகலை 28: 9-19)

The wood, which is suitable for leading a hermitage, is described in these verses.

“வந்தெறி பொறிகள் வகை மாண்புடைய கடிமதில்”

-(மணிமேகலை 28: 23-24)

The defensive fort walls provided with different machineries are mentioned here.

“உயர்வகலந் திண்மை யருமையிந் நான்கும்

அமைவ தரண் என்றுறைக்கும் நூல்” -(குறள் 743)

The defensive fort walls provided with different machineries are mentioned here. This couplet explains the height, thickness and defensive provisions in built with of a fort wall.

“நீரரண் நிலவரண் மலையரண் காட்டரண்

கடைகாப் பமைந்த காவலரிடம்

மதுரை கொண்டியங்கும் வியன் மலி மறுகும்”

-(மணிமேகலை 28: 29-30)

The four different defensive structures namely water fort, terrestrial fort, mountain fort and forest fort are referred here.

“சுடும் ணோங்கிய நெடுநகர்”

-(பெரும்பாணாற்றுப்படை 405)

The fort wall built with burnt to bricks is mentioned here.

“பொற்களப மாளிகைமேன் முன்றினின்று

“பூங்கழங்கு மணிப்பந்தும் போற்றியாடும்”

-(பெரிய புராணம் பக்கம்94)

The spacious terraces of a mansion in which a young lady were playing Kalanku and ball are referred in these verses.

“பூவிரி படப்பைப் புகார்” -(சிலப்பதிகாரம் 32)

The flowery wood of Pukar is referred here.

“தீம்புகார்த் திரை முன்றுறை

தூங்கு நாவாய்” -(பட்டினப்பாலை 173-174)

The floating vassal anchored in the front jetty of the Kavery River running through Pukar is explained here.

“நீர் நாப்பண்ணு நிலத்தின் மேலும்

ஏமாப்ப இனிது துஞ்சி” -(பட்டினப்பாலை 194-95)

The water and soil richness found in Pukar is referred in these verses.

“பயனறவறியா யவனறிருக்கை” -(சிலப்பதிகாரம் 10)

The wealth exported from Rome and Greece, which were enjoyed by the westerners settled in Pukar, is revealed here

“நீரினின்று நிலத்தேறவு

நிலத்தினின்று நீர்ப்பரப்பு

அளந்தறியாப் பலபண்டம்

வரம்பறியாமை வந்தீண்டி

யருங்கூடிப் பெருங்காப்பின்

வலியுடை வில்லணங்கினோன்

புலிவொறித்துப்புறம் போக்கி”-(பட்டினப்பாலை 129-135)

The import and export commodities are with proper taxations and sealing of the Chola kingdom, giving powerful protection to the commodities is explained here.

“வளந்தலை மயங்கிய நனந்தலை மறுகும்

-(சிலப்பதிகாரம் 21)

Hence the natural resource mingled together in Pukar is referred.

“சிறுகுறுங் கைவினைப் பிறவினை யாளரொரு

மறுவின்றி விளங்கும் மருவூர்ப் பாக்கம்”

-(சிலப்பதிகாரம் 38-39)

“கோவியன் வீதி, கொடித்தேர் வீதி” -(சிலப்பதிகாரம்.40)

“நகை வேழம்பரொடு வகை தெரியிருக்கை”

-(சிலப்பதிகாரம் 53)

All the above three reference are mentioning about the living conditions of the streets of ancient Pukar with different working community like blacksmith, goldsmith, royalty, car streets and pimps.

“இருந்து புறஞ்சுற்றில் பெரும்பாயிருக்கை”

-(சிலப்பதிகாரம் 56)

The settlement encircled by a fort wall is pointed out in this sentence.

“இருபெரு வேந்தர் முனையிடம் போல

இருபாற் பகுதியிடை நில மாகிய

கடை காலியாத்த மிடைமரச் சோலை

காதம் நான்கும் கடுங்குரலெழுப்பி”

-(சிலப்பதிகாரம் 159-61)

A wood placed in between the two different human settlement namely Maruvur Pakkam and Pattinapakkam of Pukar is explained here as a puffer zone.

“கூனும் குறளும் ஊமுஞ் செவிடும்

அழகு மெய்யாளரும் முழுகினர் கூடிப்

பழுதில் காட்சி நன்னீறும் பெற்று

வலஞ் செயாக் கழியு மிலஞ்சி மன்றமும்

-(சிலப்பதிகாரம் 1118-121)

A center of water therapy availed by sick persons is referred in this verses which can be compared with the pool of Bethatha of Bible.

“கைதை வேலி நெய்தலங்கானல்

-(சிலப்பதிகாரம் 11150)

The stunt thorny aromatic flora of the seashore pandanus is in abundance in Pukar beach is referred here.

“மலைதலைக் கொண்ட பேரியாறு போலு

முலக விடைகழி”

-(சிலப்பதிகாரம் 126-27)

“மலய மாருத மன்னவர் குறுக்கும்

பன்மலரடுக்கிய நன்னீர் பந்தல்

இலவந்திகை”

-(சிலப்பதிகாரம் 129-30)

A potable water booth in a hygiene condition can be inferred here.

“கோள் தெங்கின் குலை வாழைக்

கொழாங்காந்தள் மலர் நாகத்துத்

குடிக்குடினைக் குடிப்பாக்கம்”

-(பொருநராற்றுப்படை: 208-210)

The natural serene beauty of a hamlet is shown here.

“செழுங்கன் றியாத்த சிறுதாப் பந்தர்

பைஞ்சேறு மெழுகிய படிவ நன்னகர்

மனையுறை கோழியொடு சூமலி தன்னாது

வளைவாய்க் கிள்ளை மறைவிளி பயிற்று

மறைகாப் பாளருறைபதி”

-(பெரும்பாணாற்றுப்படை: 297-301)

The clean maintenance of housing of the high caste people shown here

“ஏணி உய்யதா நீணெடு மாப்பின்
முகடு ரித் தடுக்கிய பழம்பில் லுணவிற
குமரி மூத்த கூடமோங்கு நல்லில்”

-(பெரும்பாணாற்றுப்படை: 245-247)

A forest dwelling availed by the sangam people is referred in this passage

“பகட்டா வீன்ற கொடுநடைக் குழவி
கனவித்தாம்பு தொடுத்த காமுன்றில் இல்”

-(பெரும்பாணாற்றுப்படை: 243-244)

This shows the lively scene of the courtyard of housing

“பிடிக்க கணைத் தன்ன குதிரடை முன்றில்”

-(பெரும்பாணாற்றுப்படை: 180)

Refers the size of the granary with a young lady elephant

“குறுஞ்சாட உருளையோடு கலப்பை சார்த்தி
நெடுஞ்சுவர் பறைந்த புகை கூழ் கொட்டில்”

-(பெரும்பாணாற்றுப்படை:188-89)

The tiller laid over the wall and the smoke of the cooking explains the up keeping life style of the ancient Tamils. “iòçk வேய்ந்த கவின் குடிச் சீருள்”

-(பெரும்பாணாற்றுப்படை: 191)

“ஈந்திலை வேய்ந்த ஏய்ப்புறக் குறும்பை”

-(பெரும்பாணாற்றுப்படை: -88)

“வேழ நிரைத்து வெண்கோடு வீரைஇத்
தாழை முடித்துப் தருப்பை வேய்ந்த
குறியிறைக் குரம்பை”

-(பெரும்பாணாற்றுப்படை: 263-265)

Makes a reference of the thatch of Karuvai, dates and a special grass called tharuppai.

“புதுவை வேய்ந்த கவிசுழன் முன்றில்”

-(பெரும்பாணாற்றுப்படை: 225)

The freshness of the thatch is mentioned here.

“குளக்கரை யாத்த குறுங்காற் குரம்பைச்
செற்றை வாயில் செறிகழிக் கதவிற
கற்றை வேய்ந்த கழித்தலைக் கூம்பு”

-(பெரும்பாணாற்றுப்படை: 147-150)

It elaborates the thatching.

“கொடுத்தாம்பு தொடுத்த குறுந்தறி முன்றில்
கொடுமுகத் துருவையொடு வெள்ளை சேக்கும்
இருமுள் வேலி யெருப்படு விரைப்பு”

-(பெரும்பாணாற்றுப்படை: 152-154)

This talks about the fenced courtyard of housing.

“மிளை கூழ் கோவிலிருக்கை- (சிலப்பதிகாரம் யானூ -4)

It refers about a deep wood encircling the Temple.

“கோவிலர் தம் சிறுமியர்

தானமரு மன்றத்தாடும்

குரவையோ தகவுடைத்தே-(சிலப்பதிகாரம் யானூ)

In such a courtyard of the Temple, the girls used to play a dance called Kuravai.

“பார்வையாத்த பறைத்தாள் விளவின்
நீழல் முன்றில் நிலவிறற் செய்து
குறுங்கா முலக்கை யோச்சி நெடுங் கிணற்று
வில்லூற் றுவரி தோண்டி”

-(பெரும்பாணாற்றுப்படை: 95.99)

Points about a broad well and its springs.

“பறியுடை முன்றில்
கொடுங்காற் புன்னைக் கோடு கழித்தியற்றிய
பைங்கால் தூங்கும் பாய மறை பந்தர்
இணையரு முதியரும் துளையுடன் துவன்றி”

-(பெரும்பாணாற்றுப்படை:265-268)

This referred about the flora and shady nook of a courtyard in which the people were relaxing.

“வலையுணங்கு மணன் முன்றில்” -(பட்டினப்பாலை: 83)

This referred of a courtyard of seashore housing in which fishing net is being dried.

“வண்டோட்டுத் தொங்கின் படுமடல் வேய்ந்த
மஞ்சள் மன்றில் மணநாறு படப்பைத்
தண்டலையுழுவீர் தணி மனை”

-(பெரும்பாணாற்றுப்படை: 353-55)

“மறை பிரித்துண்ட நெல்லி வேலில்

பரலுடை முன்றில்” -(புறநானூறு: ப.120)

“புன்மூசு கவலைய முண்மிடை வேலில்

பஞ்சி முன்றில் சிற்றிலாங்கண்

பீறை நாரிய சூரையவிர் மருங்கு” -(புறநானூறு: ப.116)

குறியிறைக் குரம்பைக் குறவர் மாக்கள்

வேங்கை முன்றிற் குரவை அயரும்

-(புறநானூறு: ப.129)

“மெளவலிதழ் விரிந்து மணஞ் சூழ் பந்தர் செய் முன்றில்

-(கல்லாடம் - ப.81)

“பைங்கொடி அடங்கும் பலர்புகு வாயில்

செம்பூத்தூய செதுக்குடை முன்றில்”

-(பெரும்பாணாற்றுப்படை - 336-38)

“சினைச் சுறவின் கோடு நட்டு

மனைச் சேர்த்தில் வில்லணங்கு”

-(பட்டினப்பாலை: 80-87)

மன்று

“அரசு கோல் கோடினு மறங்கூறவையத்

உரை நவில் கோடி யொரு திறம் பற்றாது

நாவொரு நவிலாது நவை நீருகுத்துப்

பாவை நின்ற முஉம் பாவை மன்றமும்”

-(சிலப்பதிகாரம் யீ - 135-38)

“பயன்மர முள்ளூர்ப் பழுத்தற்றால்” - (திருக்குறள் 216)

“முன்னூர்ப் பழுதிய கோளியாலர்துப்

புள்ளார் யாணர்”

-(புறநானூறு: ப.254)

“தேம்படு பனையின் திரள் பழுத் தொருவிதை

வானூறவோங்கி வளம்பெற வளர்க்கும்

ஒருவற்கிருக்க நழலாகாதே

தெள்ளிய வாலின் சிறுபழக் தொருவிதை

தெண்ணீர்த் தூயத்துட சிறுமீன் சினையினு

நுண்ணீதே யாயினு மண்ணால் யானை

அணீதோர் புரவி யாட்பெரும் படையொடு

மன்னர்க்கிருக்க நழலாகும்மே

-(வெற்றி வேற்கை: 16,17)

“ரைந்தடி யற்ற தூய நடுங்கி வீழ்கின்றதென்று

விந்த வீழூன்றி விழா வகை நிலை விளக்கு மயில்பால்

மைந்தர்கள் தமக்கு நல்ல வறிவினான் மகிழ்ந்து

தந்தையைத் தளரா வண்ணம் தாங்குவீர் தலத்தினென்றவுடன்”

-(கம்பராமாயணம்) “மன்றப் பலவின் மாச்சினை மற்று

யடிவிலர் நாற்றிய விசி கூடு முடி” - (புறநானூறு - 128)

மன்ற விளவின் மனைவீழ் வெள்ளில் -(புறநானூறு 181)

“இரத்து நீடிய வகன்றலை மன்றத்துக்

கரப்பி லுள்ளமொடு வேண்டுமொழி பயிற்றி

அமலைக் கொழுஞ் சேறார்ந்த பாணர்”-(புறநானூறு 34)

“மதுகை மன்றத்

தலைந்தலையிரத்து யலங்குபடு நீழற்

கயிற்றலைச் சிறார் கணைவிளையாடும்”

-(புறநானூறு.325)

“மன்ற வேம்பின் மாச்சினை வேண்டனர்”

-(புறநானூறு.26)

“மூதூர் வாயிற் பணிக்கால் மண்ணி

மன்ற வேம்பின் ஒண்குழை மலைந்து”-(புறநானூறு 79)

“மலர்தலை மன்றத்துப் பலருடன் குழீ இ

மேழுகத் தகரொடு சிலர் விளையாட”

-(பட்டினப்பாலை - 69-67)

“நடுவூருள் வேதிகை சுற்றிக்கோட்டிக்க

பருபனை யன்னர் பலர் நச்ச வாழ்வீர்” -(நாடடியார் - 96)

“பலிகண் மாறிய பாழ்படு பொதியில்

நரைமூ தாளர் நாயிடக் குழிந்த

வல்லி னல்லகம்” - (புறநானூறு -52)

All these reference talks about the medicinal, sweet smelling comforts in the frontage of the housing which played a vital role in the different landscapes of Tamilnadu “Ok¹B¹” விளங்கு சதை நல்லில்”

-(நெடுநல்வாடை 110)

Whereas this refers the brilliant silver like stucco plastering of a beautiful house.

“சில்காற்றிசைக்கும் பல்புழை நல்லில்”

- (மதுரை காஞ்சி :-358)

“ஆடகச் செய்வினை மாடத் தாங்கட்

சாளரம் பொளித்த கால்போகு பெருவழி”

- மணிமேகலை - ணூணூர்

-52-53)

“மேனிலை மருங்கின்

வேனிற் பள்ளித் தென்வளி தருஉம்

நேர் வாய்க் கட்டளை திரியாது”

-(நெடுநல்வாடை: 60-62)

All these reference the points out the proper enjoyable ventilation of the housing through the windows.

இரும்பு செய்விளக்கின் ஈர்ந்திரிக் கொள்கி

நெல்லு மலருந் தூஉய்க் கைதொழுது”

-(நெடுநல்வாடை: 41-43)

Welcoming the evening in a divine and consoling way is referred here.

A. THE NATURE OF THE PHYSICAL WORLD

Tolkappiam is aware of the fact that the physical world of nature is made of the five elements of earth, water, fire, air and Tolkappiar would divide the world into world into words and categories (சொல், பொருள்) .

The categories themselves again may be divided in another way into rational souls and the dead and inert. In yet another way, the categories; time, world, soul, body, God, action, elements, sun, moon, and the word. This division seems to be ethical in its motif. Understanding the role of time, the soul living amidst souls like itself does deeds with the body in the world of elements.

In Ainitinai which is relevant to our purpose, consists of three categories of Mutal, Karu and Uri.

உயர்திணை என்மனார் மக்கட் சுட்டே

அஃறிணை என்மனார் அவரல பிறவே

ஆயிரு திணையில் இசைக்கு மன சொல்லே.

Of these three, land (space) and time are the first. Of these Land is fivefold: that of forest, mountainous region, riverside plain, the seashore, and the desert. This is called the elements of earth (Nilam)

But the physical world consists of earth, water, fire, air and ether. The world according to the character of the five elements, is perceived through the five senses. Earth has the quality of smell, and the other elements have taste, colour, touch and sound respectively. The senses perceive their respective qualities and are thus coordinated with the natures of elements.

Time is, as was stated, one of the categories according to Tolkappiam. It is measured by day and night. Sun and moon are mentioned only for this purpose. Time has the property of making things live through it and disappear. It makes things born, grow, decay and die. To know the essence of time is wisdom. Time is the beginning of creation. God stands first in the series but He is not a member of the series. Rather is Him time ends. Time thus seems to be synonymous with change and motion. At any rate, time is measurable only in terms of

the motion. At any rate, time is measurable only in terms of the motion of spatial quantities. Space and time thus become inseparable and all movements thus become relative. In that case, time also ceases to be absolute. Tolkappiar placed space and time together as Mutarporul.

“நிலம் தீ நீர் வளி விசும்போடைந்தும் கலந்த மயக்கம் உலகம்”.

- (தொல்-மரபு 90)

The role that time plays in the history and destiny of things has been keenly observed and an overall pattern of physical nature has been noticed by the Tolkappiam, Kural and Puram, A whole philosophy of life has been raised on the fascinating properties of time.

In recent years, India has been experiencing a severe shortage of electrical energy. Consumers of electricity for domestic purposes have been facing frequent power shut downs at different times of the day. From the point of view of thermal comfort, the people most affected are those living in hot humid zones where air movement is very essential. Middle class and upper class people, who can afford fans and air conditioners, are being affected by the vagaries of the power supply position. The majority of people living in hot humid zones where air movement is very essential, Middle class and upper class people, who can afford fans and air conditioners, are being affected by the vagaries of the power supply position. The majority of people living in hot humid zone-the low income people and the economically weaker sections, cannot afford even fans to achieve air-movement in habitable rooms.

In view of this, architects have to think of using more and more passive systems of cooling in dwellings. The electrical energy conserved by the use of passive systems in dwellings would be enormous in view of the fact that the total number of dwellings being constructed every year is increasing. Many vernacular architectural elements have contributed substantially to the cooling of dwellings in hot humid zones. There is a tremendous potential for adapting these elements to the present day context of construction technology. By tapping this potential architects can fulfill their obligation of providing thermal comfort at less cost to the masses. The preservation of vernacular character of residential buildings is an added advantage.

The river Vaikai alternately known as Vaiyai is reported to have taken its course touching the traditional Pandyan capital “Kudal” This river Vaiyai which in the Sangam age is reported to have touched ‘Kudal’ is today at about a mile’s distance from Tirupparankunram and Palankanaththam. It takes its course now touching the northern end of present Madurai. Probably, the river had changed its course.

Two rivers by name ‘Pennar’ are mentioned. The ‘South Pennar’** this river meets the sea at Cuddalore and is just south of Palar. The latter river palaru is not mentioned in purananur.

The land through which South Pennar flows is known as ‘Natu’ (Middle country). Another river mentioned in Purananuru is Kari Aru.

Mountains had a strange attraction to the Tamils. Lord Muruka, the great God of the Tamils, was a veritable Olympian and he resided on mountains. Venkatam is always mentioned as the northern frontier post of Tamilakam.² Kutakumalai, the western mountains ranged from Coorg to

Anamalais, Kantiram,³ Kutiraimalai,⁴ Konkanam,⁵ Kollai,⁶ Totti,⁷ Tondi,⁸ Nanchil,⁹ Parampu,¹⁰ Payal,¹¹ Punkunram,¹² Podiyil,¹³ Muthiram,¹⁴ Muthur,¹⁵ Virachi,¹⁶ -- are all referred to.

** Sangam Age for the purpose of this work is taken to be the first three centuries of the Christian era. Purananuru, 47, 2) Ibid, 385, 3) Ibid, 148, 4) Ibid, 106, 5) Ibid, 154, 6) Ibid, 22, 152, 7) Ibid, 205, 8) Ibid, 150, 9) Ibid, 399, 10) Ibid, 137, 11) Ibid, 108, 12) Ibid, 398, 13) Ibid, 193, 14) Ibid, 52, 15) Ibid, 158, 16) Ibid, 200.

VI. SPATIAL

The Tamil country in the Sangam age was ruled by three crowned monarchs and many lesser chieftains. The country comprised the entire area to the south of line that may be drawn to connect Bangalore with Madras. It was called Tamilakam or Tamilnadu. The major political divisions of the country were the Cholanadu, the Pandyanadu and the Chera-nadu. Chera-nadu was called Kuda-nadu (Western Country) though Kutaku or Kutaku-nadu in a restricted sense came to mean modern Coorg only. If the rendering of a Mohenjo-Daro pictograph as "Karamukil Malayalam Nadu" (the Malabar of the rain clouds) is admitted then Chera-nadu must have been in existence as a distinct geographical and political entity trading with the cities of the Indus Valley as early as B.C.2500. The Cholas ruled over the predominantly pastoral districts of the Tamil country – Madurai, Tirunelveli and Ramanad Districts.

The chieftains occupied mostly the fringes, particularly the hilly tracts. The entire area was divided into many Nadus like Kattu-nadu,¹ Konku-nadu,² Kari-nadu,³ the Parampu,⁴ Pennai-nadu,⁵ Malai-nadu,⁶ Mevokkam,⁷ Mukkaval-nadu,⁸ Venkata-nadu⁹ and Ko-nadu.¹⁰ Kadu and Kan both mean forest in the Tamil language.

Probably it was a part or the whole of the present district of Ramnad. The town 'Kanadu-kattan' (at present in Chettinad) was perhaps situated in the midst of Ka-nadu.

The geography and terrain of the country-side of that district justify the title Ka-nadu. The inhabitants of this place were Kanavar. A class of people in the area are known as Vallambar.

Konku-nadu, at times formed part of the Chera kingdom and at other times, it seems to have functioned as an independent political unit. Silappathikaram refers to Konkilam-Kosar who must have ruled from Konku-nadu at least when Senkuttuvan was the Chera king. Palyanai selkelu kuttuvan, the hero of pattu III has the conquest of Konkunadu as the crowning achievement of his military career. It must have been composed of the districts of Salem and Coimbatore.

- 1) Rev. Father Heras: 'The Longest Mohenja Daro Epigraph' Journal of Indian History, Vol. XVI, p.324, 2) Purananuru, 150, 3) Ibid, 373, 4) Purananuru, 122, 5) Ibid, 110, 118, 6) Ibid, 128, 7) Ibid, 160, 8) Ibid, 37, 39, 9) Ibid, 80, 10) Ibid, 54, 61

During the Sangam Age, it must have included the north and north eastern parts of the Coimbatore district and the western part of the Salem district. The northern part of Salem was near Karinadu and the eastern part nearer the junction of the Chera, Chola and Tondai-nadus. It is necessary to remember in this

context that the boundaries were altered with every turn in the political fortunes of the ruling dynasties.

The pre-history of Tamilakam stretches as far back as the old-stone age. Pre-historic researches in this area by Krishnaswami and exploratory trail of Bruce-Foote located the rich vestiges of early man in the riparian stations at Attirampakkam, Vadamadurai, Manjanakkaranai, Erumaivettipalayam, Odappai – all in the Korttalayar valley. This was the oldest courses of the Palar river. The distribution of middle stone-age relics has been noted on a wider region almost upto the southern limits of Vaikai valley in the south with centres particularly located in the Pudukkottai tract on the one hand and Ramanathapuram on the other. The exact nature of their chronological context is not known at present. This regional division of the Tirunelveli District is well discussed by M.Muthukrishnadas.¹ The Flora of the District combined the characteristic features of the Malabar and Coromandal coasts on the one hand and Ceylon on the other.² As for fauna, the Pandya country is not noted for any special breed.³ The Anthologies (particularly Purananuru) contain copious references to the Flora and Fauna of Tamilakam.

In the Neolithic period, man exhibited three important elements of semi-urban settled life namely agriculture or farming, domestication of animals and pottery. "The Neolithic impulses in Tamil Nadu which drew their inspiration from the lower Deccan centres and thrived on a copious supply of basaltic or doleritic nodules for the tool-making were restricted to North-west Tamilnadu".⁴

- 1) B.M.Thirunaranan; 'Rivers of the Palar basin', Journal of Madras Geographical Association, June 1938, pp.155-56., 2) The Tamraparni basin; op.cit., 3) Turnbull, Geographical and Statistical Memoir of Tinnevely and its Zamindaris, Madras, 1871, p.11., 4) V.Krishnan; A Study of the Rural Economy of the Tamraparni basin, (unpublished Essay, Madras, 1931)

The interior of Tamilnadu seems to be untouched. 'Salem sites' are said to be a class of their own within the southern Neolithic culture. Richards observes "Palghat, part of Salem goes with the konku country in the karur, Namakkal, Salem, Thiruchchengode and Omalur Taluks, While Baramahal goes with Tondaimandalam and Mysore and the Rayalaseema hinterland to the north. Hence Salem district was too poor to support a capital, a dynasty or an army of its own and too important strategically to be left in peace".

The Iron-age culture development brought enduring patterns of agricultural endeavor and semi-urban habitational growth to the bulk of Tamilakam. One and all of the ancient sites in Tamilnadu, the urban vestiges start occurring only from the early historic period and a hiatus obtains between the stone-age culture and these. The urban dwellings occur only during the latter part of the Megalithic culture and are the direct evolutionary extension of the local culture. The rise of a classical period could be plausibly related to this early historic era.

Tamilakam seems to have been inhabited by tribes. Who were evolving their own states and politics and were responsible for the numerous pathways throughout the area and the roads that penetrated into the jungle. "It is but appropriate that these kingdoms were a development on the indigenous tribes and the formation of such kingdoms marked the evolution from the tribal stage to settled life. The physical features of the land did not permit these settlers to consolidate themselves into

larger states. Hence, the states were small self-dependent groups. Having been founded on ancient river beds with ever flowing waters and protected by the sea on the one hand and the mountains on the other they continued to flourish" ... "The Markandeya Purana refers to the Dravidas (People of the south) as 'Maharnavas' or living near the coast, and this reference is probably to the coastal areas in the south.

Silappathikaram mentions the names of many Chera kings and lists their achievements. Kumulur is one of the places mentioned in this work, possible Ptolemy's 'Kourellur'. It still exists as kumili in north Travancore, an almost deserted village at the foot of the hill.² Kanakasabhai Pillai concludes that the earliest inhabitants of South India were Villavar (bowmen) and Minavar (fisherman) and it may therefore be accepted that these people lived either on the coasts or in the thickly forested hills.³

1) T.V. Kuppaswami; Sangam Chieftains and their times, op.cit., 2) Pargiter, Markandeya Purana (tr), Calcutta (1888), p.331., 3) K.G. Sessa Iyer, Chera Kings of the Sangam Age, London, (1937) pp. 7-8.

"The former being more accessible, came into contact with other people and developed a civilized life while the hill-men and the foresters out off by native barriers continued to be the same old uncivilized men unaffected by the rolling of ages". K.C. Mammen traces the settlements of the pre-dravidan Negritos and Proto-Austroloid people of the Neolithic age.¹ They lived in the forests depending on the game for their livelihood. They had a tribal organization with a head-man, living in villages knit together by social and religious ties. The centrifugal force in these villages was the common place of worship, the seat of the village headman or village assembly, where the people gathered to discuss clan rules. Baden Powell speaks of such villages as existing in the Dravidan period.² It was only when nomadic life gave way to a more stable existence based on agriculture that settlers formed clans and groups, and locality or territory became more important than social or religious ties.³

1) V.R.R. Dikshitar, 'South-India in the Ramayana' Proceedings and transactions of the Seventh All India Oriental Conference, Baroda, (1933), p.246., 2) Kerala Culture, Trivandrum, (1942) pp.32.60. 3) Ibid, p.46.

The Keralolpatti and the Kerala Mahathamayam also provide us with information. These speak of Parasurama the divine incarnation of Vishnu, who brought Arya Brahmins from the Arya country and settled them in sixty four villages along the coast of Kerala. As evidenced by these sources, the Brahmins decreed that four villages should govern all the sixty-four and subsequently that the chief of one village should rule the rest. Not satisfied with this form of Government, the Brahmins then brought in rulers from Pandya and Cholakara, the third being crowned at Paramba, and another living at Koteesvaram. Arya-perumal is credited with having divided Kerala into four divisions; another perumal is stated to have built Kennatte (mentioned in the Periplus) and a settlement near the River Naytara. Vijayam perumal is credited with the building of the town called Tirukkannapuram. Since A.D.333, the centre of attraction is claimed to have shifted from palaces and towns to village kutams or assemblies and settlements were built round them. The existence of kingdoms is strengthened by Asoka's Edicts, poet Kalidasa's Raghuvamsa, Sinhalese Traditions, periplus of Erythraean Sea and by Ptolemy's Kingdoms of the south or Dravida.

The main factors influencing the development of settlements were (a) activities of the kings, (b) Trade, (c) places of worship, (d) Village assemblies, (e) Agriculture. The settlements were more compact, partly on account of insecurity of life and property and partly on account of the undeveloped condition of agriculture which was the main activity of the people. Ancient settlements are found near River valleys or on a hill, or on an island in backwaters which provide natural defenses. They appear to have had a well ordered government with roads, buildings, tanks and reservoir* -- "almost corresponding to a feudal manor or the West".

Herodotus is one among the earliest (5th century B.C) to mention the foreign settlements in India. His Knowledge is vague and limited but his description is valuable as being the oldest existing records in the west of an ancient civilisation. The first direct account of the kingdoms of south India is that of Megasthenes. He makes mention of the ports of Kumari, Topina, Cottara, Bakare, Nelkynda and Musiris which have been identified as ports of the west-coast.

*K.P. Padmanabha Menon, p.51.

Strabo (21 A.D) describes India as rhomboid with Cape-comorin as land's end.² Pliny the elder says (23 A.D) that "The Indian seas were invested with pirates". If the wind called Hippalus be blowing, Musiris, the nearest port can be reached in forty days. It is not a desirable port of call for pirates being in the neighborhood besides, it is not well supplied with wares for traffic ships, besides anchor at a great distance from the shores and the cargos have to be landed and shipped by employed boats."³

This great port is also mentioned by Ptolemy, and in the Periplus, the author of which is supposed to be Pliny himself. Ptolemy's map of India (2nd century A.D) is distorted out of all recognition; but he mentions among other places Nitra, Tyndis, Bramagaram, Kalai-karai, Mouziris, Podopoura, Semne, Korcoura, Nelkynda, Bakarei, Mons-pyrrhus (Elankon of Ptolemy) and

1) Mc Crindle; Ancient India as described by classical Literature, Westminster (1901), p.4., 2) K.A. Nilakanta Sastri, Foreign notices of south India, University of Madras, Historical Series, (1947), p.9., 3) Mc Crindle, Ancient India as described in classical Literature, p.11.

Komarfiel with Cannanore¹ and also as Mangalore,² Tyndis as Tanur (by Yule)³ as Kadalundi by Burnell⁴ and as a busy trading centre, the seat of ruling princes and probably the Tyndis mentioned in the Periplus.⁵ Bramagara is a settlement half a degree east of Tyndis⁶ (rightly south as Ptolemy's map is distorted): and Kalai-karai, a settlement near Cranganore.⁷

To-day, there is a settlement in North Travancore called Kadal - karai which may be the one mentioned by Ptolemy. Yule, Burnell and Caldwell are all of the opinion that Musiris is Cranganore. Poudupara has been identified as Pudu Patna (New town) in Malabar Semme, a little to the east was a landing settlement. Bakara or Bacare was a coastal settlement west of Nelkynda and has been identified by V.A. Smith as Vaikkara, the landing place for Kottayam; Koroura was settlement west of Bacare. Nelkynda has been identified as Kallade or Kennet in Travancore. Schoff identifies it as a settlement near Kottayam in Travancore. All shows the knowledge gained through experiences over the yields of the nature, its values, trade, landscape and the wind blow for shipping and others practiced by the Tamils in sangam period.

1)Mazumdar Sastri, Op.cit., p.7., 2) Schoff, Op.cit., p.204, 3) Mazumdar Sastri, Op.cit., p.40.4)Ibid; p.50. , 5) Schoff, Op. cit., p.204. , 6) K.V.Krishna Iyer, The Zamorins of Calicut, Calicut, (1939) p.8, 202 & 272. , 7) Mazumdar Sastri, Op.cit., p.50,

VII. CONCLUSION

One cannot speak of environment without considering the impact on the lives of people. We have hundreds of small-scale and continuing environmental disasters taking place all around us. But we overlook them so long as they do not impact our lives or our lifestyles.

➤ Architecture and Environmental Engineering were inseparable or complex formation among the ancient Tamils.
➤ The experience of the Tamils with the nature or Environment is very rich which yield the modern green house effect to the lively hood of the ancient Tamils.
➤ According to the experience and inherited knowledge ,they have classified the Environment as follows.

1. The space filled with different gases around the earth. (Vayu Mandalam)
2. Watery surface of the earth. (Neer Mandalam)
3. The crest of earth filled with soil, rocks, etc., (Nila Mandalam)
4. Different types of life (creatures) living in the above three surfaces (Uyir Mandalam)

These classification of the inherited knowledge prevailed among the ancient Tamil confirms the following Architecture and Environmental Engineering wisdom practiced in ancient Tamil Nadu.

- Analytical knowledge of the earth and making use of system.
- Keeping pollution free earth. Awareness of pollution etc.
- Usage of natural manures for their cultivation and agricultural efforts. Keeping the potential virgin soil.
- Minimized intervention in deforestation for having their Architectural structures.
- Afforestation in and around housing either by belief or sense of beauty or religious practice.
- Awareness of pollution free water bodies. Having different water bodies for the domestic purposes like bathing, washing, building, drinking, cattle, etc.
- The drinking purpose water bodies were protected by engaging security.
- Awareness of the potable and domestic waters and the minimum usage.
- Knowledge of the pollution free air and usage by keeping away the industries in the outskirts of their residency.
- Awareness of fire and the technical know-hows of its usage.
- The soft approach over the nature -Environment can be very well understand from the inherited behavior

of the ancient Tamil people which can be inferred from the following.

All the poems of Natrinai are on love. A recurrent theme in at least 50 per cent of the verses is the reference to trees.

Today, mankind has realized the key role trees play not only as a balm for sore eyes but also in our environment. We have done this with the aid of the most advanced technology. The poets of the Natrinai had no modern technology but had not

only connected the role of trees to their well-being, but had observed even the minute variations of trees as the seasons change.



Dr V Pon Panneerselvam, Received the Ph.D degree at Tamil University, Thanjavur on December 2010, M.E(Environmental Engineering and B.E (Civil Engineering) at Annamalai University, Annamalai Nagar on December 1993 & June 1990. Life member of The Indian Society of Technical Education, New Delhi. Member of The Institution of Engineers (Calcutta). Chartered Engineer (India). Achieved certificate in CMI Level 5 Award in Management and Leadership (QCF) issued by CMI, London. Presented papers at National level seminars and published many papers in International journals with high impact factor and indexing. Expertise in Environmental Engineering Management and ideological personality in Civil Engineering fields